Lenovo CE0128TB/CE0128PB and CE0152TB/CE0152PB Switches

CLI Command Reference

For Lenovo Campus NOS 8.4.3

Lenovo™

Note: Before using this information and the product it supports, read Appendix B, “Notices" of this manual. Also read the the product *Warranty Information* document and the *Important Notices* document included with the product.

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Contents

Preface

This document describes command-line interface (CLI) commands you use to view and configure Lenovo Campus NOS software on the Lenovo CE0128TB/CE0128PB and CE0152TB/CE0152PB switch models (referred to as CE0128XB/CE0152XB throughout this document). You can access the CLI by using a direct connection to the serial port or by using telnet or SSH over a remote network connection.

Note: This document contains both standalone and stacking commands. The stacking commands are available on the CE0128XB/CE0152XB platform.

Who Should Use This Guide

This document is for system administrators who configure and operate systems using CE0128XB/CE0152XB software. It provides an understanding of the configuration options of the CE0128XB/CE0152XB software.

Software engineers who integrate CE0128XB/CE0152XB software into their hardware platform can also benefit from a description of the configuration options.

This document assumes that the reader has an understanding of the CE0128XB/CE0152XB software base and has read the appropriate specification for the relevant networking device platform. It also assumes that the reader has a basic knowledge of Ethernet and networking concepts.

Refer to the release notes for the CE0128XB/CE0152XB application-level code. The release notes detail the platform-specific functionality of the Switching, Routing, SNMP, Configuration, Management, and other packages. The suite of features the CE0128XB/CE0152XB packages support is not available on all the platforms to which CE0128XB/CE0152XB software has been ported.

What You’ll Find in This Guide

This guide will help you view and configure CE0128XB/CE0152XB switch software using the command-line interface (CLI) commands. Where possible, each section provides feature overviews, usage examples, and configuration instructions.

Additional References

Additional information about installing and configuring the CE0128XB/CE0152XB is available in the following guides:

- *Lenovo CE0128TB/CE0128PB and CE0152TB/CE0152PB Web GUI Reference*
- *Lenovo CE0128TB/CE0128PB and CE0152TB/CE0152PB Quick Start Guide*

Chapter 1. About CE0128XB/CE0152XB Software

The CE0128XB/CE0152XB software has two purposes:

- Assist attached hardware in switching frames, based on Layer 2, 3, or 4 information contained in the frames.
- Provide a complete device management portfolio to the network administrator.

Scope

CE0128XB/CE0152XB software encompasses both hardware and software support. The software is partitioned to run in the following processors:

- CPU

This code runs the networking device management portfolio and controls the overall networking device hardware. It also assists in frame forwarding, as needed and specified. This code is designed to run on multiple platforms with minimal changes from platform to platform.

- Networking device processor

This code does the majority of the packet switching, usually at wire speed. This code is platform dependent, and substantial changes might exist across products.

Product Concept

Fast Ethernet and Gigabit Ethernet switching continues to evolve from high-end backbone applications to desktop switching applications. The price of the technology continues to decline, while performance and feature sets continue to improve. Devices that are capable of switching Layers 2, 3, and 4 are increasingly in demand. CE0128XB/CE0152XB software provides a flexible solution to these ever-increasing needs.

The exact functionality provided by each networking device on which the CE0128XB/CE0152XB software base runs varies depending upon the platform and requirements of the CE0128XB/CE0152XB software.

CE0128XB/CE0152XB software includes a set of comprehensive management functions for managing both CE0128XB/CE0152XB software and the network. You can manage the CE0128XB/CE0152XB software by using one of the following three methods:

- Command-Line Interface (CLI)
- Simple Network Management Protocol (SNMP)
- Web-based

Each of the CE0128XB/CE0152XB management methods enables you to configure, manage, and control the software locally or remotely using in-band or out-of-band mechanisms. Management is standards-based, with configuration parameters and a private MIB providing control for functions not completely specified in the MIBs.

Chapter 2. Using the Command-Line Interface

The command-line interface (CLI) is a text-based way to manage and monitor the system. You can access the CLI by using a direct serial connection or by using a remote logical connection with telnet or SSH.

This chapter describes the CLI syntax, conventions, and modes.

Command Syntax

A command is one or more words that might be followed by one or more parameters. Parameters can be required or optional values.

Some commands, such as `show network` or `clear vlan`, do not require parameters. Other commands, such as `network parms`, require that you supply a value after the command. You must type the parameter values in a specific order, and optional parameters follow required parameters. The following example describes the command syntax for the `network parms ipaddr netmask [gateway]`

- `network parms` is the command name.
- `ipaddr` and `netmask` are parameters and represent required values that you must enter after you type the command keywords.
- `[gateway]` is an optional parameter, so you are not required to enter a value in place of the parameter.

The *Lenovo CLI Command Reference for CE0128TB/CE0128PB and CE0152TB/CE0152PB Switch* lists each command by the command name and provides a brief description of the command. Each command reference also contains the following information:

- Format shows the command keywords and the required and optional parameters.
- Mode identifies the command mode you must be in to access the command.
- Default shows the default value, if any, of a configurable setting on the device.

The `show` commands also contain a description of the information that the command shows.

Command Conventions

The parameters for a command might include mandatory values, optional values, or keyword choices. Parameters are order-dependent. Table 1 describes the conventions this document uses to distinguish between value types.

Table 1. *Parameter Conventions*

Symbol	Example	Description
[] square brackets	[value]	Indicates an optional parameter.
`italic font in a parameter`.	*value or [value]*	Indicates a variable value. You must replace the italicized text and brackets with an appropriate value, which might be a name or number.
{} curly braces	{choice1 | choice2}	Indicates that you must select a parameter from the list of choices.
| Vertical bars	choice1 | choice2	Separates the mutually exclusive choices.
[{}] Braces within square brackets	[{choice1 | choice2}]	Indicates a choice within an optional element.

Common Parameter Values

Parameter values might be names (strings) or numbers. To use spaces as part of a name parameter, enclose the name value in double quotation marks. For example, the expression "System Name with Spaces" forces the system to accept the spaces. Empty strings ("") are not valid user-defined strings. Table 2 describes common parameter values and value formatting.

Table 2. *Parameter Descriptions*

Parameter	Description
ipaddr	This parameter is a valid IP address. You can enter the IP address in the following formats: a (32 bits) a.b (8.24 bits) a.b.c (8.8.16 bits) a.b.c.d (8.8.8.8) In addition to these formats, the CLI accepts decimal, hexadecimal and octal formats through the following input formats (where *n* is any valid hexadecimal, octal or decimal number): 0xn (CLI assumes hexadecimal format.) 0n (CLI assumes octal format with leading zeros.) n (CLI assumes decimal format.)

ipv6-address	`FE80:0000:0000:0000:020F:24FF:FEBF:DBCB, or`
	`FE80:0:0:0:20F:24FF:FEBF:DBCB, or`
	`FE80::20F24FF:FEBF:DBCB, or`
	`FE80:0:0:0:20F:24FF:128:141:49:32`
	For additional information, refer to RFC 3513.

Interface or `unit/slot/port`	Valid slot and port number separated by a forward slash. For example, 0/1 represents slot number 0 and port number 1.

Table 2. *Parameter Descriptions (continued)*

Parameter	Description
Logical Interface	Represents a logical slot and port number. This is applicable in the case of a port-channel (LAG). You can use the logical unit/slot/port to configure the port-channel.
Character strings	Use double quotation marks to identify character strings, for example, “System Name with Spaces”. An empty string (“”) is not valid.

unit/slot/port Naming Convention

CE0128XB/CE0152XB software references physical entities such as cards and ports by using a `unit/slot/port` naming convention. The CE0128XB/CE0152XB software also uses this convention to identify certain logical entities, such as Port-Channel interfaces.

The slot number has two uses. In the case of physical ports, it identifies the card containing the ports. In the case of logical and CPU ports it also identifies the type of interface or port.

Table 3. *Type of Slots*

Slot Type	Description
Physical slot numbers	Physical slot numbers begin with zero, and are allocated up to the maximum number of physical slots.
Logical slot numbers	Logical slots immediately follow physical slots and identify port-channel (LAG) or router interfaces. The value of logical slot numbers depend on the type of logical interface and can vary from platform to platform.
CPU slot numbers	The CPU slots immediately follow the logical slots.

The port identifies the specific physical port or logical interface being managed on a given slot.

Table 4. *Type of Ports*

Port Type	Description
Physical Ports	The physical ports for each slot are numbered sequentially starting from one/ For example, port 1 on slot 0 (an internal port) for a stand alone (nonstacked) switch is 1/0/1, port 2 is 1/0/2, port 3 is 1/0/3, and so on.
Logical Interfaces	Port-channel or Link Aggregation Group (LAG) interfaces are logical interfaces that are only used for bridging functions. VLAN routing interfaces are only used for routing functions. Loopback interfaces are logical interfaces that are always up. Tunnel interfaces are logical point-to-point links that carry encapsulated packets.
CPU ports	CPU ports are handled by the driver as one or more physical entities located on physical slots.

Note: In the CLI, loopback and tunnel interfaces do not use the `unit/slot/port` format. To specify a loopback interface, you use the loopback ID. To specify a tunnel interface, you use the tunnel ID.

Using the “No” Form of a Command

The `no` keyword is a specific form of an existing command and does not represent a new or distinct command. Almost every configuration command has a `no` form. In general, use the `no` form to reverse the action of a command or reset a value back to the default. For example, the `no shutdown` configuration command reverses the shutdown of an interface. Use the command without the keyword `no` to re-enable a disabled feature or to enable a feature that is disabled by default. Only the configuration commands are available in the `no` form.

Executing Show Commands

All show commands can be issued from any configuration mode (Global Configuration, Interface Configuration, VLAN Database, etc.). The show commands provide information about system and feature-specific configuration, status, and statistics. Previously, show commands could be issued only in User EXEC or Privileged EXEC modes.

CLI Output Filtering

Many CLI `show` commands include considerable content to display to the user. This can make output confusing and cumbersome to parse through to find the information of desired importance. The CLI Output Filtering feature allows the user, when executing CLI `show display` commands, to optionally specify arguments to filter the CLI output to display only desired information. The result is to simplify the display and make it easier for the user to find the information the user is interested in.

The main functions of the CLI Output Filtering feature are:

- Pagination Control
  - Supports enabling/disabling paginated output for all `show` CLI commands. When disabled, output is displayed in its entirety. When enabled, output is displayed page-by-page such that content does not scroll off the terminal screen until the user presses a key to continue. --More-- or (q)uit is displayed at the end of each page.
  - When pagination is enabled, press the return key to advance a single line, press q or Q to stop pagination, or press any other key to advance a whole page. These keys are not configurable.

Note: Although some CE0128XB/CE0152XB `show` commands already support pagination, the implementation is unique per command and not generic to all commands.

- Output Filtering
  - “Grep”-like control for modifying the displayed output to only show the user-desired content.
    - Filter displayed output to only include lines containing a specified string match.
    - Filter displayed output to exclude lines containing a specified string match.
    - Filter displayed output to only include lines including and following a

specified string match.

- Filter displayed output to only include a specified section of the content (e.g. “interface 0/1”) with a configurable end-of-section delimiter.
- String matching should be case insensitive.
- Pagination, when enabled, also applies to filtered output.

Example: The following shows an example of the extensions made to the CLI `show` commands for the Output Filtering feature.

```
(Routing) #show running-config ?
<cr>                                    Press enter to execute the command.
|                                       Output filter options.
<scriptname>                            Script file name for writing active configuration.
all                                     Show all the running configuration on the switch.
interface                               Display the running configuration for specified
interface on the switch.


(Routing) #show running-config | ?
begin            Begin with the line that matches
exclude           Exclude lines that matches
include           Include lines that matches
section          Display portion of lines
```

For new commands for the feature, see “CLI Output Filtering Commands” on page 168.

CE0128XB/CE0152XB Modules

CE0128XB/CE0152XB software consists of flexible modules that can be applied in various combinations to develop advanced Layer 2/3/4+ products. The commands and command modes available on your switch depend on the installed modules. Additionally, for some `show` commands, the output fields might change based on the modules included in the CE0128XB/CE0152XB software.

The CE0128XB/CE0152XB software suite includes the following modules:

- Switching (Layer 2)
- Routing (Layer 3)
- IPv6 routing
- Multicast
- Quality of Service
- Management (CLI, Web UI, and SNMP)
- IPv6 Management—Allows management of the CE0128XB/CE0152XB device through an IPv6 through an IPv6 address without requiring the IPv6 Routing package in the system. The management address can be associated with the network port (front-panel switch ports), a routine interface (port or VLAN) and the Service port.
- Stacking
- Secure Management

Note: Not all modules are available for all platforms or software releases.

Command Modes

The CLI groups commands into modes according to the command function. Each of the command modes supports specific CE0128XB/CE0152XB software commands. The commands in one mode are not available until you switch to that particular mode, with the exception of the User EXEC mode commands. You can execute the User EXEC mode commands in the Privileged EXEC mode.

The command prompt changes in each command mode to help you identify the current mode. Table 5 describes the command modes and the prompts visible in that mode.

Note: The command modes available on your switch depend on the software modules that are installed.

Table 5. *CLI Command Modes*

Command Mode	Prompt	Mode Description
User EXEC	Switch>	Contains a limited set of commands to view basic system information.
Privileged EXEC	Switch#	Allows you to issue any EXEC command, enter the VLAN Database mode, or enter the Global Configuration mode.
Global Config	Switch (Config)#	Groups general setup commands and permits you to make modifications to the running configuration.
VLAN Database	Switch (Vlan)#	Groups all the VLAN commands.
Interface Config	Switch (Interface *unit/slot/port)#* Switch (Interface Loopback *id*)# Switch (Interface *unit/slot/port (startrange)-unit/slot/port(endrange)#* Switch (Interface lag lag-intf-num)# Switch (Interface vlan vlan-id)#	Manages the operation of an interface and provides access to the router interface configuration commands. Use this mode to set up a physical port for a specific logical connection operation. You can also use this mode to manage the operation of a range of interfaces. For example the prompt may display as follows: Switch (Interface 1/0/1-1/0/4) # Enters LAG Interface configuration mode for the specified LAG. Enters VLAN routing interface configuration mode for the specified VLAN ID.
Line Console	Switch (config-line)#	Contains commands to configure outbound telnet settings and console interface settings, as well as to configure console login/enable authentication.

Table 5. *CLI Command Modes (continued)*

Command Mode	Prompt	Mode Description
Line SSH	Switch (config-ssh)#	Contains commands to configure SSH login/enable authentication.
Line Telnet	Switch (config-telnet)#	Contains commands to configure telnet login/enable authentication.
AAA IAS User Config	Switch (Config-IAS-User)#	Allows password configuration for a user in the IAS database.
Mail Server Config	Switch (Mail-Server)#	Allows configuration of the email server.
Policy Map Config	Switch (Config-policy-map)#	Contains the QoS Policy-Map configuration commands.
Policy Class Config	Switch (Config-policy-class-map)#	Consists of class creation, deletion, and matching commands. The class match commands specify Layer 2, Layer 3, and general match criteria.
Class Map Config	Switch (Config-class-map)#	Contains the QoS class map configuration commands for IPv4.
Ipv6_-Class-Map Config	Switch (Config-class-map)#	Contains the QoS class map configuration commands for IPv6.
Router OSPF Config	Switch (Config-router)#	Contains the OSPF configuration commands.
Router OSPFv3 Config	Switch (Config rtr)#	Contains the OSPFv3 configuration commands.
Router RIP Config	Switch (Config-router)#	Contains the RIP configuration commands.
Route Map Config	Switch (config-route-map)#	Contains the route map configuration commands.
IPv6 Address Family Config	Switch (Config-router-af)#	Contains the IPv6 address family configuration commands.
RADIUS Dynamic Authorization Config	(Config-radius-da)	Contains the Radius Dynamic Authorization commands.
MAC Access-list Config	Switch (Config-mac-access-list)#	Allows you to create a MAC Access-List and to enter the mode containing MAC Access-List configuration commands.
IPv4 Access-list Config	Switch (Config-ipv4-acl)#	Allows you to create an IPv4 named or extended Access-List and to enter the mode containing IPv4 Access-List configuration commands.

Table 5. *CLI Command Modes (continued)*

Command Mode	Prompt	Mode Description
IPv6Access-list Config	Switch (Config-ipv6-acl)#	Allows you to create an IPv6 Access-List and to enter the mode containing IPv6 Access-List configuration commands.
Management Access-list Config	Switch (config-macal)#	Allows you to create a Management Access-List and to enter the mode containing Management Access-List configuration commands.
TACACS Config	Switch (Tacacs)#	Contains commands to configure properties for the TACACS servers.
User-Group Configuration	Switch (config-usergroup)	Contains user group commands
Task-Group Configuration	Switch (config-taskgroup)	Contains task group commands
DHCP Pool Config	Switch (Config dhcp-pool)#	Contains the DHCP server IP address pool configuration commands.
DHCPv6 Pool Config	Switch (Config dhcp6-pool)#	Contains the DHCPv6 server IPv6 address pool configuration commands.
Stack Global Config	Switch (Config stack)#	Allows you to access the Stack Global Config Mode.
ARP Access-List Config	Switch (Config-arp-access-list)#	Contains commands to add ARP ACL rules in an ARP Access List.
Support Mode	Switch (Support)#	Allows access to the support commands, which should only be used by the manufacturer's technical support personnel as improper use could cause unexpected system behavior and/or invalidate product warranty.
VLAN Config	Switch (vlan vlan-id)#	Contains commands to configure private VLAN settings on a VLAN, FIP snooping, and to configure the RSPAN mode.
ERSPAN Source Session Configuration Mode	Switch (config-erspan-src)#	Configure the source interface for ERSPAN and access ERSPAN Source Session Destination Configuration mode
ERSPAN Source Session Destination Configuration Mode	Switch (config-erspan-src-dst)#	Configure the ERSPAN origin and destination IPv4 addresses, session ID, and various characteristics of the packets in the ERSPAN traffic.

Table 5. *CLI Command Modes (continued)*

Command Mode	Prompt	Mode Description
ERSPAN Destination Session Configuration Mode	Switch (config-erspan-src)#	Configure the destination interface for ERSPAN and access ERSPAN Destination Session Source Configuration mode
ERSPAN Destination Session Source Configuration Mode	Switch (config-erspan-dst-src)#	Configure the ERSPAN destination IP address and ERSPAN session ID.
Track Configuration Mode	Switch (config-track)#	Configure settings to track the state of an IP Service-Level Agreement (SLA) operation.

Table 6 explains how to enter or exit each mode. To exit a mode and return to the previous mode, enter exit. To exit to Privileged EXEC mode, press Ctrl+z.

Note: Pressing Ctrl+z from Privileged EXEC mode exits to User EXEC mode. To exit User EXEC mode, enter logout.

Table 6. *CLI Mode Access and Exit*

Command Mode	Access Method
User EXEC	This is the first level of access.
Privileged EXEC	From the User EXEC mode, enter `enable`.
Global Config	From the Privileged EXEC mode, enter `configure`.
VLAN Database	From the Privileged EXEC mode, enter `vlan database`.
Interface Config	From the Global Config mode, enter: interface *unit/slot/port* or interface loopback id or interface *unit/slot/port*(startrange)-*unit/slot/port*(endrange) interface lag lag-intf-num interface vlan vlan-id
Line Console	From the Global Config mode, enter `line console`.
Line SSH	From the Global Config mode, enter `line ssh`.
Line Telnet	From the Global Config mode, enter `line telnet`.
AAA IAS User Config	From the Global Config mode, enter aaa ias-user username name.
Mail Server Config	From the Global Config mode, enter mail-server address
Policy-Map Config	From the Global Config mode, enter `policy-map`.
Policy-Class-Map Config	From the Policy Map mode enter `class`.
Class-Map Config	From the Global Config mode, enter `class-map`, and specify the optional keyword `ipv4` to specify the Layer 3 protocol for this class. See "class-map" on page 855 for more information.

Table 6. *CLI Mode Access and Exit (continued)*

Command Mode	Access Method
Ipv6-Class-Map Config	From the Global Config mode, enter `class-map` and specify the optional keyword `ipv6` to specify the Layer 3 protocol for this class. See "class-map" on page 855 for more information.
Router OSPF Config	From the Global Config mode, enter `router ospf`.
Router OSPFv3 Config	From the Global Config mode, enter `ipv6 router ospf`.
Router RIP Config	From the Global Config mode, enter `router rip`.
Route Map Config	From the Global Config mode, enter `-route-map map-tag`.
MAC Access-list Config	From the Global Config mode, enter `mac access-list extended name`.
IPv4 Access-list Config	From the Global Config mode, enter `ip access-list name`.
IPv6 Access-list Config	From the Global Config mode, enter `ipv6 access-list name`.
Management Access-list Config	From the Global Config mode, enter `management access-list name`.
TACACS Config	From the Global Config mode, enter `tacacs-server host ip-addr`, where `ip-addr` is the IP address of the TACACS server on your network.
User-Group Configuration Mode	From the Global Config mode, enter `usergroup user-group-name`
Task-Group Configuration Mode	From the Global Config mode, enter `taskgroup task-group-name`
DHCP Pool Config	From the Global Config mode, enter `ip dhcp pool pool-name`
DHCPv6 Pool Config	From the Global Config mode, enter `ip dhcpv6 pool pool-name`
Stack Global Config Mode	From the Global Config mode, enter the `stack` command.
ARP Access-List Config Mode	From the Global Config mode, enter `arp access-list`
Support Mode	From the Privileged EXEC mode, enter `support`. **Note:** The `support` command is available only if the `techsupport enable` command has been issued.
VLAN Config	From the Global Config mode, enter `vlan vlan-id`
ERSPAN Source Session Configuration Mode	From the Global Config mode, enter `monitor session` *`session-id`* `type erspan-source`
ERSPAN Source Session Destination Configuration Mode	From the ERSPAN Source Session Configuration Mode, enter `destination`.
ERSPAN Destination Session Configuration Mode	From the Global Config mode, enter `monitor session` *`session-id`* `type erspan-destination`
ERSPAN Destination Session Source Configuration Mode	From the ERSPAN Destination Session Configuration Mode, enter `source`.

Command Completion and Abbreviation

Command completion finishes spelling the command when you type enough letters of a command to uniquely identify the command keyword. Once you have entered enough letters, press the SPACEBAR or TAB key to complete the word.

Command abbreviation allows you to execute a command when you have entered there are enough letters to uniquely identify the command. You must enter all of the required keywords and parameters before you enter the command.

CLI Error Messages

If you enter a command and the system is unable to execute it, an error message appears. Table 7 describes the most common CLI error messages.

Table 7. *CLI Error Messages*

Message Text	Description
% Invalid input detected at '^' marker.	You entered an incorrect or unavailable command. The carat (^) shows where the invalid text is detected. This message also appears if any of the parameters or values are not recognized.
Command not found / Incomplete command. Use ? to list commands.	You did not enter the required keywords or values.
Ambiguous command	You did not enter enough letters to uniquely identify the command.

CLI Line-Editing Conventions

Table 8 describes the key combinations you can use to edit commands or increase the speed of command entry. You can access this list from the CLI by entering `help` from the User or Privileged EXEC modes.

Table 8. *CLI Editing Conventions*

Key Sequence	Description
DEL or Backspace	Delete previous character.
Ctrl-A	Go to beginning of line.
Ctrl-E	Go to end of line.
Ctrl-F	Go forward one character.
Ctrl-B	Go backward one character.
Ctrl-D	Delete current character.
Ctrl-U, X	Delete to beginning of line.
Ctrl-K	Delete to end of line.
Ctrl-W	Delete previous word.
Ctrl-T	Transpose previous character.
Ctrl-P	Go to previous line in history buffer.
Ctrl-R	Rewrites or pastes the line.
Ctrl-N	Go to next line in history buffer.
Ctrl-Y	Prints last deleted character.

Table 8. *CLI Editing Conventions (continued)*

Key Sequence	Description
Ctrl-Q	Enables serial flow.
Ctrl-S	Disables serial flow.
Ctrl-Z	Return to root command prompt.
Tab, <SPACE>	Command-line completion.
Exit	Go to next lower command prompt.
?	List available commands, keywords, or parameters.

Using CLI Help

Enter a question mark (?) at the command prompt to display the commands available in the current mode.

```
(switch) >?

enable              Enter into user privilege mode.
help               Display help for various special keys.
logout              Exit this session. Any unsaved changes are lost.
password                                            Change an existing user's password.
ping               Send ICMP echo packets to a specified IP address.
quit               Exit this session. Any unsaved changes are lost.
show                Display Switch Options and Settings.
telnet             Telnet to a remote host.
```

Enter a question mark (?) after each word you enter to display available command keywords or parameters.

```
(switch) #network ?

ipv6               Configure IPv6 parameters for system network.
javamode               Enable/Disable.
mac-address             Configure MAC Address.
mac-type              Select the locally administered or burnedin MAC
                 address.
mgmt_vlan             Configure the Management VLAN ID of the switch.
parms               Configure Network Parameters of the device.
protocol             Select DHCP, BootP, or None as the network config protocol.
```

If the help output shows a parameter in angle brackets, you must replace the parameter with a value.

```
(Routing) #network parms ?

<ipaddr>             Enter the IP Address.
none               Reset IP address and gateway on management interface
```

If there are no additional command keywords or parameters, or if additional parameters are optional, the following message appears in the output:

```
<cr>               Press Enter to execute the command
```

You can also enter a question mark (?) after typing one or more characters of a word to list the available command or parameters that begin with the letters, as shown in the following example:

```
(switch) #show m?

mac                mac-addr-table        mac-address-table
mail-server          mbuf                monitor
```

Accessing the CLI

You can access the CLI by using a direct console connection or by using a telnet or SSH connection from a remote management host.

For the initial connection, you must use a direct connection to the console port. You cannot access the system remotely until the system has an IP address, subnet mask, and default gateway. You can set the network configuration information manually, or you can configure the system to accept these settings from a BOOTP or DHCP server on your network. For more information, see “Network Interface Commands” on page 53.

Chapter 3. Stacking Commands

This chapter describes the stacking commands available in the CE0128XB/CE0152XB CLI.

Note: The commands in this chapter are in one of two functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.

Note: The Primary Management Unit is the unit that controls the stack.

Stacking

This section describes the commands you use to configure stacking.

stack

This command sets the mode to Stack Global Config.

Format	stack
Mode	Global Config

member

This command configures a switch. The `unit` is the switch identifier of the switch to be added/removed from the stack. The `switchindex` is the index into the database of the supported switch types, indicating the type of the switch being preconfigured. The switch index is a 32-bit integer. This command is executed on the Primary Management Unit.

Format	member *unit switchindex*
Mode	Stack Global Config

Note: Switch index can be obtained by executing the `show supported switchtype` command in User EXEC or Privileged EXEC mode.

no member

This command removes a switch from the stack. The `unit` is the switch identifier of the switch to be removed from the stack. This command is executed on the Primary Management Unit.

Format	no member *unit*
Mode	Stack Global Config

switch priority

This command configures the ability of a switch to become the Primary Management Unit. The `unit` is the switch identifier. The `value` is the preference parameter that allows the user to specify, priority of one backup switch over another. The range for priority is 1 to 15. The switch with the highest priority value will be chosen to become the Primary Management Unit if the active Primary Management Unit fails. The switch priority defaults to the hardware management preference value 1. Switches that do not have the hardware capability to become the Primary Management Unit are not eligible for management.

Default	enabled
Format	switch *unit* priority *value*
Mode	Global Config

switch renumber

This command changes the switch identifier for a switch in the stack. The `oldunit` is the current switch identifier on the switch whose identifier is to be changed. The `newunit` is the updated value of the switch identifier. Upon execution, the switch will be configured with the configuration information for the new switch, if any. The old switch configuration information will be retained, however the old switch will be operationally unplugged. This command is executed on the Primary Management Unit.

Note: If the management unit is renumbered, then the running configuration is no longer applied (i.e. the stack acts as if the configuration had been cleared).

Format	switch *oldunit* renumber *newunit*
Mode	Global Config

movemanagement

This command moves the Primary Management Unit functionality from one switch to another. The `fromunit` is the switch identifier on the current Primary Management Unit. The `tounit` is the switch identifier on the new Primary Management Unit. Upon execution, the entire stack (including all interfaces in the stack) is unconfigured and reconfigured with the configuration on the new Primary Management Unit. After the reload is complete, all stack management capability must be performed on the new Primary Management Unit. To preserve the current configuration across a stack move, execute the `copy system:running-config nvram:startup-config` (in Privileged EXEC) command before performing the stack move. A stack move causes all routes and layer 2 addresses to be lost. This command is executed on the Primary Management Unit. The system prompts you to confirm the management move.

Format	movemanagement *fromunit tounit*
Mode	Stack Global Config

standby

Use this command to configure a unit as a Standby Management Unit (STBY).

Note: The Standby Management Unit cannot be the current Management Unit. The Standby unit should be a management-capable unit.

Format	standby *unit number*
Mode	Stack Global Config

Parameter	Description
Standby Management Unit Number	Indicates the unit number which is to be the Standby Management Unit. **unit number** must be a valid unit number.

no standby

The `no` form of this command allows the application to run the auto Standby Management Unit logic.

Format	no standby
Mode	Stack Global Config

slot

This command configures a slot in the system. The `unit/slot` is the slot identifier of the slot. The `cardindex` is the index into the database of the supported card types, indicating the type of the card being preconfigured in the specified slot. The card index is a 32-bit integer. If a card is currently present in the slot that is unconfigured, the configured information will be deleted and the slot will be reconfigured with default information for the card.

Format	slot *unit/slot cardindex*
Mode	Global Config

Note: Card index can be obtained by executing the `show supported cardtype` command in User EXEC or Privileged EXEC mode.

no slot

This command removes configured information from an existing slot in the system.

Format	no slot *unit/slot cardindex*
Mode	Global Config

Note: Card index can be obtained by executing the `show supported cardtype` command in User EXEC or Privileged EXEC mode.

set slot disable

This command configures the administrative mode of the slot(s). If you specify [all], the command is applied to all slots, otherwise the command is applied to the slot identified by `unit/slot`.

If a card or other module is present in the slot, this administrative mode will effectively be applied to the contents of the slot. If the slot is empty, this administrative mode will be applied to any module that is inserted into the slot. If a card is disabled, all the ports on the device are operationally disabled and shown as *unplugged* on management screens.

Format	set slot disable [*unit/slot]* | all]
Mode	Global Config

no set slot disable

This command unconfigures the administrative mode of the slot(s). If you specify `all`, the command removes the configuration from all slots, otherwise the configuration is removed from the slot identified by `unit/slot`.

If a card or other module is present in the slot, this administrative mode removes the configuration from the contents of the slot. If the slot is empty, this administrative mode removes the configuration from any module inserted into the slot. If a card is disabled, all the ports on the device are operationally disabled and shown as *unplugged* on management screens.

Format	no set slot disable [*unit/slot]* | all]
Mode	Global Config

set slot power

This command configures the power mode of the slot(s) and allows power to be supplied to a card located in the slot. If you specify `all`, the command is applied to all slots, otherwise the command is applied to the slot identified by `unit/slot`.

Use this command when installing or removing cards. If a card or other module is present in this slot, the power mode is applied to the contents of the slot. If the slot is empty, the power mode is applied to any card inserted into the slot.

Format	set slot power [*unit/slot]* | all]
Mode	Global Config

no set slot power

This command unconfigures the power mode of the slot(s) and prohibits power from being supplied to a card located in the slot. If you specify `all`, the command prohibits power to all slots, otherwise the command prohibits power to the slot identified by `unit/slot`.

Use this command when installing or removing cards. If a card or other module is present in this slot, power is prohibited to the contents of the slot. If the slot is empty, power is prohibited to any card inserted into the slot.

Format	no set slot power *[unit/slot]* | all]
Mode	Global Config

reload (Stack)

This command resets the entire stack or the identified `unit.` The `unit` is the switch identifier. The system prompts you to confirm that you want to reset the switch.

Format	reload *[unit]*
Mode	Privileged EXEC

stack-status sample-mode

Use this command to configure global status management mode, sample size. The mode, sample size parameters are applied globally on all units in the stack. The default sampling mode of the operation is cumulative summing.

Note: This configuration command is implemented as part of serviceability functionality and therefore is not expected to be persistent across reloads. This configuration is never visible in the running configuration under any circumstances. It is the responsibility of the user to switch the sample mode on-demand as per the requirement. This configuration is applied to all the members that are part of the stack when the command is triggered. This configuration cannot play onto cards that are part of the stack at later point of the time.

Default	Cumulative Summing
Format	stack-status sample-mode {cumulative | history} [max-samples *100 - 500*]
Mode	Stack Global Config Mode

Parameter	Description
sample-mode	Mode of sampling
cumulative	Tracks the sum of received time stamp offsets cumulatively.
history	Tracks history of received timestamps
max-samples	Maximum number of samples to keep

Example:

The following command sets the sampling mode to cumulative summing.

```
(Routing) #configure
(Routing) (Config)#stack
(Routing) (Config-stack)# stack-status sample-mode cumulative
```

Example:

The following command sets the sampling mode to history and the sample size to default (that is, 300).

```
(Routing) #configure
(Routing) (Config)#stack
(Routing) (Config-stack)#stack-status sample-mode history
```

Example:

The following command sets the sampling mode to history and sample size to 100.

```
(Routing) #configure
(Routing) (Config)#stack
(Routing) (Config-stack)#stack-status sample-mode history max-samples 100
```

show slot

This command displays information about all the slots in the system or for a specific slot.

Format	show slot *[unit/slot]*
Mode	• User EXEC • Privileged EXEC

Parameter	Definition
Slot	The slot identifier in a *unit/slot* format.
Slot Status	The slot is empty, full, or has encountered an error
Admin State	The slot administrative mode is enabled or disabled.
Power State	The slot power mode is enabled or disabled.
Configured Card Model Identifier	The model identifier of the card preconfigured in the slot. Model Identifier is a 32-character field used to identify a card.
Pluggable	Cards are pluggable or non-pluggable in the slot.
Power Down	Indicates whether the slot can be powered down.

If you supply a value for *unit/slot*, the following additional information appears.

Parameter	Definition
Inserted Card Model Identifier	The model identifier of the card inserted in the slot. Model Identifier is a 32-character field used to identify a card. This field is displayed only if the slot is full.
Inserted Card Description	The card description. This field is displayed only if the slot is full.
Configured Card Description	10BASE-T half duplex

show stack-status

Use this command to display the stack unit’s received HB message timings, and the dropped/lost statistics for the specified unit.

Format	show stack-status [*1-n* | all] [clear]
Mode	Privileged EXEC

Parameter	Description
Current	Current time of heartbeat message reception
Average	Average time of heartbeat messages received
Min	Minimum time of heartbeat messages received
Max	Maximum time of heartbeat messages received
Dropped	Heartbeat message dropped/lost counter

Example:

This example dumps the stack unit heartbeat status information of the specified unit.

```
(Routing) #show stack-status

Stack Unit 1 Status
Sampling Mode: Cumulative Summing
--------------------------------------
Unit Current Average Min  Max  Dropped
--------------------------------------
```

show supported cardtype

This commands displays information about all card types or specific card types supported in the system.

Format	show supported cardtype *[cardindex]*
Mode	• User EXEC • Privileged EXEC

If you do not supply a value for *`cardindex`*, the following output appears.

Parameter	Definition
Card Index (CID)	The index into the database of the supported card types. This index is used when preconfiguring a slot.
Card Model Identifier	The model identifier for the supported card type.

If you supply a value for *`cardindex`*, the following output appears.

Parameter	Definition
Card Type	The 32-bit numeric card type for the supported card.
Model Identifier	The model identifier for the supported card type.
Card Description	The description for the supported card type.

show switch

This command displays switch status information about all units in the stack or a single unit when you specify the unit value.

Format show switch *[unit]*

Mode Privileged EXEC

Parameter	Definition
Switch	The unit identifier assigned to the switch.

When you do not specify a value for `unit`, the following information appears.

Parameter	Definition
Management Status	Indicates whether the switch is the Primary Management Unit, a stack member, a configured standby switch, an operational standby switch, or the status is unassigned.
Preconfigured Model Identifier	The model identifier of a preconfigured switch ready to join the stack. The Model Identifier is a 32-character field assigned by the device manufacturer to identify the device.
Plugged-In Model Identifier	The model identifier of the switch in the stack. Model Identifier is a 32-character field assigned by the device manufacturer to identify the device.
Switch Status	The switch status. Possible values for this state are: **OK**, **Unsupported**, **Code Mismatch**, **SDM Mismatch**, **Config Mismatch**, or Not Present. A mismatch indicates that a stack unit is running a different version of the code, SDM template, or configuration than the management unit. The **SDM Mismatch** status indicates that the unit joined the stack, but is running a different SDM template than the management unit. This status is temporary; the stack unit should automatically reload using the template running on the stack manager. If there is a Stacking Firmware Synchronization operation in progress status is shown as Updating Code.
Code Version	The detected version of code on this switch.

Example: The following shows example CLI display output for the command.

```
(Switching) #show switch

   Management  Standby   Preconfig    Plugged-in    Switch      Code
SW   Switch    Status     Model ID     Model ID      Status     Version
--- ---------- --------- ------------- ------------- ------------- -----------
1  Stack Mbr          Platform v1  Platform v1  STM Mismatch  10.17.15.8
2  Mgmt Sw             Platform v2  Platform v2  OK            10.17.15.8
```

When you specify a value for *unit*, the following information appears.

Parameter	Definition
Management Status	Indicates whether the switch is the Primary Management Unit, a stack member, or the status is unassigned.
Hardware Management Preference	The hardware management preference of the switch. The hardware management preference can be disabled or unassigned.
Admin Management Preference	The administrative management preference value assigned to the switch. This preference value indicates how likely the switch is to be chosen as the Primary Management Unit.
Switch Type	The 32-bit numeric switch type.
Model Identifier	The model identifier for this switch. Model Identifier is a 32-character field assigned by the device manufacturer to identify the device.

Parameter	Definition
Switch Status	The switch status. Possible values are OK, Unsupported, Code Mismatch, Config Mismatch, SDM Mismatch, STM Mismatch, or Not Present.
Switch Description	The switch description.
Expected Code Type	The expected code type.
Expected Code Version	The expected code version.
Detected Code Version	The version of code running on this switch. If the switch is not present and the data is from preconfiguration, then the code version is “None”.
Detected Code in Flash	The version of code that is currently stored in FLASH memory on the switch. This code executes after the switch is reset. If the switch is not present and the data is from preconfiguration, then the code version is “None”.
SFS Last Attempt Status	The stack firmware synchronization status in the last attempt for the specified unit.
Serial Number	The serial number for the specified unit.
Up Time	The system up time.

Example: The following shows example CLI display output for the command.

```
console #show switch 1

Switch........................... 1
Management Status................ Management Switch
Hardware Management Preference.... Unassigned
Admin Management Preference....... Unassigned
Switch Type...................... 0xb1500004
Preconfigured Model Identifier.... CE0128PB
Plugged-in Model Identifier....... CE0128PB
Switch Status.................... OK
Switch Description................ Lenovo CE0128PB Switch
Detected Code in Flash........... 12.14.16.41
SFS Last Attempt Status........... None
Serial Number.................... 0x0
Up Time.......................... 1 days 23 hrs 22 mins 27 secs
```

show supported switchtype

This commands displays information about all supported switch types or a specific switch type.

Format	show supported switchtype *[switchindex]*
Mode	User EXEC Privileged EXEC

If you do not supply a value for `switchindex`, the following output appears.

Parameter	Definition
Switch Index (SID)	The index into the database of supported switch types. This index is used when preconfiguring a member to be added to the stack.
Model Identifier	The model identifier for the supported switch type.

Parameter	Definition
Management Preference	The management preference value of the switch type.
Code Version	The code load target identifier of the switch type.

If you supply a value for `switchindex`, the following output appears.

Parameter	Definition
Switch Type	The 32-bit numeric switch type for the supported switch.
Model Identifier	The model identifier for the supported switch type.
Switch Description	The description for the supported switch type.

Stack Port Commands

This section describes the commands you use to view and configure stack port information. A stack should always be configured in a ring topology in order to support robust failover to the standby unit.

stack-port

This command sets stacking per port or range of ports to either `stack` or `ethernet` mode. The 10G ports on the CE0128XB and CE0152XB are configured as stack ports by default. Either two or four of the ports may be configured to operate as 10G Ethernet ports using this command.

The 10G ports are configured for stacking or Ethernet in pairs. Configuring a 10G Ethernet port as stacking will also configure the paired link as a stacking port. Likewise, configuring a 10G stack port as Ethernet will configure the paired link as Ethernet. On the CE0152XB, ports 49/50 and 51/52 are paired. On the CE0128XB, ports 25/26 and 27/28 are paired. The switch must be rebooted for the configuration to take effect.

The Ethernet/stack port configuration is persistent and survives clearing the running configuration or removing the stored configuration.

Default	stack
Format	stack-port *unit/slot/port* [{ethernet | stack}]
Mode	Stack Global Config

Example: This example shows an interface being configured for stacking.

```
(Routing)(Config-stack)#stack-port 1/0/25 stack
Changingthemodeofstackingportmayresultinlinkfailuresandmaydetachexistingmemberunitsfromthe
stack.
Are you sure (y/n)? y

The stack-port mode for 1/0/25 and pair port 1/0/26 has been changed.
```

show stack-port

This command displays summary stack-port information for all interfaces.

Format	show stack-port
Mode	Privileged EXEC

For Each Interface:

Parameter	Definition
Unit	The unit number.
Interface	The slot and port numbers.
Configured Stack Mode	Stack or Ethernet.
Running Stack Mode	Stack or Ethernet.
Link Status	Status of the link.
Link Speed	Speed (Gbps) of the stack port link.

show stack-port counters

This command displays summary data counter information for all interfaces.

Format	show stack-port counters [*1-n* | all]
Mode	Privileged EXEC

Parameter	Definition
Unit	The unit number.
Interface	The slot and port numbers.
Tx Data Rate	Trashing data rate in megabits per second on the stacking port.
Tx Error Rate	Platform-specific number of transmit errors per second.
Tx Total Errors	Platform-specific number of total transmit errors since power-up.
Rx Data Rate	Receive data rate in megabits per second on the stacking port.
Rx Error Rate	Platform-specific number of receive errors per second.
Rx Total Errors	Platform-specific number of total receive errors since power-up.
Link Flaps	The number of up/down events for the link since system boot up.

Example: This example shows the stack ports and associated statistics of unit 2.

```
(Routing) #show stack-port counters 2

                ------------TX-------------- ------------RX---------------- -------
                 Data     Error                 Data    Error
                 Rate     Rate       Total      Rate    Rate      Total   Link
Unit  Interface          (Mb/s) (Errors/s)  Errors   (Mb/s) (Errors/s)  Errors Flaps
----   --------   ---------- ----------- ---------- --------  ----------  -------- -------
2      0/53          0       0          0         0       0         0        0
2      0/54          0       0          0         0       0         0        0
2      0/55          0       0          0         0       0         0        0
2      0/56          0       0          0         0       0         0        0
```

show stack-port diag

This command shows stack port diagnostics for each port and is only intended for Field Application Engineers (FAEs) and developers. An FAE will advise on the necessity to run this command and capture this information. In verbose mode, the statistics and counters for RPC, transport, CPU, and transport RX/TX modules are displayed.

Format	show stack-port diag [*1-n* | all] [verbose]
Mode	Privileged EXEC

Parameter	Definition
Unit	The unit number.
Interface	The slot and port numbers.
Diagnostic Entry1	80 character string used for diagnostics.
Diagnostic Entry2	80 character string used for diagnostics.
Diagnostic Entry3	80 character string used for diagnostics.

Parameter	Definition
TBYT	Transmitted Bytes
TPKT	Transmitted Packets
TFCS	Transmit FCS Error Frame Counter
TERR	Transmit Error (set by system) Counter
RBYT	Received Bytes
RPKT	Received Packets
RFCS	Received FCS Error Frame Counter
RFRG	Received Fragment Counter
RJBR	Received Jabber Frame Counter
RUND	Received Undersize Frame Counter
ROVR	Received Oversized Frame Counter
RUNT	Received RUNT Frame Counter

Example: This example displays the stack ports and associated statistics of specified unit or all units.

```
(Routing) #show stack-port diag 1

1 - 0/53:
RBYT:27ed9a7b RPKT:bca1b TBYT:28a0739e TPKT:c93ee
RFCS:0 RFRG:0 RJBR:0 RUND:0 RUNT:0
TFCS:0 TERR:0

1 - 0/54:
RBYT:8072ed RPKT:19a66 TBYT:aecfb80 TPKT:66e4d
RFCS:6e RFRG:4414 RJBR:0 RUND:c19 RUNT:af029b1
TFCS:0 TERR:0

1 - 0/55:
RBYT:0 RPKT:0 TBYT:ae8 TPKT:23
RFCS:0 RFRG:0 RJBR:0 RUND:0 RUNT:0
TFCS:0 TERR:0

1 - 0/56:
RBYT:0 RPKT:0 TBYT:ae8 TPKT:23
RFCS:0 RFRG:0 RJBR:0 RUND:0 RUNT:0
TFCS:0 TERR:0
```

Example: Example 2: ‘show stack-port diag [<1-n> | all] [verbose]’ transport etc module statistics of specified unit or all units.

In this example, It dumps RPC, Transport (ATP, Next Hop, and RLink), and CPU Transport Rx/Tx modules Statistics of Unit 2.

```
(Routing) #show stack-port diag 2 verbose
-----------------------------------------
HPC RPC statistics/counters from unit..2
-----------------------------------------
Registered Functions........................... 58
Client Requests.............................. 0
Server Requests................................ 0
Server Duplicate Requests...................... 0
Server Replies................................. 0
Client Remote Tx............................... 0
Client Remote Retransmit Count................. 0
```

```
Tx without Errors............................. 0
Tx with Errors................................ 0
Rx Timeouts................................... 0
Rx Early Exits................................ 0
Rx Out of Sync................................ 0
No Buffer..................................... 0
Collect Sem Wait Count........................ 0
Collect Sem Dispatch Count.................... 0

------------------------------------
RPC statistics/counters from unit..2
------------------------------------
Client RPC Requests Count..................... 3
Client RPC Reply Count........................ 0
Client RPC Fail to xmit Count................. 0
Client RPC Response Timedout Count............ 3
Client RPC Missing Requests................... 0
Client RPC Detach/Remove Count................ 0
Client RPC Current Sequence Number............ 3
Server RPC Request Count...................... 0
Server RPC Reply Count........................ 0
Server RPC Processed Transactions............. 0
Server RPC Received Wrong Version Req.......... 0
Server RPC No Handlers........................ 0
Server RPC Retry Transmit Count................ 0
Server RPC Repetitive Tx Errors................ 0

------------------------------------
ATP statistics/counters from unit..2
------------------------------------
Transmit Pending Count........................ 2
Current number of TX waits.................... 2
Rx transactions created....................... 145
Rx transactions freed......................... 145
Rx transactions freed(raw).................... 0
ATP: TX timeout, seq 74. f:cc cli 778. to 1 tx cnt 21.
Tx transactions created....................... 290
BET Rx Dropped Pkts Count..................... 0
ATP Rx Dropped Pkts Count..................... 0
Failed to Add Key Pkt Count................... 0
Source Lookup Failure Count................... 0
Old Rx transactions Pkts drop Count............ 0
Nr of CPUs found in ATP communication.......... 2

----------------------------------------------
CPU Transport statistics/counters from unit..2
----------------------------------------------
State Initialization.......................... Done
Rx Setup...................................... Done
Tx Setup...................................... Done
Tx CoS[0] Reserve............................. 100
Tx CoS[1] Reserve............................. 100
Tx CoS[2] Reserve............................. 100
Tx CoS[3] Reserve............................. 100
Tx CoS[4] Reserve............................. 60
Tx CoS[5] Reserve............................. 40
Tx CoS[6] Reserve............................. 20
Tx CoS[7] Reserve............................. 0
Tx Pkt Pool Size.............................. 200
Tx Available Pkt Pool Size.................... 198
Tx failed/error Count......................... 0
Rx Pkt Pool Size.............................. 8

-----------------------------------------
```

```
Next Hop statistics/counters from unit..2
------------------------------------------
State Initialization........................... Done
Component Setup................................ Done
Thread Priority................................ 100
Rx Priority.................................... 105
Local CPU Key.................................. 00:24:81:d0:0f:c7
MTU Size....................................... 2048
Vlan Id........................................ 4094
CoS Id......................................... 7
Internal Priority for pkt transmission......... 7
Rx Pkt Queue Size.............................. 256
Tx Pkt Queue Size.............................. 64
Rx Pkt Dropped Count........................... 0
Tx Failed Pkt Count............................ 0

---------------------------------------
RLink statistics/counters from unit..2
---------------------------------------
State Initialization........................... Done
L2 Notify In Pkts.............................. 0
L2 Notify In Pkts discarded.................... 0
L2 Notify Out Pkts ............................ 0
L2 Notify Out Pkts discarded................... 0
Linkscan In Pkts............................... 0
Linkscan In Pkts discarded..................... 0
Linkscan Out Pkts ............................. 0
Linkscan Out Pkts discarded.................... 0
Auth/Unauth In Callbacks....................... 0
Auth/Unauth In Callbacks discarded............. 0
Auth/Unauth Out Callbacks...................... 0
Auth/Unauth Out Callbacks discarded............ 0
RX Tunnelling In Pkts.......................... 0
RX Tunnelling In Pkts discarded................ 0
RX Tunnelling Out Pkts......................... 0
RX Tunnelling Out Pkts discarded............... 0
OAM Events In.................................. 0
OAM Events In discarded........................ 0
OAM Events Out................................. 0
OAM Events Out discarded....................... 0
BFD Events In.................................. 0
BFD Events In discarded........................ 0
BFD Events Out................................. 0
BFD Events Out discarded....................... 0
Fabric Events In............................... 0
Fabric Events In discarded..................... 0
Fabric Events Out.............................. 0
Fabric Events Out discarded.................... 0
Scan Add Requests In........................... 0
Scan Del Requests In........................... 0
Scan Notify(Run Handlers) Out.................. 0
Scan Notify(Traverse Processing)............... 0
```

show stack-port stack-path

This command displays the route a packet will take to reach the destination.

Format show stack-port stack-path {*1-8* | *all*}{1-8}

Mode Privileged EXEC

Parameter	Definition
1-8	The destination unit number.

Stack Firmware Synchronization Commands

Stack Firmware Synchronization (SFS) provides the ability to automatically synchronize firmware for all stack members. If a unit joins the stack and its firmware version is different from the version running on the stack manager, the SFS feature can either upgrade or downgrade the firmware on the mismatched stack member. There is no attempt to synchronize the stack to the latest firmware in the stack.

boot auto-copy-sw

Use this command to enable the Stack Firmware Synchronization feature on the stack.

Default	Disabled
Format	boot auto-copy-sw
Mode	Privileged EXEC

no boot auto-copy-sw

Use this command to disable the Stack Firmware Synchronization feature on the stack

Format	no boot auto-copy-sw
Mode	Privileged EXEC

boot auto-copy-sw trap

Use this command to enable the sending of SNMP traps related to the Stack Firmware Synchronization feature.

Default	Enabled
Format	boot auto-copy-sw trap
Mode	Privileged EXEC

no boot auto-copy-sw trap

Use this command to disable the sending of traps related to the Stack Firmware Synchronization feature.

Format	no boot auto-copy-sw trap
Mode	Privileged EXEC

boot auto-copy-sw allow-downgrade

Use this command to allow the stack manager to downgrade the firmware version on the stack member if the firmware version on the manager is older than the firmware version on the member.

Default	Enabled
Format	boot auto-copy-sw allow-downgrade

Mode Privileged EXEC

no boot auto-copy-sw allow-downgrade

Use this command to prevent the stack manager from downgrading the firmware version of a stack member.

Format `no boot auto-copy-sw allow-downgrade`

Mode Privileged EXEC

show auto-copy-sw

Use this command to display Stack Firmware Synchronization configuration status information.

Format `show auto-copy-sw`

Mode Privileged EXEC

Parameter	Definition
Synchronization	Shows whether the SFS feature is enabled.
SNMP Trap Status	Shows whether the stack will send traps for SFS events.
Allow Downgrade	Shows wether the manager is permitted to downgrade the firmware version of a stack member.

Nonstop Forwarding Commands

A switch can be described in terms of three semi-independent functions called the forwarding plane, the control plane, and the management plane. The forwarding plane forwards data packets. The forwarding plane is implemented in hardware. The control plane is the set of protocols that determine how the forwarding plane should forward packets, deciding which data packets are allowed to be forwarded and where they should go. Application software on the management unit acts as the control plane. The management plane is application software running on the management unit that provides interfaces allowing a network administrator to configure and monitor the device.

Nonstop forwarding (NSF) allows the forwarding plane of stack units to continue to forward packets while the control and management planes restart as a result of a power failure, hardware failure, or software fault on the management unit. A nonstop forwarding failover can also be manually initiated using the `initiate failover` command. Traffic flows that enter and exit the stack through physical ports on a unit other than the management continue with at most subsecond interruption when the management unit fails.

To prepare the backup management unit in case of a failover, applications on the management unit continuously checkpoint some state information to the backup unit. Changes to the running configuration are automatically copied to the backup unit. MAC addresses stay the same across a nonstop forwarding failover so that neighbors do not have to relearn them.

When a nonstop forwarding failover occurs, the control plane on the backup unit starts from a partially-initialized state and applies the checkpointed state information. While the control plane is initializing, the stack cannot react to external changes, such as network topology changes. Once the control plane is fully operational on the new management unit, the control plane ensures that the hardware state is updated as necessary. Control plane failover time depends on the size of the stack, the complexity of the configuration, and the speed of the CPU.

The management plane restarts when a failover occurs. Management connections must be reestablished.

For NSF to be effective, adjacent networking devices must not reroute traffic around the restarting device. CE0128XB/CE0152XB uses three techniques to prevent traffic from being rerouted:

1. A protocol may distribute a part of its control plane to stack units so that the protocol can give the appearance that it is still functional during the restart. Spanning tree and port channels use this technique.

2. A protocol may enlist the cooperation of its neighbors through a technique known as graceful restart. OSPF uses graceful restart if it is enabled (see “IP Event Dampening Commands” on page 699).

3. A protocol may simply restart after the failover if neighbors react slowly enough that they will not normally detect the outage. The IP multicast routing protocols are a good example of this behavior.

To take full advantage of nonstop forwarding, layer 2 connections to neighbors should be via port channels that span two or more stack units. The hardware can quickly move traffic flows from port channel members on a failed unit to a surviving unit.

nsf (Stack Global Config Mode)

This command enables nonstop forwarding feature on the stack. When nonstop forwarding is enabled, if the management unit of a stack fails, the backup unit takes over as the master without clearing the hardware tables of any of the surviving units. Data traffic continues to be forwarded in hardware while the management functions initialize on the backup unit.

NSF is enabled by default on platforms that support it. The administrator may wish to disable NSF in order to redirect the CPU resources consumed by data checkpointing.

If a unit that does not support NSF is connected to the stack, then NSF is disabled on all stack members. When a unit that does not support NSF is disconnected from the stack and all other units support NSF, and NSF is administratively enabled, then NSF operation resumes.

Default	enabled
Format	nsf
Mode	Stack Global Config Mode

no nsf

This command disables NSF on the stack.

Format	no nsf
Mode	Stack Global Config Mode

show nsf

This command displays global and per-unit information on NSF configuration on the stack.

Format	show nsf
Mode	Privileged EXEC

Parameter	Description
NSF Administrative Status	Whether nonstop forwarding is administratively enabled or disabled. Default: Enabled
NSF Operational Status	Indicates whether NSF is enabled on the stack.

Parameter	Description
Last Startup Reason	The type of activation that caused the software to start the last time: • *Power-On* means that the switch rebooted. This could have been caused by a power cycle or an administrative `Reload` command. • *Administrative Move* means that the administrator issued the `move-management` command for the stand-by manager to take over. • *Warm-Auto-Restart* means that the primary management card restarted due to a failure, and the system executed a nonstop forwarding failover. • *Cold-Auto-Restart* means that the system switched from the active manager to the backup manager and was unable to maintain user data traffic. This is usually caused by multiple failures occurring close together.
Time Since Last Restart	Time since the current management unit became the active management unit.
Restart in progress	Whether a restart is in progress.
Warm Restart Ready	Whether the system is ready to perform a nonstop forwarding failover from the management unit to the backup unit.
Copy of Running Configuration to Backup Unit: Status	Whether the running configuration on the backup unit includes all changes made on the management unit. Displays as Current or Stale.
Time Since Last Copy	When the running configuration was last copied from the management unit to the backup unit.
Time Until Next Copy	The number of seconds until the running configuration will be copied to the backup unit. This line only appears when the running configuration on the backup unit is Stale.
Per Unit Status Parameters	
NSF Support	Whether a unit supports NSF.

initiate failover

This command forces the backup unit to take over as the management unit and perform a *warm restart* of the stack. On a warm restart, the backup unit becomes the management unit without clearing its hardware tables (on a cold restart, hardware tables are cleared). Applications apply checkpointed data from the former management unit. The original management unit reboots.

If the system is not ready for a warm restart, for example because no backup unit has been elected or one or more members of the stack do not support nonstop forwarding, the command fails with a warning message.

The `movemanagement` command (see "movemanagement" on page 31) also transfers control from the current management unit; however, the hardware is cleared and all units reinitialize.

Format	initiate failover
Mode	Stack Global Config Mode

show checkpoint statistics

This command displays general information about the checkpoint service operation.

Format show checkpoint statistics

Mode Privileged EXEC

Parameter	Description
Messages Checkpointed	Number of checkpoint messages transmitted to the backup unit. Range: Integer. Default: 0
Bytes Checkpointed	Number of bytes transmitted to the backup unit. Range: Integer. Default: 0
Time Since Counters Cleared	Number of days, hours, minutes and seconds since the counters were reset to zero. The counters are cleared when a unit becomes manager and with a support command. Range: Time Stamp. Default: 0d00:00:00
Checkpoint Message Rate	Average number of checkpoint messages per second. The average is computed over the time period since the counters were cleared. Range: Integer. Default: 0
Last 10-second Message Rate	Average number of checkpoint messages per second in the last 10-second interval. This average is updated once every 10 seconds. Range: Integer. Default: 0
Highest 10-second Message Rate	The highest rate recorded over a 10-second interval since the counters were cleared. Range: Integer. Default: 0

clear checkpoint statistics

This command clears all checkpoint statistics to their initial values.

Format clear checkpoint statistics

Mode Privileged EXEC

Chapter 4. Management Commands

This chapter describes the management commands available in the CE0128XB/CE0152XB CLI.

Note: The commands in this chapter are in one of three functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Clear commands clear some or all of the settings to factory defaults.

Network Interface Commands

This section describes the commands you use to configure a logical interface for management access. To configure the management VLAN, see `“network mgmt_vlan” on page 376` command.

enable (Privileged EXEC Access)

This command gives you access to the Privileged EXEC mode. From the Privileged EXEC mode, you can configure the network interface.

Format	enable
Mode	User EXEC

do (Privileged EXEC Commands)

This command executes Privileged EXEC mode commands from any of the configuration modes.

Format	do *Priv Exec Mode Command*
Mode	• Global Config • Interface Config • VLAN Database • Routing Config

Example: The following is an example of the `do` command that executes the Privileged EXEC command `script list` in Global Config Mode.

```
(Routing) #configure

(Routing)(config)#do script list

Configuration Script Name        Size(Bytes)
-------------------------------- -----------
backup-config                    2105
running-config                   4483
startup-config                   445

3 configuration script(s) found.
```

```
2041 Kbytes free.

Routing(config)#
```

serviceport ip

This command sets the IP address, the netmask and the gateway of the network management port. You can specify the `none` option to clear the IPv4 address and mask and the default gateway (i.e., reset each of these values to 0.0.0.0).

Format	serviceport ip {*ipaddr netmask* [*gateway*] | none}
Mode	Privileged EXEC

serviceport protocol

This command specifies the network management port configuration protocol. If you modify this value, the change is effective immediately. If you use the ***bootp*** parameter, the switch periodically sends requests to a BootP server until a response is received. If you use the *dhcp* parameter, the switch periodically sends requests to a DHCP server until a response is received. If you use the *none* parameter, you must configure the network information for the switch manually.

Format	serviceport protocol {none | bootp | dhcp}
Mode	Privileged EXEC

serviceport protocol dhcp

This command enables the DHCPv4 client on a Service port. If the `client-id` optional parameter is given, the DHCP client messages are sent with the client identifier option.

Default	none
Format	serviceport protocol dhcp [client-id]
Mode	Privileged EXEC

There is no support for the `no` form of the command `serviceport protocol dhcp client-id`. To remove the `client-id` option from the DHCP client messages, issue the command `serviceport protocol dhcp` without the `client-id` option. The command `serviceport protocol none` can be used to disable the DHCP client and client-id option on the interface.

Example: The following shows an example of the command.

```
(Routing) # serviceport protocol dhcp client-id
```

network parms

This command sets the IP address, subnet mask and gateway of the device. The IP address and the gateway must be on the same subnet. When you specify the `none` option, the IP address and subnet mask are set to the factory defaults.

Format	network parms {*ipaddr netmask* [*gateway*]| none}
Mode	Privileged EXEC

network protocol

This command specifies the network configuration protocol to be used. If you modify this value, change is effective immediately. If you use the *bootp* parameter, the switch periodically sends requests to a BootP server until a response is received. If you use the *dhcp* parameter, the switch periodically sends requests to a DHCP server until a response is received. If you use the *none* parameter, you must configure the network information for the switch manually.

Default	none
Format	network protocol {none | bootp | dhcp}
Mode	Privileged EXEC

network protocol dhcp

This command enables the DHCPv4 client on a Network port. If the `client-id` optional parameter is given, the DHCP client messages are sent with the client identifier option.

Default	none
Format	network protocol dhcp [client-id]
Mode	Global Config

There is no support for the `no` form of the command `network protocol dhcp client-id`. To remove the `client-id` option from the DHCP client messages, issue the command `network protocol dhcp` without the `client-id` option. The command `network protocol none` can be used to disable the DHCP client and client-id option on the interface.

Example: The following shows an example of the command.

```
(Routing) # network protocol dhcp client-id
```

network mac-address

This command sets locally administered MAC addresses. The following rules apply:

- Bit 6 of byte 0 (called the U/L bit) indicates whether the address is universally administered (b'0') or locally administered (b'1').
- Bit 7 of byte 0 (called the I/G bit) indicates whether the destination address is an individual address (b'0') or a group address (b'1').
- The second character, of the twelve character macaddr, must be 2, 6, A or E.

A locally administered address must have bit 6 On (b'1') and bit 7 Off (b'0').

Format	network mac-address *macaddr*
Mode	Privileged EXEC

network mac-type

This command specifies whether the switch uses the burned in MAC address or the locally-administered MAC address.

Default	burnedin
Format	network mac-type {local | burnedin}
Mode	Privileged EXEC

no network mac-type

This command resets the value of MAC address to its default.

Format	no network mac-type
Mode	Privileged EXEC

show network

This command displays configuration settings associated with the switch's network interface. The network interface is the logical interface used for in-band connectivity with the switch via any of the switch's front panel ports. The configuration parameters associated with the switch's network interface do not affect the configuration of the front panel ports through which traffic is switched or routed. The network interface is always considered to be up, whether or not any member ports are up; therefore, the show network command will always show `Interface Status` as `Up`.

Format	show network
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Interface Status	The network interface status; it is always considered to be “up”.
IP Address	The IP address of the interface. The factory default value is 0.0.0.0.
Subnet Mask	The IP subnet mask for this interface. The factory default value is 0.0.0.0.
Default Gateway	The default gateway for this IP interface. The factory default value is 0.0.0.0.
IPv6 Administrative Mode	Whether enabled or disabled.
IPv6 Address/Length	The IPv6 address and length.
IPv6 Default Router	The IPv6 default router address.
Burned In MAC Address	The burned in MAC address used for in-band connectivity.

Parameter	Definition
Locally Administered MAC Address	If desired, a locally administered MAC address can be configured for in-band connectivity. To take effect, 'MAC Address Type' must be set to 'Locally Administered'. Enter the address as twelve hexadecimal digits (6 bytes) with a colon between each byte. Bit 1 of byte 0 must be set to a 1 and bit 0 to a 0, i.e. byte 0 should have the following mask 'xxxx xx10'. The MAC address used by this bridge when it must be referred to in a unique fashion. It is recommended that this be the numerically smallest MAC address of all ports that belong to this bridge. However it is only required to be unique. When concatenated with dot1dStpPriority a unique Bridge Identifier is formed which is used in the Spanning Tree Protocol.
MAC Address Type	The MAC address which should be used for in-band connectivity. The choices are the burned in or the Locally Administered address. The factory default is to use the burned in MAC address.
Configured IPv4 Protocol	The IPv4 network protocol being used. The options are bootp | dhcp | none.
Configured IPv6 Protocol	The IPv6 network protocol being used. The options are dhcp | none.
DHCPv6 Client DUID	The DHCPv6 client's unique client identifier. This row is displayed only when the configured IPv6 protocol is dhcp.
IPv6 Autoconfig Mode	Whether IPv6 Stateless address autoconfiguration is enabled or disabled.
DHCP Client Identifier	The client identifier is displayed in the output of the command only if DHCP is enabled with the `client-id` option on the network port. See "network protocol dhcp" on page 55.

Example: The following shows example CLI display output for the network port.

```
(admin) #show network

Interface Status............................... Up
IP Address.................................... 10.250.3.1
Subnet Mask................................... 255.255.255.0
Default Gateway............................... 10.250.3.3
IPv6 Administrative Mode...................... Enabled
IPv6 Prefix is ............................... fe80::210:18ff:fe82:64c/64
IPv6 Prefix is ............................... 2003::1/128
IPv6 Default Router is ....................... fe80::204:76ff:fe73:423a
Burned In MAC Address......................... 80:96:21:82:06:4C
Locally Administered MAC address.............. 00:00:00:00:00:00
MAC Address Type.............................. Burned In
Configured IPv4 Protocol ..................... None
Configured IPv6 Protocol ..................... DHCP
DHCPv6 Client DUID ........................... 00:03:00:06:00:10:18:82:06:4C
IPv6 Autoconfig Mode.......................... Disabled
Management VLAN ID............................ 1
lenovo-8096.2182.160B-vl1
```

show serviceport

This command displays service port configuration information.

Format show serviceport

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
Interface Status	The network interface status. It is always considered to be up.
IP Address	The IP address of the interface. The factory default value is 0.0.0.0.
Subnet Mask	The IP subnet mask for this interface. The factory default value is 0.0.0.0.
Default Gateway	The default gateway for this IP interface. The factory default value is 0.0.0.0.
IPv6 Administrative Mode	Whether enabled or disabled. Default value is enabled.
IPv6 Address/Length	The IPv6 address and length. Default is Link Local format.
IPv6 Default Router	TheIPv6 default router address on the service port. The factory default value is an unspecified address.
Configured IPv4 Protocol	The IPv4 network protocol being used. The options are bootp | dhcp | none.
Configured IPv6 Protocol	The IPv6 network protocol being used. The options are dhcp | none.
DHCPv6 Client DUID	The DHCPv6 client's unique client identifier. This row is displayed only when the configured IPv6 protocol is dhcp.
IPv6 Autoconfig Mode	Whether IPv6 Stateless address autoconfiguration is enabled or disabled.
Burned in MAC Address	The burned in MAC address used for in-band connectivity.
DHCP Client Identifier	The client identifier is displayed in the output of the command only if DHCP is enabled with the `client-id` option on the service port.

Example: The following shows example CLI display output for the service port.

```
(admin) #show serviceport

Interface Status............................... Up
IP Address.................................... 10.230.3.51
Subnet Mask................................... 255.255.255.0
Default Gateway............................... 10.230.3.1
IPv6 Administrative Mode...................... Enabled
IPv6 Prefix is ............................... fe80::210:18ff:fe82:640/64
IPv6 Prefix is ............................... 2005::21/128
IPv6 Default Router is ....................... fe80::204:76ff:fe73:423a
Configured IPv4 Protocol ..................... DHCP
Configured IPv6 Protocol ..................... DHCP
DHCPv6 Client DUID ........................... 00:03:00:06:00:10:18:82:06:4C
IPv6 Autoconfig Mode.......................... Disabled
Burned In MAC Address......................... 80:96:21:82:06:4D
DHCP Client Identifier........................ lenovo-8096.2182.160C
```

Console Port Access Commands

This section describes the commands you use to configure the console port. You can use a serial cable to connect a management host directly to the console port of the switch.

configure

This command gives you access to the Global Config mode. From the Global Config mode, you can configure a variety of system settings, including user accounts. From the Global Config mode, you can enter other command modes, including Line Config mode.

Format	configure
Mode	Privileged EXEC

line

This command gives you access to the Line Console mode, which allows you to configure various Telnet settings and the console port, as well as to configure console login/enable authentication.

Format	line {console | telnet | ssh}
Mode	Global Config

Parameter	Definition
console	Console terminal line.
telnet	Virtual terminal for remote console access (Telnet).
ssh	Virtual terminal for secured remote console access (SSH).

Example: The following shows an example of the CLI command.

```
(Routing)(config)#line telnet
(Routing)(config-telnet)#
```

serial baudrate

This command specifies the communication rate of the terminal interface. The supported rates are 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200.

Default	9600
Format	serial baudrate {1200 | 2400 | 4800 | 9600 | 19200 | 38400 | 57600 | 115200}
Mode	Line Config

no serial baudrate

This command sets the communication rate of the terminal interface.

Format	no serial baudrate
Mode	Line Config

serial timeout

This command specifies the maximum connect time (in minutes) without console activity. A value of 0 indicates that a console can be connected indefinitely. The time range is 0 to 160.

Default	5
Format	serial timeout *0-160*
Mode	Line Config

no serial timeout

This command sets the maximum connect time (in minutes) without console activity.

Format	no serial timeout
Mode	Line Config

show serial

This command displays serial communication settings for the switch.

Format	show serial
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Serial Port Login Timeout (minutes)	The time, in minutes, of inactivity on a serial port connection, after which the switch will close the connection. A value of 0 disables the timeout.
Baud Rate (bps)	The default baud rate at which the serial port will try to connect.
Character Size (bits)	The number of bits in a character. The number of bits is always 8.
Flow Control	Whether Hardware Flow-Control is enabled or disabled. Hardware Flow Control is always disabled.
Stop Bits	The number of Stop bits per character. The number of Stop bits is always 1.
Parity	The parity method used on the Serial Port. The Parity Method is always None.

Telnet Commands

This section describes the commands you use to configure and view Telnet settings. You can use Telnet to manage the device from a remote management host.

ip telnet server enable

Use this command to enable Telnet connections to the system and to enable the Telnet Server Admin Mode. This command opens the Telnet listening port.

Default	disabled
Format	ip telnet server enable
Mode	Privileged EXEC

no ip telnet server enable

Use this command to disable Telnet access to the system and to disable the Telnet Server Admin Mode. This command closes the Telnet listening port and disconnects all open Telnet sessions.

Format	no ip telnet server enable
Mode	Privileged EXEC

ip telnet port

This command configures the TCP port number on which the Telnet server listens for requests.

Default	23
Format	ip telnet port *1-65535*
Mode	Privileged EXEC

no ip telnet port

This command restores the Telnet server listen port to its factory default value.

Format	no ip telnet port
Mode	Privileged EXEC

telnet

This command establishes a new outbound Telnet connection to a remote host. The *host* value must be a valid IP address or host name. Valid values for *port* should be a valid decimal integer in the range of 0 to 65535, where the default value is 23. If `[debug]` is used, the current Telnet options enabled is displayed. The optional *line* parameter sets the outbound Telnet operational mode as line mode where, by default, the operational mode is character mode. The *localecho* option enables local echo.

Format	telnet *ip-address*|*hostname port* [debug] [line] [localecho]
Modes	• Privileged EXEC • User EXEC

transport input telnet

This command regulates new Telnet sessions. If enabled, new Telnet sessions can be established until there are no more sessions available. An established session remains active until the session is ended or an abnormal network error ends the session.

Note: If the Telnet Server Admin Mode is disabled, Telnet sessions cannot be established. Use the `ip telnet server enable` command to enable Telnet Server Admin Mode.

Default	enabled
Format	transport input telnet
Mode	Line Config, Line Console Config

no transport input telnet

Use this command to prevent new Telnet sessions from being established.

Format	no transport input telnet
Mode	Line Config, Line Console Config

transport output telnet

This command regulates new outbound Telnet connections. If enabled, new outbound Telnet sessions can be established until the system reaches the maximum number of simultaneous outbound Telnet sessions allowed. An established session remains active until the session is ended or an abnormal network error ends it.

Default	enabled
Format	transport output telnet
Mode	Line Config, Line Console Config

no transport output telnet

Use this command to prevent new outbound Telnet connection from being established.

Format	no transport output telnet
Mode	Line Config, Line Console Config

session-limit

This command specifies the maximum number of simultaneous outbound Telnet sessions. A value of 0 indicates that no outbound Telnet session can be established.

Default	5

Format	session-limit *0-5*
Mode	Line Config

no session-limit

This command sets the maximum number of simultaneous outbound Telnet sessions to the default value.

Format	no session-limit
Mode	Line Config

session-timeout

This command sets the Telnet session timeout value.The timeout value unit of time is minutes.

Default	5
Format	session-timeout *1-160*
Mode	Line Config

no session-timeout

This command sets the Telnet session timeout value to the default. The timeout value unit of time is minutes.

Format	no session-timeout
Mode	Line Config

telnetcon maxsessions

This command specifies the maximum number of Telnet connection sessions that can be established. A value of 0 indicates that no Telnet connection can be established. The range is 0 to 5.

Default	5
Format	telnetcon maxsessions *0-5*
Mode	Privileged EXEC

no telnetcon maxsessions

This command sets the maximum number of Telnet connection sessions that can be established to the default value.

Format	no telnetcon maxsessions
Mode	Privileged EXEC

telnetcon timeout

This command sets the Telnet connection session timeout value, in minutes. A session is active as long as the session has not been idle for the value set. The time is a decimal value from 1 to 160.

Note: When you change the timeout value, the new value is applied to all active and inactive sessions immediately. Any sessions that have been idle longer than the new timeout value are disconnected immediately.

Default	5
Format	telnetcon timeout *1-160*
Mode	Privileged EXEC

no telnetcon timeout

This command sets the Telnet connection session timeout value to the default.

Note: Changing the timeout value for active sessions does not become effective until the session is accessed again. Also, any keystroke activates the new timeout duration.

Format	no telnetcon timeout
Mode	Privileged EXEC

show telnet

This command displays the current outbound Telnet settings. In other words, these settings apply to Telnet connections initiated from the switch to a remote system.

Format	show telnet
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Outbound Telnet Login Timeout	The number of minutes an outbound Telnet session is allowed to remain inactive before being logged off.
Maximum Number of Outbound Telnet Sessions	The number of simultaneous outbound Telnet connections allowed.
Allow New Outbound Telnet Sessions	Indicates whether outbound Telnet sessions will be allowed.

show telnetcon

This command displays the current inbound Telnet settings. In other words, these settings apply to Telnet connections initiated from a remote system to the switch.

Format	show telnetcon
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Remote Connection Login Timeout (minutes)	This object indicates the number of minutes a remote connection session is allowed to remain inactive before being logged off. May be specified as a number from 1 to 160. The factory default is 5.

Parameter	Definition
Maximum Number of Remote Connection Sessions	This object indicates the number of simultaneous remote connection sessions allowed. The factory default is 5.
Allow New Telnet Sessions	New Telnet sessions will not be allowed when this field is set to no. The factory default value is yes.
Telnet Server Admin Mode	If Telnet Admin mode is enabled or disabled.
Telnet Server Port	The configured TCP port number on which the Telnet server listens for requests. (The default is 23.)

Secure Shell Commands

This section describes the commands you use to configure Secure Shell (SSH) access to the switch. Use SSH to access the switch from a remote management host.

Note: The system allows a maximum of five SSH sessions.

ip ssh

Use this command to enable SSH access to the system. (This command is the short form of the `ip ssh server enable` command.)

Default	enabled
Format	ip ssh
Mode	Privileged EXEC

ip ssh port

Use this command to configure the TCP port number on which the SSH server listens for requests. Valid port numbers are from 1 to 65535.

Default	22
Format	ip ssh port *1-65535*
Mode	Privileged EXEC

no ip ssh port

Use this command to restore the SSH server listen port to its factory default value.

Format	no ip ssh port
Mode	Privileged EXEC

ip ssh server enable

This command enables the IP secure shell server. No new SSH connections are allowed, but the existing SSH connections continue to work until timed-out or logged-out.

Default	enabled
Format	ip ssh server enable
Mode	Privileged EXEC

no ip ssh server enable

This command disables the IP secure shell server.

Format	no ip ssh server enable
Mode	Privileged EXEC

sshcon maxsessions

This command specifies the maximum number of SSH connection sessions that can be established. A value of 0 indicates that no ssh connection can be established. The range is 0 to 5.

Default	5
Format	sshcon maxsessions *0-5*
Mode	Privileged EXEC

no sshcon maxsessions

This command sets the maximum number of allowed SSH connection sessions to the default value.

Format	no sshcon maxsessions
Mode	Privileged EXEC

sshcon timeout

This command sets the SSH connection session timeout value, in minutes. A session is active as long as the session has been idle for the value set. The time is a decimal value from 1 to 160.

Changing the timeout value for active sessions does not become effective until the session is re accessed. Also, any keystroke activates the new timeout duration.

Default	5
Format	sshcon timeout *1-160*
Mode	Privileged EXEC

no sshcon timeout

This command sets the SSH connection session timeout value, in minutes, to the default.

Changing the timeout value for active sessions does not become effective until the session is re accessed. Also, any keystroke activates the new timeout duration.

Format	no sshcon timeout
Mode	Privileged EXEC

show ip ssh

This command displays the ssh settings.

Format	show ip ssh
Mode	Privileged EXEC

Parameter	Definition
Administrative Mode	This field indicates whether the administrative mode of SSH is enabled or disabled.
SSH Port	The SSH port.
Protocol Level	The protocol level, which is SSH version 2.
SSH Sessions Currently Active	The number of SSH sessions currently active.
Max SSH Sessions Allowed	The maximum number of SSH sessions allowed.
SSH Timeout	The SSH timeout value in minutes.
Keys Present	Indicates whether the SSH RSA and DSA key files are present on the device.
Key Generation in Progress	Indicates whether RSA or DSA key files generation is currently in progress.
SCP Server Administrative Mode	Indicates whether the SCP server is enabled on the switch. To allow file transfers from a host system to the switch using SCP push operations, the SCP server must be enabled.

Management Security Commands

This section describes commands you use to generate keys and certificates, which you can do in addition to loading them as before.

common-name

Use the **common-name** command in Crypto Certificate Generation or Crypto Certificate Request mode to specify the common-name for the switch. This command has no default configuration. This command mode is entered using the **crypto certificate request** or **crypto certificate generate** command.

Format	**common-name** *common-name*
Mode	Crypto Certification

Parameter	Description
common-name	Specifies the fully qualified URL or IP address of the switch. If left unspecified, this parameter defaults to the lowest IP address of the switch (when the certificate is generated). (Range: 1–64)

Example: The following example displays how to specify the name of "router.gm.com."

```
console(config-crypto-cert)#common-name router.gm.com
```

country

Use the **country** command in Crypto Certificate Generation or Crypto Certificate Request mode to specify the country. This command has no default configuration. This command mode is entered using the **crypto certificate request** or **crypto certificate generate** command. The user can enter any two printable characters other than a question mark.

Format	**country** *country*
Mode	Crypto Certificate Generation or Crypto Certificate Request

Parameter	Description
country	Specifies the country name. (Range: 2 characters)

Example: The following example displays how to specify the country as "us."

```
console(config-crypto-cert)#country us
```

crypto certificate generate

Use this command to generate a self-signed certificate for HTTPS. The generated RSA key for SSL has a length of 2048 bits. The resulting certificate is generated with a common name equal to the lowest IP address of the device and a duration of 365 days.

Note: The switch uses SHA2-256 to sign the generated certificate instead of SHA1, and the key length of the certificate generated is changed from 1024 to 2048 bits. This change in key size is only for the newly generated certificates and does not alter any functionality with the existing or loaded certificates.

Format	crypto certificate generate
Mode	Global Config

no crypto certificate generate

Use this command to delete the HTTPS certificate files from the device, regardless of whether they are self-signed or downloaded from an outside source.

Format	no crypto certificate generate
Mode	Global Config

crypto certificate import

Use the **crypto certificate import** command in Global Configuration mode to import a certificate signed by the Certification Authority for HTTPS. This command has no default configuration. Use this command to enter an external certificate (signed by the Certification Authority) to the switch. To end the session, add a period (.) on a separate line after the input, and press ENTER.

The imported certificate must be based on a certificate request created by the crypto certificate request Global Config command.

If the public key found in the certificate does not match the switch's SSL RSA key, the command fails.

Regenerating the RSA key will render existing certificates invalid.

Certificates are validated on input. The system log will show any encountered certificate errors such as invalid format or if the certificate could not be validated against the switch private key. Invalid certificates are not imported. The signed certificate must contain the switch public key and match the RSA key on the switch and must be in X509 PEM text format.

This command is not saved in the router configuration; however, the certificate imported by this command is saved in the private configuration. Certificates are propagated across the stack.

Format	**crypto certificate** *number* **import**
Mode	Global Config

Parameter	Description
number	Specifies the certificate number. (Range: 1–2)

Example: The following example imports a certificate signed by the Certification Authority for HTTPS.

```
console(config)#crypto certificate 1 import
```

```
Please paste the input now, add a period (.) on a separate line after the input, and press Enter.
-----BEGIN CERTIFICATE-----
MIIDBDCCAewCCQCP5mFCRmauaDANBgkqhkiG9w0BAQUFADCBkTELMAkGA1UEBhMC
VVMxCzAJBgNVBAgMAk5DMRAwDgYDVQQHDAdSYWxlaWdoMRIwEAYDVQQKDAlEZWxs
LEluYy4xEzARBgNVBAsMCk5ldHdvcmtpbmcxGDAWBgNVBAMMD0RlbGwgTmV0d29y
a2luZzEgMB4GCSqGSIb3DQEJARYRbm9yZXBsYXlAZGVsbC5jb20wHhcNMTYwNjA5
MTc0NjAyWhcNMTcxMDIyMTc0NjAyWjB6MQ0wCwYDVQQDDARERUxMMRgwFgYDVQQL
DA9EZWxsIE5ldHdvcmtpbmcxEzARBgNVBAcMClJvdW5kIFJvY2sxCzAJBgNVBAgM
AlRYMQswCQYDVQQGEwJVUzEgMB4GCSqGSIb3DQEJARYRbm8tcmVwbHlAZGVsbC5j
b20wgZ8wDQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBAJvuBYqkIuwbfZ9JfWxbBHKA
mtT+bkg5h0mG2yztCDfu5aWRAIG7yVZjpQU5FwQ/3IJVj6PQ4yMSMC54TxVNV82I
ZHxqdoJ07rewbvvXPqBVLkzrEWc0zo6w7SsuOmdqp5Dzl4c1crRwpFYDnBEVBxgZ
L4Z8MKT0MQEYgPb+y6YPAgMBAAEwDQYJKoZIhvcNAQEFBQADggEBAOXMcQZBLMCP
lgf0Jnpv74buMNEGsNi1OoeDuAnn4E9Pcv76nPVzUarlc8T67V5WGZRWTZ9XY48r
BYY2a2YOtjoGcY7sBiEPJQbji+U9W7xCjz1q/Un8YRshdW/7dNmTwFTh55S2QmXV
RN/UVjShWRmMn0vbiyyzHaKAON+9fBt3rMQCYiRyEuWISb31/3SlWY9iQJezwoOh
ZX9DEgnxvzUjLMoYVRhqCE0+LoBWikhy6ROS+b4cubJpzTdv2n+zY8dbM9jSwiky
6rFhVznvamGap8Aw0rUnEvU5kM9MM0hsVU95H+QzWJwychy9Fhh1zhYzNTpr+VQs
c4psyXEd8GE=
-----END CERTIFICATE-----
.

Certificate imported successfully

console(config)#show crypto certificate mycertificate 1

-----BEGIN CERTIFICATE-----
MIIDBDCCAewCCQCP5mFCRmauaDANBgkqhkiG9w0BAQUFADCBkTELMAkGA1UEBhMC
VVMxCzAJBgNVBAgMAk5DMRAwDgYDVQQHDAdSYWxlaWdoMRIwEAYDVQQKDAlEZWxs
LEluYy4xEzARBgNVBAsMCk5ldHdvcmtpbmcxGDAWBgNVBAMMD0RlbGwgTmV0d29y
a2luZzEgMB4GCSqGSIb3DQEJARYRbm9yZXBsYXlAZGVsbC5jb20wHhcNMTYwNjA5
MTc0NjAyWhcNMTcxMDIyMTc0NjAyWjB6MQ0wCwYDVQQDDARERUxMMRgwFgYDVQQL
DA9EZWxsIE5ldHdvcmtpbmcxEzARBgNVBAcMClJvdW5kIFJvY2sxCzAJBgNVBAgM
AlRYMQswCQYDVQQGEwJVUzEgMB4GCSqGSIb3DQEJARYRbm8tcmVwbHlAZGVsbC5j
b20wgZ8wDQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBAJvuBYqkIuwbfZ9JfWxbBHKA
mtT+bkg5h0mG2yztCDfu5aWRAIG7yVZjpQU5FwQ/3IJVj6PQ4yMSMC54TxVNV82I
ZHxqdoJ07rewbvvXPqBVLkzrEWc0zo6w7SsuOmdqp5Dzl4c1crRwpFYDnBEVBxgZ
L4Z8MKT0MQEYgPb+y6YPAgMBAAEwDQYJKoZIhvcNAQEFBQADggEBAOXMcQZBLMCP
lgf0Jnpv74buMNEGsNi1OoeDuAnn4E9Pcv76nPVzUarlc8T67V5WGZRWTZ9XY48r
BYY2a2YOtjoGcY7sBiEPJQbji+U9W7xCjz1q/Un8YRshdW/7dNmTwFTh55S2QmXV
RN/UVjShWRmMn0vbiyyzHaKAON+9fBt3rMQCYiRyEuWISb31/3SlWY9iQJezwoOh
ZX9DEgnxvzUjLMoYVRhqCE0+LoBWikhy6ROS+b4cubJpzTdv2n+zY8dbM9jSwiky
6rFhVznvamGap8Aw0rUnEvU5kM9MM0hsVU95H+QzWJwychy9Fhh1zhYzNTpr+VQs
c4psyXEd8GE=
-----END CERTIFICATE-----
Issued by: Lenovo Networking
Valid from to Oct 22 17:46:02 2017 GMT
Subject: /CN=Lenovo/OU=Lenovo Networking/L=Round
Rock/ST=TX/C=US/emailAddress=no-reply@lenovo.com
Fingerprint: FA06E0DD138FA22A4D696A80171FF3D8
```

crypto certificate request

Use the **crypto certificate request** command to generate and display a certificate request for HTTPS. This command takes you to Crypto Certificate Request mode. This command has no default configuration. Use this command to generate a certificate request to send to a Certification Authority. The certificate request is generated in Base64-encoded X.509 format.

Before generating a certificate request, you must first generate a self-signed certificate using the **crypto certificate generate** command in Global Configuration mode in order to sign the certificate request. Make sure to reenter the identical values in the certificate request fields as were entered in the self-signed certificate generated by the **crypto certificate generate** command.

After receiving the certificate from the Certification Authority, use the crypto certificate import command in Global Configuration mode to import the certificate into the switch. This certificate replaces the self-signed certificate. Use the end command to exit Crypto Certificate Request mode without generating a certificate request. Use the exit command to exit Crypto Certificate Request mode and generate a certificate request.

Format	**crypto certificate** *number* **request**
Mode	Global Config

Parameter	Description
number	Specifies the certificate number. (Range: 1–2)

Example: The following is an example of the command.

```
console(config)#crypto certificate 1 request
console(config-crypto-cert)#common-name Lenovo
console(config-crypto-cert)#country US
console(config-crypto-cert)#email no-reply@lenovo.com
console(config-crypto-cert)#location “Round Rock”
console(config-crypto-cert)#organization-name “Lenovo”
console(config-crypto-cert)#organization-unit “Lenovo Networking”
console(config-crypto-cert)#state TX
console(config-crypto-cert)#exit

-----BEGIN CERTIFICATE REQUEST-----
MIIBujCCASMCAQIwejENMAsGA1UEAwwEREVMTDEYMBYGA1UECwwPRGVsbCBOZXR3
b3JraW5nMRMwEQYDVQQHDApSb3VuZCBSb2NrMQswCQYDVQQIDAJUWDELMAkGA1UE
BhMCVVMxIDAeBgkqhkiG9w0BCQEWEW5vLXJlcGx5QGRlbGwuY29tMIGfMA0GCSqG
SIb3DQEBAQUAA4GNADCBiQKBgQCb7gWKpCLsG32fSX1sWwRygJrU/m5IOYdJhtss
7Qg37uWlkQCBu8lWY6UFORcEP9yCVY+j0OMjEjAueE8VTVfNiGR8anaCdO63sG77
1z6gVS5M6xFnNM6OsO0rLjpnaqeQ85eHNXK0cKRWA5wRFQcYGS+GfDCk9DEBGID2
/sumDwIDAQABoAAwDQYJKoZIhvcNAQEFBQADgYEAahrQQ/Oi0Gn+R2eQnlyBfW59
caq+68/GtmeLJdOlTOpQQhT1NgNdRZG0W/TmG2PAumRrPlXf/bnnBobwCTlMPbE0
HBEoTKlAbGhXnSDHfrvpGyH8sphWDvCgZ2fSljY6e4SEE5Lu1J1MRJaLstpZGaQf
mB0MBPXsPJbIlIT+vPM=
-----END CERTIFICATE REQUEST-----
```

crypto key generate rsa

Use this command to generate an RSA key pair for SSH. The new key files will overwrite any existing generated or downloaded RSA key files.

Format	crypto key generate rsa
Mode	Global Config

no crypto key generate rsa

Use this command to delete the RSA key files from the device.

Format	no crypto key generate rsa
Mode	Global Config

crypto key generate dsa

Use this command to generate a DSA key pair for SSH. The new key files will overwrite any existing generated or downloaded DSA key files.

Format	crypto key generate dsa
Mode	Global Config

no crypto key generate dsa

Use this command to delete the DSA key files from the device.

Format	no crypto key generate dsa
Mode	Global Config

duration

Use the **duration** command in Crypto Certificate Generation mode to specify the duration of certificate validity. This command mode is entered using the **crypto certificate generate** command.

Default	365 days
Format	**duration** *days*
Mode	Crypto Certificate Generation

Parameter	Description
days	Specifies the number of days a certification would be valid. If left unspecified, the parameter defaults to 365 days. (Range: 30 to 3650 days)

Example: The following example displays how specify that a certification is valid for a duration of 50 days.

```
console(config-crypto-cert-gen)#duration 50
```

email

Use the **email** command to identify the email address used to contact your organization. The maximum length is 64 characters. By default, no email address is configured. An email address consists of a local-part, an @ symbol, and a case-sensitive domain name. Embedded spaces are not supported. The domain name should be a full-qualified domain name. The email address is not validated by the switch.

Format **email** *address*

Mode Crypto Certificate Generation or Crypto Certificate Request mode

Parameter	Description
address	A valid email address conforming to the addr-spec in RFC 5322.

end

Use the **end** command to exit without generating a certificate and return the CLI command mode back to the privileged execution mode or user execution mode. This command has no default configuration. The first invocation of **end** from Global Configuration mode, or any configuration submode, returns the command mode to Privileged Exec mode. This command is equivalent to using the Ctrl-Z key press.

Format end

Mode Crypto Certificate Generation and all command modes

exit

Once the certificate information has been entered, use the **exit** command to generate the certificate and to return the CLI command mode back to the Global Configuration mode. This command has no default configuration. If the certificate was generated, the *Certification Generation Successful...* message will be displayed.

Format exit

Mode All command modes. In User Exec mode, this command behaves identically to the **quit** command.

Example: The following example changes the configuration mode from Interface Configuration mode to User Exec mode to the login prompt.

```
(CE0128PB)(Config)#crypto certificate 1 generate
(CE0128PB)(config-crypto-cert-gen)#common-name Lenovo.com
(CE0128PB)(config-crypto-cert-gen)#country US
(CE0128PB)(config-crypto-cert-gen)#duration 365
(CE0128PB)(config-crypto-cert-gen)#email admin@lenovo.com
(CE0128PB)(config-crypto-cert-gen)#location "Lenovo address"
(CE0128PB)(config-crypto-cert-gen)#organization-name "Lenovo Inc."
(CE0128PB)(config-crypto-cert-gen)#organization-unit "Lenovo Networking"
(CE0128PB)(config-crypto-cert-gen)#state NC
(CE0128PB)(config-crypto-cert-gen)#exit
Certification Generation Successful..
```

ip http secure-certificate

Use the **ip http secure-certificate** command to configure the active certificate for HTTPS. The HTTPS certificate is imported using the **crypto certificate import** command in Global Configuration mode.

Default The default value of the certificate number is 1.

Format **ip http secure-certificate** *number*

Mode Privileged EXEC

Parameter	Description
number	Specifies the certificate number. (Range: 1–2)

Example: The following example configures the active certificate for HTTPS.

```
(switch)#ip http secure-certificate1
```

no ip http secure-certificate

Use the **no** form of this command to return to the default setting.

Format **no ip http secure-certificate**

Mode Privileged EXEC

key-generate

Use the **key-generate** command in Crypto Certificate Generation mode to generate a new RSA key prior to generating the certificate key. The certificate generated by a **crypto certificate generate** command is not a signed certificate and is used to generate a certificate signing request. Once a signed certificate is received, download the certificate to the switch. This command mode is entered using the **crypto certificate request** command. You must use the key-generate command prior to exiting the crypto certificate request mode to properly generate a certificate request. All of the common-name, country, location, state, organization-unit, and logging email commands must be issued prior to executing the key-generate command.

Default By default, the certificate generation process will utilize existing RSA keys.

Format **key-generate** [*length*]

Mode Crypto Certificate Generation

Parameter	Description
length	Specifies the length of the SSL RSA key. If left unspecified, this parameter defaults to 1024. (Range: 512 to 2048)

Example: The following example displays how to specify that you want to regenerate the SSL RSA key 1024 byes in length.

```
(switch)(config-crypto-cert-gen)#key-generate 1024
```

location

Use the **location** command in Crypto Certificate Generation or Crypto Certificate Request mode to specify the location or city name. This command has no default configuration. This command mode is entered using the **crypto certificate request** or **crypto certificate generate** command.

Format **location** *location*

Mode Crypto Certificate Generation or Crypto Certificate Request mode

Parameter	Description
location	Specifies the location or city name. (Range: 1–64 characters)

Example: The following example displays how to specify the city location of "austin."

```
(switch)(config-crypto-cert-gen)#location austin
```

organization-name

Use the **organization-name** command to identify the legal name of the organization requesting the certificate. By default, no organization name is configured. The name should not be abbreviated and should contain suffixes such as Inc., Corp., or LLC. Enclose the parameter in quotes to embed spaces within the name. The organization name is not validated by the switch.

Format **organization-name** *name*

Mode Crypto Certificate Generation or Crypto Certificate Request mode

Parameter	Description
name	The legal name of the organization requesting the certificate. The maximum length is 64 characters.

Example: The following example displays how to specify the Lenovo organization-unit.

```
(switch)(config-crypto-cert-gen)#organization-unit "Lenovo"
```

organization-unit

Use the **organization-unit** command in Crypto Certificate Generation or Crypto Certificate Request mode to specify the organization unit. This command has no default configuration. This command mode is entered using the **crypto certificate request** or **crypto certificate generate** command.

Format **organization-unit** *organization-unit*

Mode Crypto Certificate Generation or Crypto Certificate Request mode

Parameter	Description
organization-unit	Specifies the organization-unit or department name. (Range: 1 to 64 characters)

Example: The following example displays how to specify the Lenovo organization-unit.

```
(switch)(config-crypto-cert-gen)#organization-unit "Lenovo"
```

show crypto certificate mycertificate

Use the **show crypto certificate mycertificate** command to view the SSL certificates of your switch. This command has no default configuration.

Format **show crypto certificate mycertificate** [*number*]

Mode Privileged Exec mode, Global Configuration mode and all Configuration submodes

Parameter	Description
number	Specifies the certificate number. (Range: 1–2 digits)

Example: The following example displays the SSL certificate of a sample switch.

```
(switch)(config)#show crypto certificate mycertificate 1

-----BEGIN CERTIFICATE-----
MIIDBDCCAewCCQCP5mFCRmauaDANBgkqhkiG9w0BAQUFADCBkTELMAkGA1UEBhMC
VVMxCzAJBgNVBAgMAk5DMRAwDgYDVQQHDAdSYWxlaWdoMRIwEAYDVQQKDAlEZWxs
LEluYy4xEzARBgNVBAsMCk5ldHdvcmtpbmcxGDAWBgNVBAMMD0RlbGwgTmV0d29y
a2luZzEgMB4GCSqGSIb3DQEJARYRbm9yZXBsYXlAZGVsbC5jb20wHhcNMTYwNjA5
MTc0NjAyWhcNMTcxMDIyMTc0NjAyWjB6MQ0wCwYDVQQDDARERUxMMRgwFgYDVQQL
DA9EZWxsIE5ldHdvcmtpbmcxEzARBgNVBAcMClJvdW5kIFJvY2sxCzAJBgNVBAgM
AlRYMQswCQYDVQQGEwJVUzEgMB4GCSqGSIb3DQEJARYRbm8tcmVwbHlAZGVsbC5j
b20wgZ8wDQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBAJvuBYqkIuwbfZ9JfWxbBHKA
mtT+bkg5h0mG2yztCDfu5aWRAIG7yVZjpQU5FwQ/3IJVj6PQ4yMSMC54TxVNV82I
ZHxqdoJ07rewbvvXPqBVLkzrEWc0zo6w7SsuOmdqp5Dzl4c1crRwpFYDnBEVBxgZ
L4Z8MKT0MQEYgPb+y6YPAgMBAAEwDQYJKoZIhvcNAQEFBQADggEBAOXMcQZBLMCP
lgf0Jnpv74buMNEGsNi1OoeDuAnn4E9Pcv76nPVzUarlc8T67V5WGZRWTZ9XY48r
BYY2a2YOtjoGcY7sBiEPJQbji+U9W7xCjz1q/Un8YRshdW/7dNmTwFTh55S2QmXV
RN/UVjShWRmMn0vbiyyzHaKAON+9fBt3rMQCYiRyEuWISb31/3SlWY9iQJezwoOh
ZX9DEgnxvzUjLMoYVRhqCE0+LoBWikhy6ROS+b4cubJpzTdv2n+zY8dbM9jSwiky
6rFhVznvamGap8Aw0rUnEvU5kM9MM0hsVU95H+QzWJwychy9Fhh1zhYzNTpr+VQs
c4psyXEd8GE=
-----END CERTIFICATE-----
Issued by: Lenovo Networking
Valid from to Oct 22 17:46:02 2017 GMT
Subject: /CN=Lenovo/OU=Lenovo Networking/L=Round
Rock/ST=TX/C=US/emailAddress=no-reply@lenovo.com
Fingerprint: FA06E0DD138FA22A4D696A80171FF3D8
```

state

Use the **state** command in Crypto Certificate Generation or Crypto Certificate Request mode to specify the state or province name. This command has no default configuration. This command mode is entered using the **crypto certificate request** or **crypto certificate generate** command.

Format **state** *state*

Mode Crypto Certificate Generation or Crypto Certificate Request mode

Parameter	Description
state	Specifies the state or province name. (Range: 1–64 characters)

Example: The following example shows how to specify the state of "TX."

```
(switch)(config-crypto-cert-gen)#state TX
```

Hypertext Transfer Protocol Commands

This section describes the commands you use to configure Hypertext Transfer Protocol (HTTP) and secure HTTP access to the switch. Access to the switch by using a Web browser is enabled by default. Everything you can view and configure by using the CLI is also available by using the Web.

ip http accounting exec, ip https accounting exec

This command applies user exec (start-stop/stop-only) accounting list to the line methods HTTP and HTTPS.

Note: The user exec accounting list should be created using the command "aaa accounting" on page 107.

Format	ip {http|https} accounting exec {default|listname}
Mode	Global Config

Parameter	Description
http/https	The line method for which the list needs to be applied.
default	The default list of methods for authorization services.
listname	An alphanumeric character string used to name the list of accounting methods.

no ip http/https accounting exec

This command deletes the authorization method list.

Format	no ip {http|https} accounting exec {default|listname}
Mode	Global Config

ip http authentication

Use this command to specify authentication methods for http server users. The default configuration is the local user database is checked. This action has the same effect as the command `ip http authentication local`. The additional methods of authentication are used only if the previous method returns an error, not if it fails. To ensure that the authentication succeeds even if all methods return an error, specify `none` as the final method in the command line. For example, if `none` is specified as an authentication method after `radius`, no authentication is used if the RADIUS server is down.

Default	local
Format	ip http authentication method1 *[method2...]*
Mode	Global Config

Parameter	Description
local	Uses the local username database for authentication.
none	Uses no authentication.
radius	Uses the list of all RADIUS servers for authentication.
tacacs	Uses the list of all TACACS+ servers for authentication.

Example: The following example configures the http authentication.

```
(switch)(config)# ip http authentication radius local
```

no ip http authentication

Use this command to return to the default.

Format	no ip http authentication
Mode	Global Config

ip https authentication

Use this command to specify authentication methods for https server users. The default configuration is the local user database is checked. This action has the same effect as the command `ip https authentication local`. The additional methods of authentication are used only if the previous method returns an error, not if it fails. To ensure that the authentication succeeds even if all methods return an error, specify `none` as the final method in the command line. For example, if `none` is specified as an authentication method after `radius`, no authentication is used if the RADIUS server is down.

Default	local
Format	ip https authentication method1 *[method2...]*
Mode	Global Config

Parameter	Description
local	Uses the local username database for authentication.
none	Uses no authentication.
radius	Uses the list of all RADIUS servers for authentication.
tacacs	Uses the list of all TACACS+ servers for authentication.

Example: The following example configures https authentication.

```
(switch)(config)# ip https authentication radius local
```

no ip https authentication

Use this command to return to the default.

Format	no ip https authentication
Mode	Global Config

ip http server

This command enables access to the switch through the Web interface. When access is enabled, the user can login to the switch from the Web interface. When access is disabled, the user cannot login to the switch's Web server. Disabling the Web interface takes effect immediately. All interfaces are affected.

Default	disabled
Format	ip http server
Mode	Privileged EXEC

no ip http server

This command disables access to the switch through the Web interface. When access is disabled, the user cannot login to the switch's Web server.

Format	no ip http server
Mode	Privileged EXEC

ip http secure-server

This command is used to enable the secure socket layer for secure HTTP.

Default	enabled
Format	ip http secure-server
Mode	Privileged EXEC

no ip http secure-server

This command is used to disable the secure socket layer for secure HTTP.

Format	no ip http secure-server
Mode	Privileged EXEC

ip http port

This command configures the TCP port number on which the HTP server listens for requests.

Default	80
Format	ip http port *1-65535*
Mode	Privileged EXEC

no ip http port

This command restores the HTTP server listen port to its factory default value.

Format	no ip http port

Mode	Privileged EXEC

ip http session hard-timeout

This command configures the hard timeout for un-secure HTTP sessions in hours. Configuring this value to zero will give an infinite hard-timeout. When this timeout expires, the user will be forced to reauthenticate. This timer begins on initiation of the web session and is unaffected by the activity level of the connection.

Default	24
Format	ip http session hard-timeout *1-168*
Mode	Privileged EXEC

no ip http session hard-timeout

This command restores the hard timeout for un-secure HTTP sessions to the default value.

Format	no ip http session hard-timeout
Mode	Privileged EXEC

ip http session maxsessions

This command limits the number of allowable un-secure HTTP sessions. Zero is the configurable minimum.

Default	16
Format	ip http session maxsessions *0-16*
Mode	Privileged EXEC

no ip http session maxsessions

This command restores the number of allowable un-secure HTTP sessions to the default value.

Format	no ip http session maxsessions
Mode	Privileged EXEC

ip http session soft-timeout

This command configures the soft timeout for un-secure HTTP sessions in minutes. Configuring this value to zero will give an infinite soft-timeout. When this timeout expires the user will be forced to reauthenticate. This timer begins on initiation of the Web session and is restarted with each access to the switch.

Default	5
Format	ip http session soft-timeout *1-60*

Mode	Privileged EXEC

no ip http session soft-timeout

This command resets the soft timeout for un-secure HTTP sessions to the default value.

Format	no ip http session soft-timeout
Mode	Privileged EXEC

ip http secure-session hard-timeout

This command configures the hard timeout for secure HTTP sessions in hours. When this timeout expires, the user is forced to reauthenticate. This timer begins on initiation of the Web session and is unaffected by the activity level of the connection. The secure-session hard-timeout can not be set to zero (infinite).

Default	24
Format	ip http secure-session hard-timeout *1-168*
Mode	Privileged EXEC

no ip http secure-session hard-timeout

This command resets the hard timeout for secure HTTP sessions to the default value.

Format	no ip http secure-session hard-timeout
Mode	Privileged EXEC

ip http secure-session maxsessions

This command limits the number of secure HTTP sessions. Zero is the configurable minimum.

Default	16
Format	ip http secure-session maxsessions *0-16*
Mode	Privileged EXEC

no ip http secure-session maxsessions

This command restores the number of allowable secure HTTP sessions to the default value.

Format	no ip http secure-session maxsessions
Mode	Privileged EXEC

ip http secure-session soft-timeout

This command configures the soft timeout for secure HTTP sessions in minutes. Configuring this value to zero will give an infinite soft-timeout. When this timeout expires, you are forced to reauthenticate. This timer begins on initiation of the Web session and is restarted with each access to the switch. The secure-session soft-timeout can not be set to zero (infinite).

Default	5
Format	ip http secure-session soft-timeout *1-60*
Mode	Privileged EXEC

no ip http secure-session soft-timeout

This command restores the soft timeout for secure HTTP sessions to the default value.

Format	no ip http secure-session soft-timeout
Mode	Privileged EXEC

ip http secure-port

This command is used to set the SSL port where port can be 1025-65535 and the default is port 443.

Default	443
Format	ip http secure-port *portid*
Mode	Privileged EXEC

no ip http secure-port

This command is used to reset the SSL port to the default value.

Format	no ip http secure-port
Mode	Privileged EXEC

ip http secure-protocol

This command is used to set protocol levels (versions). The protocol level can be set to TLS1, SSL3 or to both TLS1 and SSL3.

Default	SSL3 and TLS1
Format	ip http secure-protocol *[SSL3] [TLS1]*
Mode	Privileged EXEC

show ip http

This command displays the http settings for the switch.

Format show ip http

Mode Privileged EXEC

Parameter	Definition
HTTP Mode (Unsecure)	The unsecure HTTP server administrative mode.
HTTP Port	The configured TCP port on which the HTTP server listens for requests. (The default is 80.)
Maximum Allowable HTTP Sessions	The number of allowable un-secure http sessions.
HTTP Session Hard Timeout	The hard timeout for un-secure http sessions in hours.
HTTP Session Soft Timeout	The soft timeout for un-secure http sessions in minutes.
HTTP Mode (Secure)	The secure HTTP server administrative mode.
Secure Port	The secure HTTP server port number.
Secure Protocol Level(s)	The protocol level may have the values of SSL3, TLS1, or both SSL3 and TLS1.
Maximum Allowable HTTPS Sessions	The number of allowable secure http sessions.
HTTPS Session Hard Timeout	The hard timeout for secure http sessions in hours.
HTTPS Session Soft Timeout	The soft timeout for secure http sessions in minutes.
Certificate Present	Indicates whether the secure-server certificate files are present on the device.
Certificate Generation in Progress	Indicates whether certificate generation is currently in progress.

Access Commands

Use the commands in this section to close remote connections or to view information about connections to the system.

disconnect

Use the `disconnect` command to close HTTP, HTTPS, Telnet or SSH sessions. Use `all` to close all active sessions, or use *`session-id`* to specify the session ID to close. To view the possible values for *`session-id`*, use the `show loginsession` command.

Format	disconnect {*session_id* | all}
Mode	Privileged EXEC

linuxsh

Use the `linuxsh` command to access the Linux shell. Use the `exit` command to exit the Linux shell and return to the CE0128XB/CE0152XB CLI. The shell session will timeout after five minutes of inactivity. The inactivity timeout value can be changed using the command "session-timeout" on page 63 in Line Console mode.

Default	ip-port:2324
Format	linuxsh [*ip-port*]
Mode	Privileged EXEC

Parameter	Description
ip-port	The IP port number on which the telnet daemon listens for connections. ip-port is an integer from 1 to 65535. The default value is 2324.

show loginsession

This command displays current Telnet, SSH and serial port connections to the switch. This command displays truncated user names. Use the `show loginsession long` command to display the complete user names.

Format	show loginsession
Mode	Privileged EXEC

Parameter	Definition
ID	Login Session ID.
User Name	The name the user entered to log on to the system.
Connection From	IP address of the remote client machine or EIA-232 for the serial port connection.
Idle Time	Time this session has been idle.
Session Time	Total time this session has been connected.
Session Type	Shows the type of session, which can be HTTP, HTTPS, telnet, serial, or SSH.

show loginsession long

This command displays the complete user names of the users currently logged in to the switch.

Format	show loginsession long
Mode	Privileged EXEC

Example: The following shows an example of the command.

```
(switch) #show loginsession long
User Name
------------
admin
test1111test1111test1111test1111test1111test1111test1111test1111
```

User Account Commands

This section describes the commands you use to add, manage, and delete system users. CE0128XB/CE0152XB software has two default users: admin and guest. The admin user can view and configure system settings, and the guest user can view settings.

Note: You cannot delete the admin user. There is only one user allowed with level-15 privileges. You can configure up to five level-1 users on the system.

aaa authentication login

Use this command to set authentication at login. The default and optional list names created with the command are used with the `aaa authentication login` command. Create a list by entering the `aaa authentication login list-name method` command, where `list-name` is any character string used to name this list. The `method` argument identifies the list of methods that the authentication algorithm tries, in the given sequence.

The additional methods of authentication are used only if the previous method returns an error, not if there is an authentication failure. To ensure that the authentication succeeds even if all methods return an error, specify `none` as the final method in the command line. For example, if `none` is specified as an authentication method after `radius`, no authentication is used if the RADIUS server is down.

Default	• `defaultList`. Used by the console and only contains the method none. • `networkList`. Used by telnet and SSH and only contains the method local.
Format	aaa authentication login {default | *list-name*} *method1 [method2...]*
Mode	Global Config

Parameter	Definition
default	Uses the listed authentication methods that follow this argument as the default list of methods when a user logs in.
list-name	Character string of up to 15 characters used to name the list of authentication methods activated when a user logs in.
method1... *[*method2...*]*	At least one from the following: • enable. Uses the enable password for authentication. • line. Uses the line password for authentication. • local. Uses the local username database for authentication. • none. Uses no authentication. • radius. Uses the list of all RADIUS servers for authentication. • tacacs. Uses the list of all TACACS servers for authentication.

Example: The following shows an example of the command.

```
(switch)(config)# aaa authentication login default radius local enable none
```

no aaa authentication login

This command returns to the default.

Format	aaa authentication login {default | *list-name*}
Mode	Global Config

aaa authentication enable

Use this command to set authentication for accessing higher privilege levels. The default enable list is `enableList`. It is used by console, and contains the method as `enable followed by none`.

A separate default enable list, `enableNetList`, is used for Telnet and SSH users instead of `enableList`. This list is applied by default for Telnet and SSH, and contains enable followed by deny methods. In CE0128XB/CE0152XB, by default, the enable password is not configured. That means that, by default, Telnet and SSH users will not get access to Privileged EXEC mode. On the other hand, with default conditions, a console user always enter the Privileged EXEC mode without entering the `enable` password.

The default and optional list names created with the `aaa authentication enable` command are used with the `enable authentication` command. Create a list by entering the `aaa authentication enable list-name method` command where `list-name` is any character string used to name this list. The `method` argument identifies the list of methods that the authentication algorithm tries in the given sequence.

The user manager returns ERROR (not PASS or FAIL) for enable and line methods if no password is configured, and moves to the next configured method in the authentication list. The method `none` reflects that there is no authentication needed.

The user will only be prompted for an enable password if one is required. The following authentication methods do not require passwords:

1. none
2. deny
3. enable (if no enable password is configured)
4. line (if no line password is configured)

Example: See the examples below.

a. aaa authentication enable default enable none

b. aaa authentication enable default line none

c. aaa authentication enable default enable radius none

d. aaa authentication enable default line tacacs none

Examples a and b do not prompt for a password, however because examples c and d contain the radius and tacacs methods, the password prompt is displayed.

If the login methods include only enable, and there is no enable password configured, then CE0128XB/CE0152XB does not prompt for a user name. In such cases, CE0128XB/CE0152XB only prompts for a password. CE0128XB/CE0152XB supports configuring methods after the local method in authentication and authorization lists. If the user is not present in the local database, then the next configured method is tried.

The additional methods of authentication are used only if the previous method returns an error, not if it fails. To ensure that the authentication succeeds even if all methods return an error, specify `none` as the final method in the command line.

Use the command "show authorization methods" on page 92 to display information about the authentication methods.

Note: Requests sent by the switch to a RADIUS server include the user name `$enabx$`, where `x` is the requested privilege level. For enable to be authenticated on Radius servers, add `$enabx$` users to them. The login user ID is now sent to TACACS+ servers for enable authentication.

Default	default
Format	aaa authentication enable {default | *list-name*} *method1 [method2...]*
Mode	Global Config

Parameter	Description
default	Uses the listed authentication methods that follow this argument as the default list of methods, when using higher privilege levels.
list-name	Character string used to name the list of authentication methods activated, when using access higher privilege levels. Range: 1-15 characters.
method1 *[*method2...*]*	Specify at least one from the following: • `deny`. Used to deny access. • `enable`. Uses the enable password for authentication. • `line`. Uses the line password for authentication. • `none`. Uses no authentication. • `radius`. Uses the list of all RADIUS servers for authentication. • `tacacs`. Uses the list of all TACACS+ servers for authentication.

Example: The following example sets authentication when accessing higher privilege levels.

```
(switch)(config)# aaa authentication enable default enable
```

no aaa authentication enable

Use this command to return to the default configuration.

Format	no aaa authentication enable {default | *list-name*}
Mode	Global Config

aaa authorization

Use this command to configure command and exec authorization method lists. This list is identified by `default` or a user-specified `list-name`. If `tacacs` is specified as the authorization method, authorization commands are notified to a TACACS+ server. If `none` is specified as the authorization method, command authorization is not applicable. A maximum of five authorization method lists can be created for the `commands` type.

Note: Local method is not supported for command authorization. Command authorization with RADIUS will work if, and only if, the applied authentication method is also radius.

Per-Command Authorization

When authorization is configured for a line mode, the user manager sends information about an entered command to the AAA server. The AAA server validates the received command, and responds with either a PASS or FAIL response. If approved, the command is executed. Otherwise, the command is denied and an error message is shown to the user. The various utility commands like tftp, and ping, and outbound telnet should also pass command authorization. Applying the script is treated as a single command apply script, which also goes through authorization. Startup-config commands applied on device boot-up are not an object of the authorization process.

The per-command authorization usage scenario is this:

1. Configure Authorization Method List

   aaa authorization commands *listname* tacacs radius none

2. Apply AML to an Access Line Mode (console, telnet, SSH)

   authorization commands listname

3. Commands entered by the user will go through command authorization via TACACS+ or RADIUS server and will be accepted or denied.

Exec Authorization

When exec authorization is configured for a line mode, the user may not be required to use the `enable` command to enter Privileged EXEC mode. If the authorization response indicates that the user has sufficient privilege levels for Privileged EXEC mode, then the user bypasses User EXEC mode entirely.

The exec authorization usage scenario is this:

1. Configure Authorization Method List

   aaa authorization exec *listname method1* [*method2....*]

2. Apply AML to an Access Line Mode (console, telnet, SSH)

   authorization exec *listname*

3. When the user logs in, in addition to authentication, authorization will be performed to determine if the user is allowed direct access to Privileged EXEC mode.

Format	*aaa authorization {commands|exec} {default|list-name} method1[method2]*
Mode	Global Config

Parameter	Description
commands	Provides authorization for all user-executed commands.
exec	Provides exec authorization.
default	The default list of methods for authorization services.

Parameter	Description
list-name	Alphanumeric character string used to name the list of authorization methods.
method	`TACACS+/RADIUS/Local` and `none` are supported.

Example: The following shows an example of the command.

```
(Routing) #configure
(Routing) (Config)#aaa authorization exec default  tacacs+ none
(Routing) (Config)#aaa authorization commands default tacacs+ none
```

no aaa authorization

This command deletes the authorization method list.

Format *no aaa authorization {commands|exec} {default|list-name}*

Mode Global Config

authorization commands

This command applies a command authorization method list to an access method (console, telnet, ssh). For usage scenarios on per command authorization, see the command "aaa authorization" on page 89.

Format *authorization commands [default|list-name]*

Mode Line console, Line telnet, Line SSH

Parameter	Description
commands	This causes command authorization for each command execution attempt.

no authorization commands

This command removes command authorization from a line config mode.

Format *no authorization {commands|exec}*

Mode Line console, Line telnet, Line SSH

Example: The following shows an example of the command.

```
(Switching) (Config)#line console
(Switching) (Config-line)#authorization commands list2
(Switching) (Config-line)#exit
```

authorization exec

This command applies a command authorization method list to an access method so that the user may not be required to use the enable command to enter Privileged EXEC mode. For usage scenarios on exec authorization, see the command "aaa authorization" on page 89.

Format *authorization exec list-name*

Mode Line console, Line telnet, Line SSH

Parameter	Description
list-name	The command authorization method list.

no authorization exec

This command removes command authorization from a line config mode.

Format *no authorization exec*

Mode Line console, Line telnet, Line SSH

authorization exec default

This command applies a default command authorization method list to an access method so that the user may not be required to use the enable command to enter Privileged EXEC mode. For usage scenarios on exec authorization, see the command "aaa authorization" on page 89.

Format *authorization exec default*

Mode Line console, Line telnet, Line SSH

no authorization exec default

This command removes command authorization from a line config mode.

Format *no authorization exec default*

Mode Line console, Line telnet, Line SSH

show authorization methods

This command displays the configured authorization method lists.

Format *show authorization methods*

Mode Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switching) #show authorization methods

Command Authorization List                    Method
------------------------- --------------------------------------
dfltCmdAuthList                               tacacs     none
list2                                         none       undefined
list4                                         tacacs     undefined

Line                                          Command Method List
------------ ------------------------------
Console                                       dfltCmdAuthList
Telnet                                        dfltCmdAuthList
SSH                                            dfltCmdAuthList
```

```
Exec Authorization List                          Method
----------------------   --------------------------------------
dfltExecAuthList                                 tacacs    none
list2                                            none      undefined
list4                                            tacacs    undefined

Line                                             Exec Method List
------------ ------------------------------
Console                                          dfltExecAuthList
Telnet                                           dfltExecAuthList
SSH                                              dfltExecAuthList
```

enable authentication

Use this command to specify the authentication method list when accessing a higher privilege level from a remote telnet or console.

Format	*enable authentication* {default | *list-name*}
Mode	Line Config

Parameter	Description
default	Uses the default list created with the `aaa authentication enable` command.
list-name	Uses the indicated list created with the `aaa authentication enable` command.

Example: The following example specifies the default authentication method when accessing a higher privilege level console.

```
(switch)(config)# line console
(switch)(config-line)# enable authentication default
```

no enable authentication

Use this command to return to the default specified by the `enable authentication` command.

Format	*no enable authentication*
Mode	Line Config

username (Global Config)

Use the `username` command in Global Config mode to add a new user to the local user database. The default privilege level is 1. Using the `encrypted` keyword allows the administrator to transfer local user passwords between devices without having to know the passwords. When the `password` parameter is used along with `encrypted` parameter, the password must be exactly 128 hexadecimal characters in length. If the password strength feature is enabled, this command checks for password strength and returns an appropriate error if it fails to meet the password strength criteria. Giving the optional parameter `override-complexity-check` disables the validation of the password strength.

Format username *name* {password *password* [encrypted [override-complexity-check] | level *level* [encrypted [override-complexity-check]] | override-complexity-check]} | {level *level* [override-complexity-check] password}

Mode Global Config

Parameter	Description
name	The name of the user. Range: 1-64 characters.
password	The authentication password for the user. Range 8-64 characters. This value can be zero if the `no passwords min-length` command has been executed. The special characters allowed in the password include ! # $ % & ' ( ) * + , - . / : ; < = > @ [\ ] ^ _ ` { | } ~.
level	The user level. Level 0 can be assigned by a level 15 user to another user to suspend that user's access. Range 0-15. Enter access level 1 for non-privileged (switch> prompt) or 15 for highest privilege (switch# prompt) Access. If not specified where it is optional, the privilege level is 1.
encrypted	Encrypted password entered, copied from another switch configuration.
override-complexity-check	Disables the validation of the password strength.

Example: The following example configures user `bob` with password `xxxyyymmmm` and user level 15.

```
(switch)(config)# username bob password xxxyyymmmm level 15
```

Example: The following example configures user test with password testPassword and assigns a user level of 1. The password strength will not be validated.

```
(switch)(config)# username test password testPassword level 1 override-complexity-check
```

Example: A third example.

```
(Switching) (Config)#username test password testtest
```

Example: A fourth example.

```
(Switching) (Config)# username test password
e8d63677741431114f9e39a853a15e8fd35ad059e2e1b49816c243d7e08152b052eafbf23b528d348cdba1b1b7ab91
be842278e5e970dbfc62d16dcd13c0b864 level 1 encrypted override-complexity-check

(Switching) (Config)#  username test level 15 password

Enter new password:********

Confirm new password:********
```

Example: A fifth example.

```
(Switching) (Config)# username test level 15 override-complexity-check  password

Enter new password:********

Confirm new password:********
```

no username

Use this command to remove a user name.

Format no username *name*

Mode Global Config

username nopassword

Use this command to remove an existing user's password (NULL password).

Format username *name* nopassword *[level level]*

Mode Global Config

Parameter	Description
name	The name of the user. Range: 1-32 characters.
password	The authentication password for the user. Range 8-64 characters.
level	The user level. Level 0 can be assigned by a level 15 user to another user to suspend that user's access. Range 0-15.

username unlock

Use this command to allows a locked user account to be unlocked. Only a user with Level 1 access can reactivate a locked user account.

Format username *name* unlock

Mode Global Config

show users

This command displays the configured user names and their settings. The `show users` command displays truncated user names. Use the `show users long` command to display the complete user names. The `show users` command is only available for users with Level 15 privileges. The SNMPv3 fields will only be displayed if SNMP is available on the system.

Format show users

Mode Privileged EXEC

Parameter	Definition
User Name	The name the user enters to login using the serial port, Telnet or Web.
Access Mode	Shows whether the user is able to change parameters on the switch (Level 15) or is only able to view them (Level 1). As a factory default, the "admin" user has Level 15 access and the "guest" has Level 1 access.

Parameter	Definition
SNMPv3 Access Mode	The SNMPv3 Access Mode. If the value is set to `ReadWrite,` the SNMPv3 user is able to set and retrieve parameters on the system. If the value is set to `ReadOnly,` the SNMPv3 user is only able to retrieve parameter information. The SNMPv3 access mode may be different than the CLI and Web access mode.
SNMPv3 Authentication	The authentication protocol to be used for the specified login user.
SNMPv3 Encryption	The encryption protocol to be used for the specified login user.

show users long

This command displays the complete user names of the configured users on the switch.

Format show users long

Mode Privileged EXEC

Example: The following shows an example of the command.

```
(switch) #show users long
User Name
------------
admin
guest
test1111test1111test1111test1111
```

show users accounts

This command displays the local user status with respect to user account lockout and password aging.This command displays truncated user names. Use the `show users long` command to display the complete username.

Format show users accounts [detail]

Mode Privileged EXEC

Parameter	Definition
User Name	The local user account’s user name.
Access Level	The user’s access level (1 for non-privilege (switch>prompt) or 15 for highest privilege (switch# prompt).
Password Aging	Number of days, since the password was configured, until the password expires.
Password Expiry Date	The current password expiration date in date format.
Lockout	Indicates whether the user account is locked out (true or false).

If the detail keyword is included, the following additional fields display.

Parameter	Definition
Password Override Complexity Check	Displays the user's Password override complexity check status. By default it is disabled.
Password Strength	Displays the user password's strength (Strong or Weak). This field is displayed only if the Password Strength feature is enabled.

Example: The following example displays information about the local user database.

```
(switch)#show users accounts

UserName          Privilege Password Password     Lockout
                         Aging    Expiry date
------------------- --------- -------- ------------ -------
admin             15        ---      ---          False
guest             1         ---      ---          False

console#show users accounts detail

UserName....................................... admin
Privilege...................................... 15
Password Aging................................. ---
Password Expiry................................ ---
Lockout........................................ False
Override Complexity Check...................... Disable
Password Strength.............................. ---

UserName....................................... guest
Privilege...................................... 1
Password Aging................................. ---
Password Expiry................................ ---
Lockout........................................ False
Override Complexity Check...................... Disable
Password Strength.............................. ---
```

show users login-history [long]

Use this command to display information about the login history of users.

Format	show users login-history [long]
Mode	Privileged EXEC

show users login-history [username]

Use this command to display information about the login history of users.

Format	show users login-history [username *name*]
Mode	Privileged EXEC

Parameter	Description
name	Name of the user. Range: 1-20 characters.

Example: The following example shows user login history outputs.

```
Console>show users login-history
Login Time           Username  Protocol  Location
--------------------  --------- --------- ---------------
Jan 19 2005 08:23:48  Bob       Serial
Jan 19 2005 08:29:29  Robert    HTTP      172.16.0.8
Jan 19 2005 08:42:31  John      SSH       172.16.0.1
Jan 19 2005 08:49:52  Betty     Telnet    172.16.1.7
```

login authentication

Use this command to specify the login authentication method list for a line (console, telnet, or SSH). The default configuration uses the default set with the command `aaa authentication login`.

Format	login authentication {default | *list-name*}
Mode	Line Configuration

Parameter	Description
default	Uses the default list created with the `aaa authentication login` command.
list-name	Uses the indicated list created with the `aaa authentication login` command.

Example: The following example specifies the default authentication method for a console.

```
(switch) (config)# line console
(switch) (config-line)# login authentication default
```

no login authentication

Use this command to return to the default specified by the `authentication login` command.

password

This command allows the currently logged in user to change his or her password without having Level 15 privileges.

Format	password *cr*
Mode	User EXEC

Example: The following is an example of the command.

```
console>password

Enter old password:********

Enter new password:********

Confirm new password:********
```

password (Line Configuration)

Use the `password` command in Line Configuration mode to specify a password on a line. The default configuration is no password is specified.

Format	password [*password* [encrypted]]
Mode	Line Config

Parameter	Definition
password	Password for this level. Range: 8-64 characters
encrypted	Encrypted password to be entered, copied from another switch configuration. The encrypted password should be 128 characters long because the assumption is that this password is already encrypted with AES.

Example: The following example specifies a password `mcmxxyyy` on a line.

```
(switch)(config-line)# password mcmxxyyy
```

Example: The following is another example of the command.

```
(Switching)(Config-line)# password testtest

(Switching) (Config-line)# password
e8d63677741431114f9e39a853a15e8fd35ad059e2e1b49816c243d7e08152b052eafbf23b528d348cdba1b1b7ab91
be842278e5e970dbfc62d16dcd13c0b864 encrypted

(Switching) (Config-line)# password

Enter new password:********

Confirm new password:********
```

no password (Line Configuration)

Use this command to remove the password on a line.

Format	no password
Mode	Line Config

password (User EXEC)

Use this command to allow a user to change the password for only that user. This command should be used after the password has aged. The user is prompted to enter the old password and the new password.

Format	password
Mode	User EXEC

Example: The following example shows the prompt sequence for executing the password command.

```
(switch)>password
Enter old password:********
Enter new password:********
Confirm new password:********
```

password (aaa IAS User Config)

This command is used to configure a password for a user. An optional parameter `[encrypted]` is provided to indicate that the password given to the command is already pre-encrypted.

Format	password *password* [encrypted]
Mode	aaa IAS User Config

no password (aaa IAS User Config)

This command is used to clear the password of a user.

Format	no password
Mode	aaa IAS User Config

Example: The following shows an example of the command.

```
(Routing) #configure
(Routing) (Config)#aaa ias-user username client-1
(Routing) (Config-aaa-ias-User)#password client123
(Routing) (Config-aaa-ias-User)#no password
```

Example: The following is an example of adding a MAB Client to the Internal user database.

```
(Routing) #
(Routing) #configure
(Routing) (Config)#aaa ias-user username 1f3ccb1157
(Routing) (Config-aaa-ias-User)#password 1f3ccb1157
(Routing) (Config-aaa-ias-User)#exit
(Routing) (Config)#
```

enable password (Privileged EXEC)

Use the `enable password` configuration command to set a local password to control access to the privileged EXEC mode.

Format	enable password [*password* [encrypted]]
Mode	Privileged EXEC

Parameter	Description
password	Password string. Range: 8-64 characters.
encrypted	Encrypted password you entered, copied from another switch configuration. The encrypted password should be 128 characters long because the assumption is that this password is already encrypted with AES.

Example: The following shows an example of the command.

```
(Switching) #enable password testtest

(Switching) #enable password
e8d63677741431114f9e39a853a15e8fd35ad059e2e1b49816c243d7e08152b052eafbf23b528d348cdba1b1b7ab91
be842278e5e970dbfc62d16dcd13c0b864 encrypted

(Switching) #enable password
```

Enter old password:********

Enter new password:********

Confirm new password:********

no enable password (Privileged EXEC)

Use the `no enable password` command to remove the password requirement.

Format	no enable password
Mode	Privileged EXEC

passwords min-length

Use this command to enforce a minimum password length for local users. The value also applies to the enable password. The valid range is 8-64.

Default	8
Format	passwords min-length *8-64*
Mode	Global Config

no passwords min-length

Use this command to set the minimum password length to the default value.

Format	no passwords min-length
Mode	Global Config

passwords history

Use this command to set the number of previous passwords that shall be stored for each user account. When a local user changes his or her password, the user will not be able to reuse any password stored in password history. This ensures that users do not reuse their passwords often. The valid range is 0-10.

Default	0
Format	passwords history *0-10*
Mode	Global Config

no passwords history

Use this command to set the password history to the default value.

Format	no passwords history
Mode	Global Config

passwords aging

Use this command to implement aging on passwords for local users. When a user's password expires, the user will be prompted to change it before logging in again. The valid range is 1-365. The default is 0, or no aging.

Default	0
Format	passwords aging *1-365*
Mode	Global Config

no passwords aging

Use this command to set the password aging to the default value.

Format	no passwords aging
Mode	Global Config

passwords lock-out

Use this command to strengthen the security of the switch by locking user accounts that have failed login due to wrong passwords. When a lockout count is configured, a user that is logged in must enter the correct password within that count. Otherwise the user will be locked out from further switch access. Only a user with Level 15 access can reactivate a locked user account. Password lockout does not apply to logins from the serial console. The valid range is 1-5. The default is 0, or no lockout count enforced.

Default	0
Format	passwords lock-out *1-5*
Mode	Global Config

no passwords lock-out

Use this command to set the password lock-out count to the default value.

Format	no passwords lock-out
Mode	Global Config

passwords strength-check

Use this command to enable the password strength feature. It is used to verify the strength of a password during configuration.

Default	Disable
Format	passwords strength-check
Mode	Global Config

no passwords strength-check

Use this command to set the password strength checking to the default value.

Format	no passwords strength-check
Mode	Global Config

passwords strength maximum consecutive-characters

Use this command to set the maximum number of consecutive characters to be used in password strength. The valid range is 0-15. The default is 0. Minimum of 0 means no restriction on that set of characters.

Default	0
Format	passwords strength maximum consecutive-characters *0-15*
Mode	Global Config

passwords strength maximum repeated-characters

Use this command to set the maximum number of repeated characters to be used in password strength. The valid range is 0-15. The default is 0. Minimum of 0 means no restriction on that set of characters.

Default	0
Format	passwords strength maximum consecutive-characters *0-15*
Mode	Global Config

passwords strength minimum uppercase-letters

Use this command to enforce a minimum number of uppercase letters that a password should contain. The valid range is 0-16. The default is 2. Minimum of 0 means no restriction on that set of characters.

Default	2
Format	passwords strength minimum uppercase-letters
Mode	Global Config

no passwords strength minimum uppercase-letters

Use this command to reset the minimum uppercase letters required in a password to the default value.

Format	no passwords minimum uppercase-letter
Mode	Global Config

passwords strength minimum lowercase-letters

Use this command to enforce a minimum number of lowercase letters that a password should contain. The valid range is 0-16. The default is 2. Minimum of 0 means no restriction on that set of characters.

Default	2
Format	passwords strength minimum lowercase-letters
Mode	Global Config

no passwords strength minimum lowercase-letters

Use this command to reset the minimum lower letters required in a password to the default value.

Format	no passwords minimum lowercase-letter
Mode	Global Config

passwords strength minimum numeric-characters

Use this command to enforce a minimum number of numeric characters that a password should contain. The valid range is 0-16. The default is 2. Minimum of 0 means no restriction on that set of characters.

Default	2
Format	passwords strength minimum numeric-characters
Mode	Global Config

no passwords strength minimum numeric-characters

Use this command to reset the minimum numeric characters required in a password to the default value.

Format	no passwords minimum numeric-characters
Mode	Global Config

passwords strength minimum special-characters

Use this command to enforce a minimum number of special characters that a password should contain. The valid range is 0-16. The default is 2. Minimum of 0 means no restriction on that set of characters.

Default	2
Format	passwords strength minimum special-characters
Mode	Global Config

no passwords strength minimum special-characters

Use this command to reset the minimum special characters required in a password to the default value.

Format	no passwords minimum special-characters

Mode	Global Config

passwords strength minimum character-classes

Use this command to enforce a minimum number of characters classes that a password should contain. Character classes are uppercase letters, lowercase letters, numeric characters and special characters. The valid range is 0-4. The default is 4.

Default	4
Format	passwords strength minimum character-classes
Mode	Global Config

no passwords strength minimum character-classes

Use this command to reset the minimum number of character classes required in a password to the default value.

Format	no passwords minimum character-classes
Mode	Global Config

passwords strength exclude-keyword

Use this command to exclude the specified keyword while configuring the password. The password does not accept the keyword in any form (in between the string, case in-sensitive and reverse) as a substring. User can configure up to a maximum of 3 keywords.

Format	passwords strength exclude-keyword *keyword*
Mode	Global Config

no passwords strength exclude-keyword

Use this command to reset the restriction for the specified keyword or all the keywords configured.

Format	no passwords exclude-keyword *[keyword]*
Mode	Global Config

show passwords configuration

Use this command to display the configured password management settings.

Format	show passwords configuration
Mode	Privileged EXEC

Parameter	Definition
Minimum Password Length	Minimum number of characters required when changing passwords.
Password History	Number of passwords to store for reuse prevention.

Parameter	Definition
Password Aging	Length in days that a password is valid.
Lockout Attempts	Number of failed password login attempts before lockout.
Minimum Password Uppercase Letters	Minimum number of uppercase characters required when configuring passwords.
Minimum Password Lowercase Letters	Minimum number of lowercase characters required when configuring passwords.
Minimum Password Numeric Characters	Minimum number of numeric characters required when configuring passwords.
Maximum Password Consecutive Characters	Maximum number of consecutive characters required that the password should contain when configuring passwords.
Maximum Password Repeated Characters	Maximum number of repetition of characters that the password should contain when configuring passwords.
Minimum Password Character Classes	Minimum number of character classes (uppercase, lowercase, numeric and special) required when configuring passwords.
Password Exclude-Keywords	The set of keywords to be excluded from the configured password when strength checking is enabled.

show passwords result

Use this command to display the last password set result information.

Format	show passwords result
Mode	Privileged EXEC

Parameter	Definition
Last User Whose Password Is Set	Shows the name of the user with the most recently set password.
Password Strength Check	Shows whether password strength checking is enabled.
Last Password Set Result	Shows whether the attempt to set a password was successful. If the attempt failed, the reason for the failure is included.

aaa ias-user username

The Internal Authentication Server (IAS) database is a dedicated internal database used for local authentication of users for network access through the IEEE 802.1X feature.

Use the `aaa ias-user username` command in Global Config mode to add the specified user to the internal user database. This command also changes the mode to AAA User Config mode.

Format	aaa ias-user username *user*
Mode	Global Config

no aaa ias-user username

Use this command to remove the specified user from the internal user database.

Format no aaa ias-user username *user*

Mode Global Config

Example: The following shows an example of the command.

```
(Routing) #
(Routing) #configure
(Routing) (Config)#aaa ias-user username client-1
(Routing) (Config-aaa-ias-User)#exit
(Routing) (Config)#no aaa ias-user username client-1
(Routing) (Config)#
```

aaa session-id

Use this command in Global Config mode to specify if the same session-id is used for Authentication, Authorization and Accounting service type within a session.

Default common

Format aaa session-id [common | unique]

Mode Global Config

Parameter	Description
common	Use the same session-id for all AAA Service types.
unique	Use a unique session-id for all AAA Service types.

no aaa session-id

Use this command in Global Config mode to reset the aaa session-id behavior to the default.

Format no aaa session-id [unique]

Mode Global Config

aaa accounting

Use this command in Global Config mode to create an accounting method list for user EXEC sessions, user-executed commands, or DOT1X. This list is identified by default or a user-specified `list_name`. Accounting records, when enabled for a line-mode, can be sent at both the beginning and at the end (`start-stop`) or only at the end (`stop-only`). If `none` is specified, then accounting is disabled for the specified list. If `tacacs` is specified as the accounting method, accounting records are notified to a TACACS+ server. If `radius` is the specified accounting method, accounting records are notified to a RADIUS server.

Note: Note the following:

- A maximum of five Accounting Method lists can be created for each exec and commands type.
- Only the default Accounting Method list can be created for DOT1X. There is no provision to create more.
- The same list-name can be used for both exec and commands

accounting type

- AAA Accounting for commands with RADIUS as the accounting method is not supported.
- Start-stop or None are the only supported record types for DOT1X accounting. Start-stop enables accounting and None disables accounting.
- RADIUS is the only accounting method type supported for DOT1X accounting.

Format aaaaccounting{exec|commands|dot1x}{default|list_name}{start-stop|stop-only|none} *method1* [*method2…*]

Mode Global Config

Parameter	Description
exec	Provides accounting for a user EXEC terminal sessions.
commands	Provides accounting for all user executed commands.
dot1x	Provides accounting for DOT1X user commands.
default	The default list of methods for accounting services.
list-name	Character string used to name the list of accounting methods.
start-stop	Sends a start accounting notice at the beginning of a process and a stop accounting notice at the beginning of a process and a stop accounting notice at the end of a process.
stop-only	Sends a stop accounting notice at the end of the requested user process.
none	Disables accounting services on this line.
method	Use either TACACS or radius server for accounting purposes.

Example: The following shows an example of the command.

```
(Routing) #
(Routing) #configure
(Routing) #aaa accounting commands default stop-only tacacs
(Routing) #aaa accounting exec default start-stop radius
(Routing) #aaa accounting dot1x default start-stop radius
(Routing) #aaa accounting dot1x default none
(Routing) #exit
```

For the same set of accounting type and list name, the administrator can change the record type, or the methods list, without having to first delete the previous configuration.

```
(Routing) #
(Routing) #configure
(Routing) #aaa accounting exec ExecList stop-only tacacs
(Routing) #aaa accounting exec ExecList start-stop tacacs
(Routing) #aaa accounting exec ExecList start-stop tacacs radius
```

The first `aaa` command creates a method list for exec sessions with the name *ExecList*, with `record-type` as *stop-only* and the `method` as *TACACS+*. The second command changes the `record type` to *start-stop* from *stop-only* for the same method list. The third command, for the same list changes the `methods list` to {*tacacs,radius*} from {*tacacs*}.

no aaa accounting

This command deletes the accounting method list.

Format no aaa accounting {exec | commands | dot1x} {default | list_name default}

Mode Global Config

Example: The following shows an example of the command.

```
(Routing) #
(Routing) #configure
(Routing) #aaa accounting commands userCmdAudit stop-only tacacs radius
(Routing) #no aaa accounting commands userCmdAudit
(Routing) #exit
```

aaa accounting update

Use this command to configure interim accounting records.

Default newinfo: Disabled
Periodic: 5 minutes

Format aaa accounting update [newinfo [periodic 1-200] | periodic 1-200]

Mode Global Config

Parameter	Definition
newinfo	Indicates that updates should be sent to the RADIUS server whenever there is a new information available, such as “Reauthentication of the client.”
periodic	The interval at which interim accounting records are sent, in minutes

no aaa accounting update

This command resets sending the interim accounting records.

Format no aaa accounting update

Mode Global Config

Example: The following shows an example of the command.

```
(Routing) #configure
(Routing) (Config)#aaa accounting update newinfo periodic 20
```

password (AAA IAS User Configuration)

Use this command to specify a password for a user in the IAS database. An optional parameter `encrypted` is provided to indicate that the password given to the command is already pre-encrypted.

Format password *password* [encrypted]

Mode AAA IAS User Config

Parameter	Definition
password	Password for this level. Range: 8-64 characters
encrypted	Encrypted password to be entered, copied from another switch configuration.

no password (AAA IAS User Configuration)

Use this command to clear the password of a user.

Format	no password
Mode	AAA IAS User Config

Example: The following shows an example of the command.

```
(Routing) #
(Routing) #configure
(Routing) (Config)#aaa ias-user username client-1
(Routing) (Config-aaa-ias-User)#password client123
(Routing) (Config-aaa-ias-User)#no password
```

Example: The following is an example of adding a MAB Client to the Internal user database.

```
(Routing) #
(Routing) #configure
(Routing) (Config)#aaa ias-user username 1f3ccb1157
(Routing) (Config-aaa-ias-User)#password 1f3ccb1157
(Routing) (Config-aaa-ias-User)#exit
(Routing) (Config)#
```

clear aaa ias-users

Use this command to remove all users from the IAS database.

Format	clear aaa ias-users
Mode	Privileged EXEC

Parameter	Definition
password	Password for this level. Range: 8-64 characters
encrypted	Encrypted password to be entered, copied from another switch configuration.

Example: The following is an example of the command.

```
(Routing) #
(Routing) #clear aaa ias-users
(Routing) #
```

show aaa ias-users

Use this command to display configured IAS users and their attributes. Passwords configured are not shown in the `show` command output.

Format	show aaa ias-users [username]
Mode	Privileged EXEC

Example: The following is an example of the command.

```
(Routing) #
(Routing) #show aaa ias-users

UserName
-------------------
Client-1
Client-2
```

Example: Following are the IAS configuration commands shown in the output of `show running-config` command. Passwords shown in the command output are always encrypted.

```
aaa ias-user username client-1
password a45c74fdf50a558a2b5cf05573cd633bac2c6c598d54497ad4c46104918f2c encrypted
exit
```

accounting

Use this command in Line Configuration mode to apply the accounting method list to a line config (console/telnet/ssh).

Format	accounting {exec | commands } {default | *listname*}
Mode	Line Configuration

Parameter	Description
exec	Causes accounting for an EXEC session.
commands	This causes accounting for each command execution attempt. If a user is enabling accounting for exec mode for the current line-configuration type, the user will be logged out.
default	The default Accounting List
listname	Enter a string of not more than 15 characters.

Example: The following is a example of the command.

```
(Routing) #
(Routing) #configure
(Routing) (Config)#line telnet
(Routing)(Config-line)# accounting exec default
(Routing) #exit
```

no accounting

Use this command to remove accounting from a Line Configuration mode.

Format	no accounting {exec|commands]
Mode	Line Configuration

show accounting

Use this command to display ordered methods for accounting lists.

Format	show accounting
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show accounting
Number of Accounting Notifications sent at beginning of an EXEC session:     0
Errors when sending Accounting Notifications beginning of an EXEC session:          0
Number of Accounting Notifications at end of an EXEC session:            0
Errors when sending Accounting Notifications at end of an EXEC session:            0
Number of Accounting Notifications sent at beginning of a command execution:       0
Errors when sending Accounting Notifications at beginning of a command execution:   0
Number of Accounting Notifications sent at end of a command execution:            0
Errors when sending Accounting Notifications at end of a command execution:        0
```

show accounting methods

Use this command to display configured accounting method lists.

Format	show accounting methods
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #
(Routing) #show accounting methods

Acct Type                                    Method Name     Record Type    Method Type
----------                                   ------------    ------------   ------------
Exec                                          dfltExecList    start-stop TACACS
Commands                                     dfltCmdsList    stop-only TACACS
Commands                                      UserCmdAudit start-stopTACACS
DOT1X                                        dfltDot1xList start-stopradius

Line     EXEC Method List    Command Method List
-------  ---------------------------------------
Console  dfltExecList         dfltCmdsList
Telnet   dfltExecList         dfltCmdsList
SSH      dfltExecList         UserCmdAudit
```

show accounting update

Use this command to display configured accounting interim update information.

Format	show accounting update
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #
(Routing) #show accounting update

aaa accounting  update newinfo  : Enabled
aaa accounting  update periodic : 10 minutes
```

clear accounting statistics

This command clears the accounting statistics.

Format	clear accounting statistics
Mode	Privileged EXEC

show domain-name

This command displays the configured domain-name.

Format	show domain-name
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #
(Routing) #show domain-name

Domain          : Enable
Domain-name         :abc
```

SNMP Commands

This section describes the commands you use to configure Simple Network Management Protocol (SNMP) on the switch. You can configure the switch to act as an SNMP agent so that it can communicate with SNMP managers on your network.

snmp-server

This command sets the name and the physical location of the switch, and the organization responsible for the network. The parameters `name`, `loc` and `con` can be up to 255 characters in length.

Default	none
Format	snmp-server {sysname *name* | location *loc* | contact *con*}
Mode	Global Config

Note: To clear the snmp-server, enter an empty string in quotation marks. For example, `snmp-server {sysname " "}` clears the system name.

snmp-server community

This command adds (and names) a new SNMP community, and optionally sets the access mode, allowed IP address, and create a view for the community.

Note: Note the following:

- No SNMP communities exist by default.
- Community names in the SNMP Community Table must be unique. When making multiple entries using the same community name, the first entry is kept and processed and all duplicate entries are ignored.

Default	None
Format	snmp-server community *community-string* [{ro | rw |su *}*] [ipaddress *ip-address* [ipmask *ip-mask*]] *[view view-name]*
Mode	Global Config

Parameter	Description
community-string	A name associated with the switch and with a set of SNMP managers that manage it with a specified privileged level. The length of `community-string` can be up to 20 case-sensitive characters.
ro | rw | su	The access mode of the SNMP community, which can be read-only (ro), read-write (rw), or super user (su).
ip-address	The associated community SNMP packet sending address. It is used along with an optional IP mask value to denote an individual client or range of IP addresses from which SNMP clients may access the device using the specified community-string. If unspecified, access from any host is permitted.
ip-mask	The optional IP mask. This value is AND'ed with the IP address to determine the range of permitted client IP addresses.
view-name	The name of the view to create or update.

no snmp-server community

This command removes this community name from the table. The `name` is the community name to be deleted.

Format	no snmp-server community *community-name*
Mode	Global Config

snmp-server community-group

This command configures a community access string to permit access via the SNMPv1 and SNMPv2c protocols.

Format	snmp-server community-group *community-string group-name* [ipaddress *ipaddress*]
Mode	Global Config

Parameter	Description
community-string	The community which is created and then associated with the group. The range is 1 to 20 characters.
group-name	The name of the group that the community is associated with. The range is 1 to 30 characters.
ipaddress	Optionally, the IPv4 address that the community may be accessed from.

snmp-server enable traps violation

The Port MAC locking component interprets this command and configures violation action to send an SNMP trap with default trap frequency of 30 seconds. The Global command configures the trap violation mode across all interfaces valid for port-security. There is no global trap mode as such.

Note: For other port security commands, see "Port Security Commands" on page 544.

Default	disabled
Format	snmp-server enable traps violation
Mode	• Global Config • Interface Config

no snmp-server enable traps violation

This command disables the sending of new violation traps.

Format	no snmp-server enable traps violation
Mode	Interface Config

snmp-server enable traps

This command enables the Authentication Flag.

Default	enabled
Format	snmp-server enable traps
Mode	Global Config

no snmp-server enable traps

This command disables the Authentication Flag.

Format	no snmp-server enable traps
Mode	Global Config

snmp-server port

This command configures the UDP port number on which the SNMP server listens for requests.

Default	161
Format	snmp-server port *1025-65535*
Mode	Privileged EXEC

no snmp-server port

This command restores the SNMP server listen port to its factory default value.

Format	no snmp-server port
Mode	Privileged EXEC

snmp trap link-status

This command enables link status traps on an interface or range of interfaces.

Note: This command is valid only when the Link Up/Down Flag is enabled. See "show snmp" on page 123.

Format	snmp trap link-status
Mode	Interface Config

no snmp trap link-status

This command disables link status traps by interface.

Note: This command is valid only when the Link Up/Down Flag is enabled.

Format	no snmp trap link-status
Mode	Interface Config

snmp trap link-status all

This command enables link status traps for all interfaces.

Note: This command is valid only when the Link Up/Down Flag is enabled. See "show snmp" on page 123.

Format	snmp trap link-status all
Mode	Global Config

no snmp trap link-status all

This command disables link status traps for all interfaces.

Note: This command is valid only when the Link Up/Down Flag is enabled. See "show snmp" on page 123.

Format	no snmp trap link-status all
Mode	Global Config

snmp-server enable traps linkmode

Note: This command may not be available on all platforms.

This command enables Link Up/Down traps for the entire switch. When enabled, link traps are sent only if the Link Trap flag setting associated with the port is enabled. See "show snmp" on page 123.

Default	enabled
Format	snmp-server enable traps linkmode
Mode	Global Config

no snmp-server enable traps linkmode

This command disables Link Up/Down traps for the entire switch.

Format	no snmp-server enable traps linkmode
Mode	Global Config

snmp-server enable traps multiusers

This command enables Multiple User traps. When the traps are enabled, a Multiple User Trap is sent when a user logs in to the terminal interface (EIA 232 or Telnet) and there is an existing terminal interface session.

Default	enabled
Format	snmp-server enable traps multiusers
Mode	Global Config

no snmp-server enable traps multiusers

This command disables Multiple User traps.

Format	no snmp-server enable traps multiusers

Mode	Global Config

snmp-server enable traps stpmode

This command enables the sending of new root traps and topology change notification traps.

Default	enabled
Format	snmp-server enable traps stpmode
Mode	Global Config

no snmp-server enable traps stpmode

This command disables the sending of new root traps and topology change notification traps.

Format	no snmp-server enable traps stpmode
Mode	Global Config

snmp-server engineID local

This command configures the SNMP engine ID on the local device.

Default	The engineID is configured automatically, based on the device MAC address.
Format	snmp-server engineID local {*engineid-string*|default}
Mode	Global Config

Parameter	Description
engineid-string	A hexadecimal string identifying the engine-id, used for localizing configuration. Engine-id must be an even length in the range of 6 to 32 hexadecimal characters.
default	Sets the engine-id to the default string, based on the device MAC address.

⚠

CAUTION:

Changing the engine-id will invalidate all SNMP configuration that exists on the box.

no snmp-server engineID local

This command removes the specified engine ID.

Default	The engineID is configured automatically, based on the device MAC address.
Format	no snmp-server engineID local
Mode	Global Config

snmp-server filter

This command creates a filter entry for use in limiting which traps will be sent to a host.

Default	No filters are created by default.
Format	snmp-server filter *filtername oid-tree* {included|excluded}
Mode	Global Config

Parameter	Description
filtername	The label for the filter being created. The range is 1 to 30 characters.
oid-tree	The OID subtree to include or exclude from the filter. Subtrees may be specified by numerical (1.3.6.2.4) or keywords (system), and asterisks may be used to specify a subtree family (1.3.*.4).
included	The tree is included in the filter.
excluded	The tree is excluded from the filter.

no snmp-server filter

This command removes the specified filter.

Default	No filters are created by default.
Format	snmp-server filter *filtername* [*oid-tree*]
Mode	Global Config

snmp-server group

This command creates an SNMP access group.

Default	Generic groups are created for all versions and privileges using the default views.
Format	snmp-server group *group-name* {v1 | v2c | v3 {noauth | auth | priv}} [context *context-name*] [read *read-view*] [write *write-view*] [notify *notify-view*]
Mode	Global Config

Parameter	Description
group-name	The group name to be used when configuring communities or users. The range is 1 to 30 characters.
v1	This group can only access via SNMPv1.
v2	This group can only access via SNMPv2c.
v3	This group can only access via SNMPv3.
noauth	This group can be accessed only when not using Authentication or Encryption. Applicable only if SNMPv3 is selected.
auth	This group can be accessed only when using Authentication but not Encryption. Applicable only if SNMPv3 is selected.
priv	This group can be accessed only when using both Authentication and Encryption. Applicable only if SNMPv3 is selected.

Parameter	Description
context-name	The SNMPv3 context used during access. Applicable only if SNMPv3 is selected.
read-view	The view this group will use during GET requests. The range is 1 to 30 characters.
write-view	The view this group will use during SET requests. The range is 1 to 30 characters.
notify-view	The view this group will use when sending out traps. The range is 1 to 30 characters.

no snmp-server group

This command removes the specified group.

Format no snmp-server group *group-name* {v1 | v2c | 3 {noauth | auth | priv}} [context context-name]

Mode Global Config

snmp-server host

This command configures traps to be sent to the specified host.

Default No default hosts are configured.

Format snmp-server host *host-addr* {informs [timeout *seconds*] [retries *retries*] | traps version {1 | 2c}} community-string [udp-port *port*] [filter *filter-name*]

Mode Global Config

Parameter	Description
host-addr	The IPv4 or IPv6 address of the host to send the trap or inform to.
traps	Send SNMP traps to the host. This option is selected by default.
version 1	Sends SNMPv1 traps. This option is not available if informs is selected.
version 2	Sends SNMPv2c traps. This option is not available if informs is selected. This option is selected by default.
informs	Send SNMPv2 informs to the host.
seconds	The number of seconds to wait for an acknowledgment before resending the Inform. The default is 15 seconds. The range is 1 to 300 seconds.
retries	The number of times to resend an Inform. The default is 3 attempts. The range is 0 to 255 retries.
community-string	Community string sent as part of the notification. The range is 1 to 20 characters.
port	The SNMP Trap receiver port. The default is port 162.
filter-name	The filter name to associate with this host. Filters can be used to specify which traps are sent to this host. The range is 1 to 30 characters.

no snmp-server host

This command removes the specified host entry.

Format no snmp-server host *host-addr* [traps|informs]

Mode Global Config

snmp-server user

This command creates an SNMPv3 user for access to the system.

Default No default users are created.

Format snmp-server user *username groupname* [remote *engineid-string*] [{auth-md5 *password* | auth-sha *password* | auth-md5-key *md5-key* | auth-sha-key *sha-key*} [priv-des *password* | priv-des-key *des-key*]

Mode Global Config

Parameter	Description
username	The username the SNMPv3 user will connect to the switch as. The range is 1 to 30 characters.
group-name	The name of the group the user belongs to. The range is 1 to 30 characters.
engineid-string	The engine-id of the remote management station that this user will be connecting from. The range is 5 to 32 characters.
password	The password the user will use for the authentication or encryption mechanism. The range is 1 to 32 characters.
md5-key	A pre-generated MD5 authentication key. The length is 32 characters.
sha-key	A pre-generated SHA authentication key. The length is 48 characters.
des-key	A pre-generated DES encryption key. The length is 32 characters if MD5 is selected, 48 characters if SHA is selected.

no snmp-server user

This command removes the specified SNMPv3 user.

Format no snmp-server user *username*

Mode Global Config

snmp-server view

This command creates or modifies an existing view entry that is used by groups to determine which objects can be accessed by a community or user.

Default Views are created by default to provide access to the default groups.

Format snmp-server *viewname oid-tree* {included|excluded}

Mode Global Config

Parameter	Description
viewname	The label for the view being created. The range is 1 to 30 characters.

Parameter	Description
oid-tree	The OID subtree to include or exclude from the view. Subtrees may be specified by numerical (1.3.6.2.4) or keywords (system), and asterisks may be used to specify a subtree family (1.3.*.4).
included	The tree is included in the view.
excluded	The tree is excluded from the view.

no snmp-server view

This command removes the specified view.

Format	no snmp-server view *viewname* [*oid-tree*]
Mode	Global Config

snmp-server v3-host

This command configures traps to be sent to the specified host.

Default	No default hosts are configured.
Format	snmp-server v3-host *host-addr username* [traps | informs [timeout *seconds*] [retries *retries*]] [auth | noauth | priv] [udpport *port*] [filter *filtername*]
Mode	Global Config

Parameter	Description
host-addr	The IPv4 or IPv6 address of the host to send the trap or inform to.
user-name	User used to send a Trap or Inform message. This user must be associated with a group that supports the version and access method. The range is 1 to 30 characters.
traps	Send SNMP traps to the host. This is the default option.
informs	Send SNMP informs to the host.
seconds	Number of seconds to wait for an acknowledgement before resending the Inform. The default is 15 seconds. The range is 1 to 300 seconds.
retries	Number of times to resend an Inform. The default is 3 attempts. The range is 0 to 255 retries.
auth	Enables authentication but not encryption.
noauth	No authentication or encryption. This is the default.
priv	Enables authentication and encryption.
port	The SNMP Trap receiver port. This value defaults to port 162.
filter-name	The filter name to associate with this host. Filters can be used to specify which traps are sent to this host. The range is 1 to 30 characters.

snmptrap source-interface

Use this command in Global Configuration mode to configure the global source-interface (Source IP address) for all SNMP communication between the SNMP client and the server.

Format	snmptrap source-interface {*unit/slot/port* | loopback *loopback-id* | network *network* | serviceport *serviceport* | vlan *vlan-id*}

Mode	Global Configuration

Parameter	Description
unit/slot/port	Enter interface in unit/slot/port format.
loopback-id	Configuration of the loopback interface.
network	Use network source IP address.
serviceport	Use serviceport source IP address.
vlan-id	Configuration of the VLAN interface.

no snmptrap source-interface

Use this command in Global Configuration mode to remove the global source-interface (Source IP selection) for all SNMP communication between the SNMP client and the server.

Format	no snmptrap source-interface
Mode	Global Configuration

show snmp

This command displays the current SNMP configuration.

Format	show snmp
Mode	Privileged EXEC

Parameter		Definition
Community Table:	Community-String	The community string for the entry. This is used by SNMPv1 and SNMPv2 protocols to access the switch.
	Community-Access	The type of access the community has: • Read only • Read write • su
	View Name	The view this community has access to.
	IP Address	Access to this community is limited to this IP address.
Community Group Table:	Community-String	The community this mapping configures
	Group Name	The group this community is assigned to.
	IP Address	The IP address this community is limited to.

Parameter		Definition
Host Table:	Target Address	The address of the host that traps will be sent to.
	Type	The type of message that will be sent, either traps or informs.
	Community	The community traps will be sent to.
	Version	The version of SNMP the trap will be sent as.
	UDP Port	The UDP port the trap or inform will be sent to.
	Filter name	The filter the traps will be limited by for this host.
	TO Sec	The number of seconds before informs will time out when sending to this host.
	Retries	The number of times informs will be sent after timing out.

show snmp engineID

This command displays the currently configured SNMP engineID.

Format	show snmp engineID
Mode	Privileged EXEC

Parameter	Description
Local SNMP EngineID	The current configuration of the displayed SNMP engineID.

show snmp filters

This command displays the configured filters used when sending traps.

Format	show snmp filters [filtername]
Mode	Privileged EXEC

Parameter	Description
Name	The filter name for this entry.
OID Tree	The OID tree this entry will include or exclude.
Type	Indicates if this entry includes or excludes the OID Tree.

show snmp group

This command displays the configured groups.

Format	show snmp group [groupname]
Mode	Privileged EXEC

Parameter	Description
Name	The name of the group.

Parameter	Description
Security Model	Indicates which protocol can access the system via this group.
Security Level	Indicates the security level allowed for this group.
Read View	The view this group provides read access to.
Write View	The view this group provides write access to.
Notify View	The view this group provides trap access to.

show snmp-server

This command displays the current SNMP server user configuration.

Format	show snmp-server
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing)#show snmp-server

SNMP Server Port.............................. 161
```

show snmp source-interface

Use this command in Privileged EXEC mode to display the configured global source-interface (Source IP address) details used for an SNMP client.

Format	show snmp source-interface
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing)# show snmp source-interface
SNMP trap Client Source Interface............. (not configured)
```

show snmp user

This command displays the currently configured SNMPv3 users.

Format	show snmp user [*username*]
Mode	Privileged EXEC

Parameter	Definition
Name	The name of the user.
Group Name	The group that defines the SNMPv3 access parameters.
Auth Method	The authentication algorithm configured for this user.
Privilege Method	The encryption algorithm configured for this user.
Remote Engine ID	The engineID for the user defined on the client machine.

show snmp views

This command displays the currently configured views.

Format	show snmp views [*viewname*]
Mode	Privileged EXEC

Parameter	Description
Name	The view name for this entry.
OID Tree	The OID tree that this entry will include or exclude.
Type	Indicates if this entry includes or excludes the OID tree.

show trapflags

This command displays trap conditions. The command's display shows all the enabled OSPFv2 and OSPFv3 trapflags. Configure which traps the switch should generate by enabling or disabling the trap condition. If a trap condition is enabled and the condition is detected, the SNMP agent on the switch sends the trap to all enabled trap receivers. You do not have to reset the switch to implement the changes. Cold and warm start traps are always generated and cannot be disabled.

Format	show trapflags
Mode	Privileged EXEC

Parameter	Definition
Authentication Flag	Can be enabled or disabled. The factory default is enabled. Indicates whether authentication failure traps will be sent.
Link Up/Down Flag	Can be enabled or disabled. The factory default is enabled. Indicates whether link status traps will be sent.
Multiple Users Flag	Can be enabled or disabled. The factory default is enabled. Indicates whether a trap will be sent when the same user ID is logged into the switch more than once at the same time (either through Telnet or the serial port).
Spanning Tree Flag	Can be enabled or disabled. The factory default is enabled. Indicates whether spanning tree traps are sent.
ACL Traps	May be enabled or disabled. The factory default is disabled. Indicates whether ACL traps are sent.
DVMRP Traps	Can be enabled or disabled. The factory default is disabled. Indicates whether DVMRP traps are sent.
OSPFv2 Traps	Can be enabled or disabled. The factory default is disabled. Indicates whether OSPF traps are sent. If any of the OSPF trap flags are not enabled, then the command displays `disabled`. Otherwise, the command shows all the enabled OSPF traps' information.
OSPFv3 Traps	Can be enabled or disabled. The factory default is disabled. Indicates whether OSPF traps are sent. If any of the OSPFv3 trap flags are not enabled, then the command displays `disabled`. Otherwise, the command shows all the enabled OSPFv3 traps' information.
PIM Traps	Can be enabled or disabled. The factory default is disabled. Indicates whether PIM traps are sent.

Parameter	Definition
Power Supply Module State Trap	Can be enabled or disabled. The factory default is enabled. Indicates whether Power Supply Module State trap is sent.
Temperature Trap	Can be enabled or disabled. The factory default is enabled. Indicates whether Temperature trap is sent.
Fan Trap	Can be enabled or disabled. The factory default is enabled. Indicates whether Fan trap is sent.
VRRP Trap	Can be enabled or disabled. The factory default is enabled. Indicates whether VRRP trap is sent.

RADIUS Commands

This section describes the commands you use to configure the switch to use a Remote Authentication Dial-In User Service (RADIUS) server on your network for authentication and accounting.

aaa server radius dynamic-author

This command enables CoA functionality and enters dynamic authorization local server configuration mode.

Default	None
Format	aaa server radius dynamic-author
Mode	Global Config

Example:

```
(Routing) #configure
(Routing) (Config)#aaa server radius dynamic-author
(Routing) (Config- radius-da)#
```

no aaa server radius dynamic-author

This command disables CoA functionality.

Default	None
Format	no aaa server radius dynamic-author
Mode	Global Config

Example:

```
(Routing) #configure
(Routing) (Config)#no aaa server radius dynamic-author
```

authentication command bounce-port ignore

This command configures the device to ignore a RADIUS server bounce-host-port command. The bounce-host-port command causes a host to flap the link on an authentication port. The link flap causes DHCP renegotiation from one or more hosts connected to this port.

Default	FALSE (Bounce-Port messages will be processed)
Format	authentication command bounce-port ignore
Mode	Global Config

Example:

```
(Routing) #configure
(Routing) (Config)#authentication command bounce-port ignore
```

no authentication command bounce-port ignore

This command resets the device to the default value so that RADIUS server bounce-host-port commands are processed.

Format	no authentication command bounce-port ignore
Mode	Global Config

Example:

```
(Routing) #configure
(Routing) (Config)#no authentication command bounce-port ignore
```

auth-type

Use this command to specify the type of authorization that the device uses for RADIUS clients. The client must match the configured attributes for authorization.

Default	All
Format	auth-type { any | all | session-key }
Mode	Dynamic Authorization

Example:

```
(Routing) (Config- radius-da)#auth-type all
```

no auth-type

Use this command to reset the type of authorization that the device must use for RADIUS clients.

Default	None
Format	no auth-type
Mode	Dynamic Authorization

Example:

```
(Routing) (Config- radius-da)#no auth-type
```

authorization network radius

Use this command to enable the switch to accept VLAN assignment by the radius server.

Default	disable
Format	authorization network radius
Mode	Global Config

no authorization network radius

Use this command to disable the switch to accept VLAN assignment by the radius server.

Format	no authorization network radius
Mode	Global Config

clear radius dynamic-author statistics

This command clears radius dynamic authorization counters.

Default	None
Format	clear radius dynamic-author statistics
Mode	Privileged EXEC

Example:

```
(Routing) #clear radius dynamic-author statistics

Are you sure you want to clear statistics? (y/n) y

Statistics cleared.
```

client

Use this command to configure the IP address or hostname of the AAA server client. Use the optional `server-key` keyword and string argument to configure the server key at the client level.

Default	None
Format	client { *ip-address* | *hostname* } [server-key [0|7] *key-string*]
Mode	Dynamic Authorization

Example:

```
(Routing) (Config- radius-da)#client 10.0.0.1 server-key 7  device1
```

no client

Use this command to remove the configured Dynamic Authorization client and the key associated with that client in the device.

Default	None
Format	no client { *ip-address* | *hostname* }
Mode	Dynamic Authorization

Example:

```
(Routing) (Config- radius-da)#no client 10.0.0.1
```

debug aaa coa

Use this command to display Dynamic Authorization Server processing debug information.

Default	None

Format	debug aaa coa
Mode	Dynamic Authorization

debug aaa pod

Use this command to display Disconnect Message packets.

Default	None
Format	debug aaa pod
Mode	Dynamic Authorization

ignore server-key

Use this optional command to configure the device to ignore the server key.

Default	Disable
Format	ignore server-key
Mode	Dynamic Authorization

Example:

```
(Routing) (Config- radius-da)#ignore server-key
```

no ignore server-key

Use this optional command to configure the device not to ignore the server key (that is, it resets the ignore server key property on the device).

Default	Disable
Format	no ignore server-key
Mode	Dynamic Authorization

Example:

```
(Routing) (Config- radius-da)#no ignore server-key
```

ignore session-key

Use this optional command to configure the device to ignore the session key.

Default	Disable
Format	ignore session-key
Mode	Dynamic Authorization

Example:

```
(Routing) (Config- radius-da)#ignore session-key
```

no ignore session-key

Use this optional command to configure the device to not ignore the session key (that is, it resets the ignore session key property on the device).

Default	Disable
Format	no ignore session-key
Mode	Dynamic Authorization

Example:

```
(Routing) (Config- radius-da)#no ignore session-key
```

port

Use this command to specify the UDP port on which a device listens for RADIUS requests from configured Dynamic Authorization clients. The supported range for the port-number is 1025 to 65535.

Default	3799
Format	port *port-number*
Mode	Dynamic Authorization

Example:

```
(Routing) (Config- radius-da)#port 1700
```

no port

Use this command to reset the configured UDP port on which a device listens for RADIUS requests from configured Dynamic Authorization clients.

Default	3799
Format	no port
Mode	Dynamic Authorization

Example:

```
(Routing) (Config- radius-da)#no port
```

radius accounting mode

This command is used to enable the RADIUS accounting function.

Default	disabled
Format	radius accounting mode
Mode	Global Config

no radius accounting mode

This command is used to set the RADIUS accounting function to the default value - i.e. the RADIUS accounting function is disabled.

Format no radius accounting mode

Mode Global Config

radius server attribute

This command specifies the RADIUS client to use the specified RADIUS attribute in the RADIUS requests. The supported attributes are as follows:

- 4: Include the NAS-IP Address attribute. If the specific IP address is configured while enabling this attribute, the RADIUS client uses that IP address while sending NAS-IP-Address attribute in RADIUS communication.
- 44: This command configures the format in which the MAC address is sent to the RADIUS server in attribute 44.
- 95: Include the NAS-IPV6-Address attribute. If the specific IPv6 address is configured while enabling this attribute, the RADIUS client uses that IPv6 address while sending NAS-IPV6-Address attribute in RADIUS communication.
- 30: This command configures the format in which the MAC address is sent to the RADIUS server in attribute 30.
- 31: This command configures the format in which the MAC address is sent to the RADIUS server in attribute 31 (Calling-Station-ID).
- 32: This command configures the format in which the MAC address is sent to the RADIUS server in attribute 32 (NAS-Identifier).

Default (Attribute 30 and 31 only) MAC address format: legacy lower case

Format radius server attribute {4 [*ipaddr*] | 95 [*ipv6_addr*] | {30 | 31 | 32} mac-format {leagacy *lower-case* | *upper-case* | ietf *lower-case* | *upper-case* | unformatted *lower-case* | *upper-case* }}

Mode Global Config

Parameter	Definition
4	NAS-IP-Address attribute to be used in RADIUS requests.
ipaddr	The IP address of the server.
ipv6_addr	The IPv6 address of the server.
ietf	Format the MAC address as xx-xx-xx-xx-xx-xx.
legacy	Format the MAC address as xx:xx:xx:xx:xx:xx
unformatted	Format the MAC address as aaaabbbbcccc.

Example: The following shows an example of the command.

```
(Switch) (Config) #radius server attribute 4  192.168.37.60
```

Example: The following shows an example of the command.

```
(Switch) (Config) #(Config)#radius server attribute 95 3ffe:ffff:100:f101::1
```

Example: The following shows an example of the command.

```
(Switch) (Config) #(Config)#radius server attribute 31 mac-format unformatted lower-case
```

no radius server attribute

The `no` version of this command resets the RADIUS attributes to their default values. For attributes 4 and 95, this command disables the specified attribute global parameter for the RADIUS client. When this parameter is disabled, the RADIUS client does not send the NAS-IP-Address or NAS-IPv6-Address attribute in RADIUS requests.

Format	no radius server attribute {4 [*ipaddr*] | 95 [*ipv6_addr*] | {30 | 31 | 32} mac-format}
Mode	Global Config

radius server attribute 32 include-in-access-req

When this command is configured with the `32` option, the RADIUS attribute 32 (NAS-Identifier) is sent to the RADIUS server in access-request and accounting-request messages. The `format` option specifies the RADIUS Attribute 32 format. If the format is not configured, a default format (%m) is used.

Default	Attribute is not sent
Format	radius server attribute 32 include-in-access-req [format *format*]
Mode	Global Config

Parameter	Definition
format	The format value can be 2 to 128 characters or one or more of the following: • %m: MAC address • %i: IP address • %h: Host Name • %d: Domain Name. **Note**: If the `format` parameter is not configured, the default format `%m` is used.

Example: The following shows an example of the command.

```
(Switch) (Config) #(Config)#radius server attribute 32 include-in-access-req format %i
```

no radius server attribute 32 include-in-access-req

This command disables sending RADIUS attribute 32.

Format	no radius server attribute 32 include-in-access-req
Mode	Global Config

radius server attribute 44 include-in-access-req

When this command is configured with the `44` option, the RADIUS attribute 44 (Accounting-Session-ID) is sent to the RADIUS server in access-request messages. The same accounting session ID is used in the subsequent accounting requests sent to the RADIUS server.

Default	Attribute is not sent

Format radius server attribute 44 include-in-access-req

Mode Global Config

no radius server attribute include-in-access-req

This command disables sending RADIUS attribute 44.

Format no radius server attribute 44 include-in-access-req

Mode Global Config

radius server deadtime

This command configures the dead time (in minutes) for all RADIUS authentication servers. The dead time is the amount of time to skip a RADIUS server that is not responding to authentication requests. The valid deadtime range is 0 to 2000 minutes.

Default 0

Format radius server deadtime *minutes*

Mode Global Config

no radius server deadtime

This command resets the deadtime for all RADIUS authentication servers to the default value.

Format no radius server deadtime

Mode Global Config

radius server dead-criteria

This command configures the condition under which a RADIUS server is considered to be dead. The criteria configured for both the dead time and the number of tries need to be satisfied before a RADIUS server is consider as unavailable.

Default Time: 20 seconds
Tries 4

Format radius server dead-criteria time *seconds* tries *tries*

Mode Global Config

Parameter	Definition
time	Number of seconds during which a RADIUS client need not get a valid response from the RADIUS server. The valid range is 1 to 120 seconds.
tries	Number of times that a RADIUS client attempts to get a valid response before the RADIUS server is considered as unavailable. The valid range is 1 to 100.

Example:

```
(Switch) (Config)# radius server dead-criteria time 40 tries 6
```

no radius server dead-criteria

This command resets the dead criteria for all RADIUS servers to the default value.

Format	no radius server dead-criteria {time | tries}
Mode	Global Config

radius server host

This command configures the IPv4/IPv6 address or DNS name to use for communicating with the RADIUS server of a selected server type. While configuring the IPv4/IPv6 address or DNS name for the authenticating or accounting servers, you can also configure the deadtime, port number, and server name. If the authenticating and accounting servers are configured without a name, the command uses the Default_RADIUS_Auth_Server and Default_RADIUS_Acct_Server as the default names, respectively. The same name can be configured for more than one authenticating servers and the name should be unique for accounting servers. The RADIUS client allows the configuration of a maximum 32 authenticating and accounting servers.

If you use the *auth* parameter, the command configures the IPv4/IPv6 address or hostname to use to connect to a RADIUS authentication server. You can configure up to three servers per RADIUS client. If the maximum number of configured servers is reached, the command fails until you remove one of the servers by issuing the no form of the command. If you use the optional *port* parameter, the command configures the UDP port number to use when connecting to the configured RADIUS server. The *port* number range is 1 to 65535, with 1812 being the default value. If you use the optional deadtime parameter, the command configures the deadtime to use for the configured RADIUS server. The deadtime value is 0 to 2000 (in minutes), with 0 being the default.

Note: To reconfigure a RADIUS authentication server to use the default UDP *port*, set the *port* parameter to 1812.

If you use the *acct* token, the command configures the IPv4/IPv6 address or hostname to use for the RADIUS accounting server. You can only configure one accounting server. If an accounting server is currently configured, use the no form of the command to remove it from the configuration. The IPv4/IPv6 address or hostname you specify must match that of a previously configured accounting server. If you use the optional *port* parameter, the command configures the UDP port to use when connecting to the RADIUS accounting server. If a *port* is already configured for the accounting server, the new *port* replaces the previously configured *port*. The *port* must be a value in the range 0 to 65535, with 1813 being the default. If you use the optional deadtime parameter, the command configures the deadtime to use for the configured RADIUS server. The deadtime value is 0 to 2000 (in minutes), with 0 being the default.

Note: To reconfigure a RADIUS accounting server to use the default UDP *port*, set the *port* parameter to 1813.

Format	radius server host {auth | acct} {*ipaddr* | *ipv6addr* | *dnsname*} [name *servername*] [port *0-65535*] [deadtime *0-2000*]

Mode Global Config

Field	Description
ipaddr	The IP address of the server.
ipv6addr	The IPv6 address of the server.
dnsname	The DNS name of the server.
0-65535	The port number to use to connect to the specified RADIUS server.
servername	The alias name to identify the server.
deadtime	The amount of time to skip a RADIUS server that is not responding to authentication requests. The valid deadtime range is 0 to 2000 minutes

no radius server host

The `no` version of this command deletes the configured server entry from the list of configured RADIUS servers. If the RADIUS authenticating server being removed is the active server in the servers that are identified by the same server name, then the RADIUS client selects another server for making RADIUS transactions. If the `auth` token is used, the previously configured RADIUS authentication server is removed from the configuration. Similarly, if the `acct` token is used, the previously configured RADIUS accounting server is removed from the configuration. The *`ipaddr | ipv6addr | dnsname`* parameter must match the IPv4/IPv6 address or DNS name of the previously configured RADIUS authentication / accounting server.

Format no radius server host {auth | acct} {*ipaddr* | *ipv6addr* | *dnsname*}

Mode Global Config

Example: The following shows an example of the command.

```
(Switch) (Config) #radius server host acct 192.168.37.60
(Switch) (Config) #radius server host acct 192.168.37.60 port 1813
(Switch) (Config) #radius server host auth 192.168.37.60 name Network1_RS port 1813
(Switch) (Config) #radius server host acct 192.168.37.60 name Network2_RS
(Switch) (Config) #no radius server host acct 192.168.37.60
```

radius server host link-local

This command configures the link-local-address of the RADIUS server and the outgoing interface to be used by the RADIUS client to communicate with the RADIUS server. The outgoing interface can be any physical interface or service port or network port.

Default None

Format radius server host {auth | acct} link-local *link-local-address* interface {*unit/slot/port* | network | serviceport } [name *servername*] [port *port*]

Mode Global Config

Field	Description
link-local-address	The IP address of the server.
interface	The interface for the RADIUS client to use for outgoing RADIUS messages.
servername	The alias name to identify the server.
port	The port number to use to connect to the specified RADIUS server.

Example: The following shows an examples of the command.

```
(Switch) (Config) #radius server host auth link-local fe80::208:a1ff:fe7e:4519 interface network name auth_server  port 1813

 (Switch) (Config) #radius server host acct link-local fe80::208:a1ff:fe7e:4519 interface serviceport name acct_server port 1813
```

no radius server host link-local

This command removes the configured radius server link-local-address.

Default	None
Format	radius server host {auth | acct} link-local *link-local-address*
Mode	Global Config

Example: The following shows an examples of the command.

```
(Switch) (Config) #no radius server host auth link-local fe80::208:a1ff:fe7e:4519
```

radius server host test

This command configures automated tests for configured RADIUS servers. When a test user name is configured for a RADIUS server, the client sends periodic test probes to the server. The RADIUS server responds with a reject message. The receipt of a response is an indication of liveliness of the server. Test probes are sent to server based configured time interval in minutes, idle time.

Default	Idle time: 60 minutes
Format	radius server host {auth | acct} {*ipaddr* | *ipv6addr* | *hostname*} test username *name* [deadtime *0–2000*] [idle-time *1–35791*] [name *servername*] [port *1–65535*]
Mode	Global Config

Field	Description
ipaddr	The IP address of the server.
ipv6addr	The IPv6 address of the server.
hostname	The host name of the server.
username	RADIUS server test user name.
deadtime	The amount of time to skip a RADIUS server that is not responding to authentication requests. The valid deadtime range is 0 to 2000 minutes.
idle-time	The number of minutes between test probes, which is in the range of 1 to 35792 minutes.
name	Identification name to the server.

Field	Description
port	A Layer 4 port number in the range of 1 to 65535 (the default is 1813).

Example:

```
(Routing)(Config)# radius server acct 10.22.11.33 test username dummy idle-time 2
```

no radius server host test

This command disables RADIUS server test user name. It can also be used to set server idle-time to default value.

Format	no radius server host {auth | acct} {*ipaddr* | *ipv6addr* | *hostname*} test username
Mode	Global Config

radius server key

This command configures the key to be used in RADIUS client communication with the specified server. The key can be configured for all RADIUS servers or, depending on whether the `auth` or `acct` token is used, the shared secret is configured for the particular RADIUS authentication or accounting server. The IP address or IPv6 address or hostname, when provided, must match a previously configured server. When this command is executed, the secret is prompted.

Text-based configuration supports RADIUS server's secrets in encrypted and non-encrypted format. When you save the configuration, these secret keys are stored in encrypted format only. If you want to enter the key in encrypted format, enter the key along with the encrypted keyword. In the "show running-config" on page 191 command's display, these secret keys are displayed in encrypted format. You cannot show these keys in plain text format.

Note: The secret must be an alphanumeric value not exceeding 64 characters.

Format	radius server key [auth | acct | encrypted *password*] {*ipaddr* | *ipv6addr* | *hostname*} *encrypted password*
Mode	Global Config

Field	Description
ipaddr	The IP address of the server.
dnsname	The DNS name of the server.
password	The password in encrypted format.

Example: The following shows an example of the CLI command.

```
radius server key acct 10.240.4.10 encrypted encrypt-string
```

no radius server key

This command removes the shared secret used for the RADIUS servers.

Format	no radius server key [{acct | auth} {*ipaddr* | *ipv6address* | *hostname*}]
Mode	Global Config

radius server load-balance

This command configures the load balancing algorithm used by the RADIUS client to manage authentication and accounting requests sent to configured RADIUS servers. Load balancing configuration is configured for a group of RADIUS servers or global default RADIUS server group. A server group is identified as a group of RADIUS servers using the same configured server name.

The supported load balancing method is based on the least number of outstanding requests. In this mode, the RADIUS client selects a configured RADIUS server that has the least number of pending requests. Before selecting a new server, the number of pending requests on the current server in use should be more than configured batch size value.

Default	Method: None Batch size: 25
Format	radiusserverload-balance{acct|auth}{name*servername*|radius}method{least-outstanding [batch-size *1–2147483647*] | none}
Mode	Global Config

Field	Description
acct	Configure the RADIUS accounting server group.
auth	Configure the RADIUS authentication server group.
name	The RADIUS server group name.
radius	Server using default identification name.
method	Load balance based on the lowest number of outstanding requests.
none	Do not load balance.

Example:

```
(Routing) (Config)# radius server load-balance acct name group1 method least-outstanding batch-size
40
(Routing) (Config)# radius server load-balance auth radius method least-outstanding batch-size 30
```

no radius server load-balance

The no version of this command disables the load balancing algorithm to be used for the specified RADIUS server.

Format	no radius server load-balance {auth | acct} {radius | name *servername*} method
Mode	Global Config

radius server msgauth

This command enables the message authenticator attribute to be used for the specified RADIUS Authenticating server.

Format	radius server msgauth {*ipaddr* | *ipv6addr* | *dnsname*}
Mode	Global Config

Field	Description
ipaddr	The IP address of the server.
ipv6addr	The IPv6 address of the server.
dnsname	The DNS name of the server.

no radius server msgauth

The no version of this command disables the message authenticator attribute to be used for the specified RADIUS Authenticating server.

Format	no radius server msgauth {*ipaddr* | *ipv6addr* | *dnsname*}
Mode	Global Config

radius server primary

This command specifies a configured server that should be the primary server in the group of servers which have the same server name. Multiple primary servers can be configured for each number of servers that have the same name. When the RADIUS client has to perform transactions with an authenticating RADIUS server of specified name, the client uses the primary server that has the specified server name by default. If the RADIUS client fails to communicate with the primary server for any reason, the client uses the backup servers configured with the same server name. These backup servers are identified as the Secondary type.

Format	radius server primary {*ipaddr* | *ipv6addr* | *dnsname*}
Mode	Global Config

Field	Description
ip addr	The IP address of the RADIUS Authenticating server.
dnsname	The DNS name of the server.

radius server retransmit

This command configures the global parameter for the RADIUS client that specifies the number of transmissions of the messages to be made before attempting the fall back server upon unsuccessful communication with the current RADIUS authenticating server. When the maximum number of retries are exhausted for the RADIUS accounting server and no response is received, the client does not communicate with any other server.

Default	4
Format	radius server retransmit *retries*
Mode	Global Config

Field	Description
retries	The maximum number of transmission attempts in the range of 1 to 15.

no radius server retransmit

The no version of this command sets the value of this global parameter to the default value.

Format	no radius server retransmit
Mode	Global Config

radius source-interface

Use this command to specify the physical or logical interface to use as the RADIUS client source interface (Source IP address). If configured, the address of source Interface is used for all RADIUS communications between the RADIUS server and the RADIUS client. The selected source-interface IP address is used for filling the IP header of RADIUS management protocol packets. This allows security devices (firewalls) to identify the source packets coming from the specific switch.

If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as the source address. If the configured interface is down, the RADIUS client falls back to its default behavior.

Format	radius source-interface {*unit/slot/port* | loopback *loopback-id* | *vlan vlan-id*}
Mode	Global Config

Parameter	Description
unit/slot/port	The unit identifier assigned to the switch.
loopback-id	Configures the loopback interface. The range of the loopback ID is 0 to 7.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

no radius source-interface

Use this command to reset the RADIUS source interface to the default settings.

Format	no radius source-interface
Mode	Global Config

radius server timeout

This command configures the global parameter for the RADIUS client that specifies the timeout value (in seconds) after which a request must be retransmitted to the RADIUS server if no response is received. The timeout value is an integer in the range of 1 to 30.

Default	5
Format	radius server timeout *seconds*
Mode	Global Config

Field	Description
retries	Maximum number of transmission attempts in the range 1–30.

no radius server timeout

The no version of this command sets the timeout global parameter to the default value.

Format	no radius server timeout
Mode	Global Config

radius server vsa send

This command enables the processing of Cisco dynamic ACL vendor-specific attributes sent by the RADIUS server. Use the authentication keyword to allow the processing of attributes for authentication.

Default	Disabled
Format	radius server vsa send [authentication]
Mode	Global Config

no radius vsa send

The no version of this command sets the Cisco dynamic VSA processing to the default value.

Format	no radius server vsa send [authentication]
Mode	Global Config

server-key

Use this command to configure a global shared secret that is used for all dynamic authorization clients that do not have an individual shared secret key configured.

Default	None
Format	server-key [7] *key-string*
Mode	Dynamic Authorization

Parameter	Definition
0	An unencrypted key is to be entered
7	An encrypted key is to be entered
string	The shared secret string. Maximum length is 128 characters for unencrypted key and 256 characters for encrypted key. Overrides the global setting for this client only. Enclose in quotation marks to use special characters or embedded blanks.

Example:

```
(Routing) (Config-radius-da)# server-key encrypted mydevice
```

no server-key

Use this command to remove the global shared secret key configuration.

Default	None
Format	no server-key
Mode	Dynamic Authorization

Example:

```
(Routing) (Config-radius-da)#no server-key
```

show radius

This command displays the values configured for the global parameters of the RADIUS client.

Format	show radius
Mode	Privileged EXEC

Parameter	Definition
Number of Configured Authentication Servers	The number of RADIUS Authentication servers that have been configured.
Number of Configured Accounting Servers	The number of RADIUS Accounting servers that have been configured.
Number of Named Authentication Server Groups	The number of configured named RADIUS server groups.
Number of Named Accounting Server Groups	The number of configured named RADIUS server groups.
Number of Dead RADIUS Authentication Servers	The number of RADIUS authentication servers that are considered to be unresponsive based on the dead-time criteria.
Number of Dead RADIUS Accounting Servers	The number of RADIUS accounting servers that are considered to be unresponsive based on the dead-time criteria.
Number of Retransmits	The configured value of the maximum number of times a request packet is retransmitted.
Dead Time	The amount of time to skip a RADIUS server that is not responding to authentication requests.
RADIUS Server VSA Authentication	Indicates whether VSA authentication is enabled for the configured RADIUS server.
Dead Criteria Time	Number of seconds during which a RADIUS client need not get a valid response from the RADIUS server.
Dead Criteria Tries	Number of times that a RADIUS client attempts to get a valid response before the RADIUS server is considered as unavailable.
Timeout Duration	The configured timeout value, in seconds, for request retransmissions.
RADIUS Accounting Mode	A global parameter to indicate whether the accounting mode for all the servers is enabled or not.
RADIUS Attribute 4 Mode	A global parameter to indicate whether the NAS-IP-Address attribute has been enabled to use in RADIUS requests.

Parameter	Definition
RADIUS Attribute 4 Value	A global parameter that specifies the IP address to be used in the NAS-IP-Address attribute to be used in RADIUS requests.
RADIUS Attribute 95 Mode	A global parameter to indicate whether the NAS-IPv6-Address attribute has been enabled to use in RADIUS requests.
RADIUS Attribute 95 Value	A global parameter that specifies the IPv6 address to be used in the NAS-IPv6-Address attribute to be used in RADIUS requests.
RADIUS Attribute 30 MAC Format	The format in which the MAC address is sent to the RADIUS server in attribute 30.
RADIUS Attribute 31 MAC Format	The format in which the MAC address is sent to the RADIUS server in attribute 31 (Calling-Station-ID).
RADIUS Attribute 32 MAC Format	The format in which the MAC address is sent to the RADIUS server in attribute 32 (NAS-Identifier).
RADIUS Attribute 32 include in access request	Indicates whether RADIUS attribute 32 is sent to the RADIUS server in access-request and accounting-request messages.
RADIUS Attribute 32 format	The format for RADIUS attribute 32, which is one or more of the following: • %m: MAC address • %i: IP address • %h: Host Name • %d: Domain Name.
RADIUS Attribute 44 include in access request	Indicates whether RADIUS attribute 44 is sent to the RADIUS server in access-request and accounting-request messages.

Example: The following shows example CLI display output for the command.

```
(Switch) #show radius

Number of Configured Authentication Servers.... 1
Number of Configured Accounting Servers........ 1
Number of Named Authentication Server Groups... 1
Number of Named Accounting Server Groups....... 1
Number of Dead RADIUS Authentication Servers... 0
Number of Dead RADIUS Accounting Servers....... 0
Number of Retransmits.......................... 4
Dead Time...................................... 0
Radius Server VSA Authentication: ............. Enabled
Dead Criteria Time............................. 20
Dead Criteria Tries............................ 4
Timeout Duration............................... 5
RADIUS Accounting Mode......................... Disable
RADIUS Attribute 4 Mode........................ Disable
RADIUS Attribute 4 Value....................... 0.0.0.0
RADIUS Attribute 95 Mode....................... Disable
RADIUS Attribute 95 Value...................... ::
RADIUS Attribute 30 Mac Format................. legacy lower-case
RADIUS Attribute 31 Mac Format................. ietf upper-case
RADIUS Attribute 32 Mac Format................. legacy lower-case
RADIUS Attribute 32 include in access request.. Enable
RADIUS Attribute 32 format..................... %i.%d.%m
RADIUS Attribute 44 include in access request.. Disable
```

show radius servers

This command displays the summary and details of RADIUS authenticating servers configured for the RADIUS client.

Format	show radius servers [{*ipaddr* | *ipv6addr* | *dnsname*} | name [*servername*]}]
Mode	Privileged EXEC

Parameter	Description
Command Variables	
ipaddr	The IP address of the authenticating server.
ipv6addr	The IPv6 address of the server.
dnsname	The DNS name of the authenticating server.
servername	The alias name to identify the server.
Command Output Fields	
Current	The * symbol preceding the server host address specifies that the server is currently active.
Host Address	The IP address of the host.
Server Name	The name of the authenticating server.
Port	The port used for communication with the authenticating server.
Type	Specifies whether this server is a primary or secondary type.
Current Host Address (*)	An asterisk (*) indicates which configured RADIUS host is the currently active authenticating server.
Number of Retransmits	The configured value of the maximum number of times a request packet is retransmitted.
Dead Time	The amount of time to skip a RADIUS server that is not responding to authentication requests.
Timeout Duration	The configured timeout value, in seconds, for request retransmissions.
RADIUS Server VSA Authentication	Indicates whether the system processes Cisco dynamic ACL vendor-specific attributes sent by RADIUS Server.
Server State	The administrative state of the RADIUS server.
Server Immortal State	Indicates whether the server is an *immortal* RADIUS server, which is a dead server that is marked as alive after being determined to be dead because it is the last server known to be alive
Test User	The name of the configured RAIDUS server test user.
Idle Time	The number of minutes between RADIUS server test probes,
RADIUS Accounting Mode	A global parameter to indicate whether the accounting mode for all the servers is enabled or not.
RADIUS Attribute 4 Mode	A global parameter to indicate whether the NAS-IP-Address attribute has been enabled to use in RADIUS requests.
RADIUS Attribute 4 Value	A global parameter that specifies the IP address to be used in NAS-IP-Address attribute used in RADIUS requests.
RADIUS Attribute 95 Mode	A global parameter to indicate whether the NAS-IPv6-Address attribute has been enabled to use in RADIUS requests.
RADIUS Attribute 95 Value	A global parameter that specifies the IPv6 address to be used in the NAS-IPv6-Address attribute to be used in RADIUS requests.
RADIUS Attribute 30 MAC Format	The format in which the MAC address is sent to the RADIUS server in attribute 30.

Parameter	Description
RADIUS Attribute 31 MAC Format	The format in which the MAC address is sent to the RADIUS server in attribute 31 (Calling-Station-ID).
RADIUS Attribute 32 MAC Format	The format in which the MAC address is sent to the RADIUS server in attribute 32 (NAS-Identifier).
RADIUS Attribute 32 include in access request	Indicates whether RADIUS attribute 32 is sent to the RADIUS server in access-request and accounting-request messages.
RADIUS Attribute 32 format	The format for RADIUS attribute 32, which is one or more of the following: • %m: MAC address • %i: IP address • %h: Host Name • %d: Domain Name.
RADIUS Attribute 44 include in access request	Indicates whether RADIUS attribute 44 is sent to the RADIUS server in access-request and accounting-request messages.
Link local interface	If configured, the link local IPv6 address.
Secret Configured	Yes or No Boolean value that indicates whether this server is configured with a secret.
Message Authenticator	A global parameter to indicate whether the Message Authenticator attribute is enabled or disabled.
CoA Bounce-Host-Port	Indicates whether RADIUS server Bounce-Port messages will be processed (Accept) or ignored.
Number of CoA Requests Received	The number of RADIUS Change of Authorization (CoA) requests messages received from a RADIUS host.
Number of CoA ACK Responses Sent	The number of RADIUS CoA acknowledgments the client has sent.
Number of CoA NAK Responses Sent	The number of RADIUS CoA non-acknowledgments the client has sent.
Number of CoA Requests Ignored	The number of RADIUS CoA requests the client has ignored.
Number of CoA Missing/Unsupported Attribute R	The number of RADIUS CoA requests the client has received that have a missing or unsupported attribute value.
Number of CoA Session Context Not Found Request	The number of RADIUS CoA requests the client has received in which the session context identified in the CoA-Request or not exist on the NAS.
Number of CoA Invalid Attribute Value Request	The number of RADIUS CoA requests the client has received that have an invalid attribute value.
Number of Administratively Prohibited Request	The number of RADIUS CoA requests the client has received that where the NAS is configured to prohibit honoring of CoA-Request or Disconnect- Request packets for the specified session.
Number of Dead servers in Named Server Group	When the `name servername` options are used, this field shows the number of RADIUS servers in the named server group that are determined to be dead.

Example: The following shows example CLI display output for the command.

```
(Switch) #show radius servers

Cur  Host Address          Server Name                  Port  Type
rent
---- ------------------------ -------------------------------- ----- ----------
                                                             * 192.168.37.200     Network1_RADIUS_Server
1813  Primary
```

```
   192.168.37.201        Network2_RADIUS_Server         1813  Secondary
   192.168.37.202        Network3_RADIUS_Server         1813  Primary
   192.168.37.203        Network4_RADIUS_Server         1813  Secondary

(Switch) #show radius servers name

Current Host Address     Server Name                   Type
------------------------ --------------------------------- ----------192.168.37.200       Network1_RADIUS_Server
Secondary
192.168.37.201        Network2_RADIUS_Server         Primary
192.168.37.202        Network3_RADIUS_Server         Secondary
192.168.37.203        Network4_RADIUS_Server         Primary

(Switch) #show radius servers 2.2.2.2

RADIUS Server Name............................ Default-RADIUS-Server
Current Server IP Address..................... 2.2.2.2
Number of Retransmits......................... 4
Dead Time..................................... 0
Timeout Duration.............................. 5
RADIUS Server VSA Authentication............... Enable
Server State.................................. Up
Server Immortal State......................... False
Load Balance.................................. Disable
Test User.....................................
Idle Time..................................... 60
RADIUS Accounting Mode......................... Disable
RADIUS Attribute 4 Mode........................ Disable
RADIUS Attribute 4 Value....................... 0.0.0.0
RADIUS Attribute 30 Mac Format................. legacy lower-case
RADIUS Attribute 31 Mac Format................. legacy lower-case
RADIUS Attribute 32 Mac Format................. legacy lower-case
RADIUS Attribute 32 include in access request.. Disable
RADIUS Attribute 32 format.................... %m
RADIUS Attribute 44 include in access request.. Disable
Port.......................................... 1812
Type.......................................... Secondary
Secret Configured............................. Yes
Message Authenticator......................... Enable
CoA Bounce-Host-Port.......................... Accept
Number of CoA Requests Received................ 0
Number of CoA ACK Responses Sent............... 0
Number of CoA NAK Responses Sent............... 0
Number of CoA Requests Ignored................. 0
Number of CoA Missing/Unsupported Attribute R.. 0
Number of CoA Session Context Not Found Reque.. 0
Number of CoA Invalid Attribute Value Request.. 0
Number of Administratively Prohibited Request.. 0
```

show radius accounting

This command displays a summary of configured RADIUS accounting servers.

Format show radius accounting {name [*servername*] | *ipaddr* | *ipv6address* | *hostname*}

Mode Privileged EXEC

Field	Description
servername	An alias name to identify the server.
ipaddr	The IPv4 address of the server.

Field	Description
ipv6address	the IPv6 address of the server.
hostname	The DNS resolvable hostname of the server.

If you use the `name` parameter without the *`servername`* option, then only the accounting mode and the RADIUS accounting server details are displayed.

Parameter	Definition
Server Name	The name of the accounting server.
Host Address	The IP address or configured name of the host.
Port	The port used for communication with the accounting server.
Secret Configured	Yes or No Boolean value indicating whether this server is configured with a secret.

Example: The following shows example CLI display output for the command.

```
(Routing) #show radius accounting name

Server Name              Host Address         Port   Secret
                                                     Configured
-------------------------------- ------------------------ ------ ----------
Default-RADIUS-Server        acctServer            1813   No
backupAcct                192.168.10.55          1813   No
testServer               fe80::1               1813   No
```

If you specify the hostname, IPv4 or IPv6 address of the accounting server, the following RADIUS accounting server details are displayed.

Parameter	Definition
RADIUS Accounting Server IP Address	The IPv4 address, IPv6 address, link local address, or configured hostname of the host.
RADIUS Accounting Server Name	The name of the accounting server.
RADIUS Accounting Mode	The mode of the accounting server.
Link local interface	If configured, the interface associated with the link-local IPv6 address.
Port	The port used for communication with the accounting server.
Secret Configured	Yes or No Boolean value indicating whether this server is configured with a secret.
Server State	The administrative state of the server.
Server Immortal State	Indicates whether the server is an *immortal* RADIUS server, which is a dead server that is marked as alive after being determined to be dead because it is the last server known to be alive
Test User	The name of the configured RAIDUS server test user.
Idle Time	The number of minutes between RADIUS server test probes,
Number of Dead servers in Named Server Group	When the `name servername` options are used, this field shows the number of RADIUS servers in the named server group that are determined to be dead.

Example:

```
(Routing) #show radius accounting acctServer

RADIUS Accounting Server IP Address............ 192.168.10.55
RADIUS Accounting Server Name.................. backupAcct
RADIUS Accounting Mode......................... Disable
Link local interface........................... Not Available
Port........................................... 1813
Secret Configured.............................. No
Server State................................... Up
Server Immortal State.......................... False
Test User...................................... testUser
Idle Time...................................... 3233

(Routing) #show radius accounting fe80::1

RADIUS Accounting Server IP Address............ fe80::1
RADIUS Accounting Server Name.................. testServer
RADIUS Accounting Mode......................... Disable
Link local interface........................... 1/0/3
Port........................................... 1813
Secret Configured.............................. No
Server State................................... Up
Server Immortal State.......................... False
Test User...................................... testUser
Idle Time...................................... 3233
```

show radius accounting servers

This command displays the configured RADIUS accounting servers and its name.

Format	show radius accounting servers
Mode	Privileged EXEC

The command displays the information the following table describes.

Parameter	Definition
Selected Server	If an asterisk (*) appears in the first column, the RADIUS accounting server is the primary server for its group.
Host Address	The IPv4 address, IPv6 address, link local address, or configured hostname of the host.
Server Name	The name of the accounting server.
Port	The port used for communication with the accounting server.

Example: The following shows example CLI display output for the command.

```
(Routing) #show radius accounting servers
*  Host Address           Server Name                 Port
---- ------------------------ -------------------------------- ---
  *  10.25.4.10           group1                      1813
  *  10.25.4.5            Default-RADIUS-Server       1813
     10.25.4.4            group1                      1813

 * currently selected server
```

show radius accounting statistics

This command displays a summary of statistics for the configured RADIUS accounting servers.

Format show radius accounting statistics [{*ipaddr* | *ipv6addr* | *dnsname*} | name [*servername*]}]

Mode Privileged EXEC

Parameter	Definition
ipaddr	The IP address of the server.
dnsname	The DNS name of the server.
servername	The alias name to identify the server.
RADIUS Accounting Server Name	The name of the accounting server.
Server Host Address	The IP address of the host.
Round Trip Time	The time interval, in hundredths of a second, between the most recent Accounting-Response and the Accounting-Request that matched it from this RADIUS accounting server.
Requests	The number of RADIUS Accounting-Request packets sent to this server. This number does not include retransmissions.
Retransmission	The number of RADIUS Accounting-Request packets retransmitted to this RADIUS accounting server.
Responses	The number of RADIUS packets received on the accounting port from this server.
Malformed Responses	The number of malformed RADIUS Accounting-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or signature attributes or unknown types are not included as malformed accounting responses.
Bad Authenticators	The number of RADIUS Accounting-Response packets containing invalid authenticators received from this accounting server.
Pending Requests	The number of RADIUS Accounting-Request packets sent to this server that have not yet timed out or received a response.
Timeouts	The number of accounting timeouts to this server.
Unknown Types	The number of RADIUS packets of unknown types, which were received from this server on the accounting port.
Packets Dropped	The number of RADIUS packets received from this server on the accounting port and dropped for some other reason.

Example: The following shows example CLI display output for the command.

```
(Switch) #show radius accounting statistics 192.168.37.200

RADIUS Accounting Server Name................. Default_RADIUS_Server
Host Address................................. 192.168.37.200
Round Trip Time.............................. 0.00
Requests..................................... 0
Retransmissions.............................. 0
Responses.................................... 0
Malformed Responses.......................... 0
Bad Authenticators........................... 0
Pending Requests............................. 0
Timeouts..................................... 0
Unknown Types................................ 0
Packets Dropped.............................. 0
```

```
(Switch) #show radius accounting statistics name Default_RADIUS_Server

RADIUS Accounting Server Name................. Default_RADIUS_Server
Host Address.................................. 192.168.37.200
Round Trip Time............................... 0.00
Requests...................................... 0
Retransmissions............................... 0
Responses..................................... 0
Malformed Responses........................... 0
Bad Authenticators............................ 0
Pending Requests.............................. 0
Timeouts...................................... 0
Unknown Types................................. 0
Packets Dropped............................... 0
```

show radius source-interface

Use this command in Privileged EXEC mode to display the configured RADIUS client source-interface (Source IP address) information.

Format	show radius source-interface
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switch)#show radius source-interface

RADIUS Client Source Interface................. 0/1
RADIUS Client Source IPv4 Address............. 192.168.0.1       [Up]
RADIUS Client Source IPv6 Address............. 200:23::12        [Up]
```

show radius statistics

This command displays the summary statistics of configured RADIUS Authenticating servers.

Format	show radius statistics [{*ipaddr* | *ipv6addr* | *dnsname*} | name [*servername*]}]
Mode	Privileged EXEC

Parameter	Definition
ipaddr	The IP address of the server.
dnsname	The DNS name of the server.
servername	The alias name to identify the server.
RADIUS Server Name	The name of the authenticating server.
Server Host Address	The IP address of the host.
Access Requests	The number of RADIUS Access-Request packets sent to this server. This number does not include retransmissions.
Access Retransmissions	The number of RADIUS Access-Request packets retransmitted to this RADIUS authentication server.
Access Accepts	The number of RADIUS Access-Accept packets, including both valid and invalid packets, that were received from this server.

Parameter	Definition
Access Rejects	The number of RADIUS Access-Reject packets, including both valid and invalid packets, that were received from this server.
Access Challenges	The number of RADIUS Access-Challenge packets, including both valid and invalid packets, that were received from this server.
Malformed Access Responses	The number of malformed RADIUS Access-Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or signature attributes or unknown types are not included as malformed access responses.
Bad Authenticators	The number of RADIUS Access-Response packets containing invalid authenticators or signature attributes received from this server.
Pending Requests	The number of RADIUS Access-Request packets destined for this server that have not yet timed out or received a response.
Timeouts	The number of authentication timeouts to this server.
Unknown Types	The number of packets of unknown type that were received from this server on the authentication port.
Packets Dropped	The number of RADIUS packets received from this server on the authentication port and dropped for some other reason.

Example: The following shows example CLI display output for the command.

```
(Switch) #show radius statistics 192.168.37.200

RADIUS Server Name............................ Default_RADIUS_Server
Server Host Address........................... 192.168.37.200
Access Requests............................... 0.00
Access Retransmissions........................ 0
Access Accepts................................ 0
Access Rejects................................ 0
Access Challenges............................. 0
Malformed Access Responses.................... 0
Bad Authenticators............................ 0
Pending Requests.............................. 0
Timeouts...................................... 0
Unknown Types................................. 0
Packets Dropped............................... 0

(Switch) #show radius statistics name Default_RADIUS_Server

RADIUS Server Name............................ Default_RADIUS_Server
Server Host Address........................... 192.168.37.200
Access Requests............................... 0.00
Access Retransmissions........................ 0
Access Accepts................................ 0
Access Rejects................................ 0
Access Challenges............................. 0
Malformed Access Responses.................... 0
Bad Authenticators............................ 0
Pending Requests.............................. 0
Timeouts...................................... 0
Unknown Types................................. 0
Packets Dropped............................... 0
```

TACACS+ Commands

TACACS+ provides access control for networked devices via one or more centralized servers. Similar to RADIUS, this protocol simplifies authentication by making use of a single database that can be shared by many clients on a large network. TACACS+ is based on the TACACS protocol (described in RFC1492) but additionally provides for separate authentication, authorization, and accounting services. The original protocol was UDP based with messages passed in clear text over the network; TACACS+ uses TCP to ensure reliable delivery and a shared key configured on the client and daemon server to encrypt all messages.

tacacs-server host

Use the `tacacs-server host` command in Global Configuration mode to configure a TACACS+ server. This command enters into the TACACS+ configuration mode. Use the ***`ip-address`***, ***`ipv6-address`***, or ***`hostname`*** parameter to specify the IPv4 address, IPv6 address, or hostname of the TACACS+ server. To specify multiple hosts, multiple `tacacs-server host` commands can be used.

Format	tacacs-server host {*ip-address*| *ipv6-address* | *hostname}*
Mode	Global Config

no tacacs-server host

Use the `no tacacs-server host` command to delete the specified hostname or IP address. The ***`ip-address`***, ***`ipv6-address`***, or ***`hostname`*** parameter is the IPv4 address, IPv6 address, or hostname of the TACACS+ server.

Format	no tacacs-server host {*ip-address*| *ipv6-address* | *hostname*}
Mode	Global Config

tacacs-server host link-local

Use this command to configure the link-local-address of the TACACS+ server and the outgoing interface to be used by the TACACS+ client to communicate with the TACACS+ server. The outgoing interface can be any physical interface, the service port, or the network port.

Format	tacacs-server host link-local *link-local-address* interface {*unit/slot/port* | network | serviceport}
Mode	Global Config

no tacacs-server host link-local

Use this command to remove the configured TACACS+ server link-local address.

Format	no tacacs-server host link-local
Mode	Global Config

tacacs-server key

Use the `tacacs-server key` command to set the authentication and encryption key for all TACACS+ communications between the switch and the TACACS+ daemon. The *`key-string`* parameter has a range of 0 - 128 characters and specifies the authentication and encryption key for all TACACS communications between the switch and the TACACS+ server. This key must match the key used on the TACACS+ daemon.

Text-based configuration supports TACACS server's secrets in encrypted and non-encrypted format. When you save the configuration, these secret keys are stored in encrypted format only. If you want to enter the key in encrypted format, enter the key along with the encrypted keyword. In the "show running-config" on page 191 command's display, these secret keys are displayed in encrypted format. You cannot show these keys in plain text format.

Format	tacacs-server key [*key-string* | encrypted *key-string*]
Mode	Global Config

no tacacs-server key

Use the `no tacacs-server key` command to disable the authentication and encryption key for all TACACS+ communications between the switch and the TACACS+ daemon. The *`key-string`* parameter has a range of 0 - 128 characters This key must match the key used on the TACACS+ daemon.

Format	no tacacs-server key *key-string*
Mode	Global Config

tacacs-server keystring

Use the `tacacs-server keystring` command to set the global authentication encryption key used for all TACACS+ communications between the TACACS+ server and the client.

Format	tacacs-server keystring
Mode	Global Config

Example: The following shows an example of the CLI command.

```
(Switching)(Config)#tacacs-server keystring
Enter tacacs key:********
Re-enter tacacs key:********
```

tacacs-server source-interface

Use this command in Global Configuration mode to configure the source interface (Source IP address) for TACACS+ server configuration. The selected source-interface IP address is used for filling the IP header of management protocol packets. This allows security devices (firewalls) to identify the source packets coming from the specific switch.

If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as the source address.

Format	tacacs-server source-interface {*unit/slot/port*|loopback *loopback-id*|network *network-id*|serviceport *serviceport-id*|vlan *vlan-id*}
Mode	Global Config

Parameter	Description
unit/slot/port	The unit identifier assigned to the switch, in *unit/slot/port* format.
loopback-id	The loopback interface. The range of the loopback ID is 0 to 7.
network	Use network port IP address.
serviceport	Use serviceport IP address.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

Example: The following shows an example of the command.

```
(Config)#tacacs-server source-interface loopback 0
(Config)#tacacs-server source-interface 1/0/1
(Config)#no tacacs-server source-interface
```

no tacacs-server source-interface

Use this command in Global Configuration mode to remove the global source interface (Source IP selection) for all TACACS+ communications between the TACACS+ client and the server.

Format	no tacacs-server source-interface
Mode	Global Config

tacacs-server timeout

Use the `tacacs-server timeout` command to set the timeout value for communication with the TACACS+ servers. The ***`timeout`*** parameter has a range of 1-30 and is the timeout value in seconds. If you do not specify a timeout value, the command sets the global timeout to the default value. TACACS+ servers that do not use the global timeout will retain their configured timeout values.

Default	5
Format	tacacs-server timeout *timeout*
Mode	Global Config

no tacacs-server timeout

Use the `no tacacs-server timeout` command to restore the default timeout value for all TACACS servers.

Format	no tacacs-server timeout
Mode	Global Config

key

Use the `key` command in TACACS Configuration mode to specify the authentication and encryption key for all TACACS communications between the device and the TACACS server. This key must match the key used on the TACACS daemon. The *`key-string`* parameter specifies the key name. For an empty string use `" "`. (Range: 0 - 128 characters).

Text-based configuration supports TACACS server's secrets in encrypted and non-encrypted format. When you save the configuration, these secret keys are stored in encrypted format only. If you want to enter the key in encrypted format, enter the key along with the encrypted keyword. In the "show running-config" on page 191 command's display, these secret keys are displayed in encrypted format. You cannot show these keys in plain text format.

Format	key [*key-string* | encrypted *key-string*]
Mode	TACACS Config

keystring

Use the `keystring` command in TACACS Server Configuration mode to set the TACACS+ server-specific authentication encryption key used for all TACACS+ communications between the TACACS+ server and the client.

Format	keystring
Mode	TACACS Server Config

Example: The following shows an example of the command.

```
(Switching)(Config)#tacacs-server host 1.1.1.1
(Switching)(Tacacs)#keystring

Enter tacacs key:********
Re-enter tacacs key:********
```

port

Use the `port` command in TACACS Configuration mode to specify a server port number. The server *`port-number`* range is 0 - 65535.

Default	49
Format	port *port-number*
Mode	TACACS Config

priority (TACACS Config)

Use the `priority` command in TACACS Configuration mode to specify the order in which servers are used, where 0 (zero) is the highest priority. The *`priority`* parameter specifies the priority for servers. The highest priority is 0 (zero), and the range is 0 - 65535.

Default	0

Format priority *priority*

Mode TACACS Config

timeout

Use the `timeout` command in TACACS Configuration mode to specify the timeout value in seconds. If no timeout value is specified, the global value is used. The *`timeout`* parameter has a range of 1-30 and is the timeout value in seconds.

Format timeout *timeout*

Mode TACACS Config

show tacacs

Use the `show tacacs` command to display the configuration, statistics, and source interface details of the TACACS+ client.

Format show tacacs *[ip-address | ipv6-address | hostname]*

Mode Privileged EXEC

Parameter	Definition
Host address	The IP address or hostname of the configured TACACS+ server.
Port	The configured TACACS+ server port number.
TimeOut	The timeout in seconds for establishing a TCP connection.
Priority	The preference order in which TACACS+ servers are contacted. If a server connection fails, the next highest priority server is contacted.

Example: The following examples show output of this command.

```
(Routing) #show tacacs
Global Timeout: 5

Host address            Port   Timeout   Priority   Link Local Interface
------------------------ -----  -------   --------   --------------------
10.27.3.6               49     Global    0
200:25:dead:beaf::1     49     Global    0          Not Available
```

show tacacs source-interface

Use the `show tacacs source-interface` command in Global Config mode to display the configured global source interface details used for a TACACS+ client. The IP address of the selected interface is used as source IP for all communications with the server.

Format show tacacs source-interface

Mode Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Config)# show tacacs source-interface
TACACS Client Source Interface     : loopback 0
TACACS Client Source IPv4 Address  : 1.1.1.1 [UP]
```

Configuration Scripting Commands

Configuration Scripting allows you to generate text-formatted script files representing the current configuration of a system. You can upload these configuration script files to a PC or UNIX system and edit them. Then, you can download the edited files to the system and apply the new configuration. You can apply configuration scripts to one or more switches with no or minor modifications.

Use the `show running-config` command (see "show running-config" on page 191) to capture the running configuration into a script. Use the `copy` command (see "copy" on page 222) to transfer the configuration script to or from the switch.

Use the `show` command to view the configuration stored in the startup-config, backup-config, or factory-defaults file (see "show" on page 193).

You should use scripts on systems with default configuration; however, you are not prevented from applying scripts on systems with non-default configurations.

Scripts must conform to the following rules:

- Script files are not distributed across the stack, and only live in the unit that is the master unit at the time of the file download.
- The file extension must be ".scr".
- A maximum of ten scripts are allowed on the switch.
- The combined size of all script files on the switch shall not exceed 2048 KB.
- The maximum number of configuration file command lines is 2000.

You can type single-line annotations at the command prompt to use when you write test or configuration scripts to improve script readability. The exclamation point (!) character flags the beginning of a comment. The comment flag character can begin a word anywhere on the command line, and all input following this character is ignored. Any command line that begins with the "!" character is recognized as a comment line and ignored by the parser.

The following lines show an example of a script:

```
! Script file for displaying management access

show telnet !Displays the information about remote connections

! Display information about direct connections

show serial

! End of the script file!
```

Note: To specify a blank password for a user in the configuration script, you must specify it as a space within quotation marks. For example, to change the password for user jane from a blank password to hello, the script entry is as follows:

```
users passwd jane
" "
hello
```

```
hello
```

script apply

This command applies the commands in the script to the switch. The `scriptname` parameter is the name of the script to apply.

Format	script apply *scriptname*
Mode	Privileged EXEC

script delete

This command deletes a specified script where the `scriptname` parameter is the name of the script to delete. The `all` option deletes all the scripts present on the switch.

Format	script delete {*scriptname* | all}
Mode	Privileged EXEC

script list

This command lists all scripts present on the switch as well as the remaining available space.

Format	script list
Mode	Privileged EXEC

Parameter	Definition
Configuration Script	Name of the script.
Size	Privileged EXEC

script show

This command displays the contents of a script file, which is named `scriptname`.

Format	script show *scriptname*
Mode	Privileged EXEC

Parameter	Definition
Output Format	`line` *`number`*`:` *`line contents`*

script validate

This command validates a script file by parsing each line in the script file where `scriptname` is the name of the script to validate.The validate option is intended to be used as a tool for script development. Validation identifies potential problems. It might not identify all problems with a given script on any given device.

Format	script validate *scriptname*
Mode	Privileged EXEC

Prelogin Banner, System Prompt, and Host Name Commands

This section describes the commands you use to configure the prelogin banner and the system prompt. The prelogin banner is the text that displays before you login at the `User:` prompt.

copy (pre-login banner)

The `copy` command includes the option to upload or download the CLI Banner to or from the switch. You can specify local URLs by using FTP, TFTP, SFTP, SCP, or Xmodem.

Note: The parameter *ip6address* is also a valid parameter for routing packages that support IPv6.

Default	none
Format	copy <tftp://<ipaddr>/<filepath>/<filename>> nvram:clibanner copy nvram:clibanner <tftp://<ipaddr>/<filepath>/<filename>>
Mode	Privileged EXEC

set prompt

This command changes the name of the prompt. The length of name may be up to 64 alphanumeric characters.

Format	set prompt *prompt_string*
Mode	Privileged EXEC

hostname

This command sets the system hostname. It also changes the prompt. The length of name may be up to 64 alphanumeric, case-sensitive characters.

Format	hostname *hostname*
Mode	Privileged EXEC

show clibanner

Use this command to display the configured prelogin CLI banner. The prelogin banner is the text that displays before displaying the CLI prompt.

Default	No contents to display before displaying the login prompt.
Format	show clibanner
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show clibanner

Banner Message configured :
```

```
==========================


--------------------------
       TEST
--------------------------
```

set clibanner

Use this command to configure the prelogin CLI banner before displaying the login prompt.

Format	set clibanner *line*
Mode	Global Config

Parameter	Description
line	Banner text where ““ (double quote) is a delimiting character. The banner message can be up to 2000 characters.

no set clibanner

Use this command to unconfigure the prelogin CLI banner.

Format	no set clibanner
Mode	Global Config

Chapter 5. Utility Commands

This chapter describes the utility commands available in the CE0128XB/CE0152XB CLI.

Note: The commands in this chapter are in one of four functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Copy commands transfer or save configuration and informational files to and from the switch.
- Clear commands clear some or all of the settings to factory defaults.

AutoInstall Commands

The AutoInstall feature enables the automatic update of the image and configuration of the switch. This feature enables touchless or low-touch provisioning to simplify switch configuration and imaging.

AutoInstall includes the following support:

- Downloading an image from TFTP server using DHCP option 125. The image update can result in a downgrade or upgrade of the firmware on the switch.
- Automatically downloading a configuration file from a TFTP server when the switch is booted with no saved configuration file.
- Automatically downloading an image from a TFTP server in the following situations:
  - When the switch is booted with no saved configuration found.
  - When the switch is booted with a saved configuration that has AutoInstall enabled.

When the switch boots and no configuration file is found, it attempts to obtain an IP address from a network DHCP server. The response from the DHCP server includes the IP address of the TFTP server where the image and configuration flies are located.

After acquiring an IP address and the additional relevant information from the DHCP server, the switch downloads the image file or configuration file from the TFTP server. A downloaded image is automatically installed. A downloaded configuration file is saved to non-volatile memory.

Note: AutoInstall from a TFTP server can run on any IP interface, including the network port, service port, and in-band routing interfaces (if supported). To support AutoInstall, the DHCP client is enabled operationally on the service port, if it exists, or the network port, if there is no service port.

boot autoinstall

Use this command to operationally start or stop the AutoInstall process on the switch. The command is non-persistent and is not saved in the startup or running configuration file.

Default	stopped
Format	boot autoinstall {start | stop}
Mode	Privileged EXEC

boot host retrycount

Use this command to set the number of attempts to download a configuration file from the TFTP server.

Default	3
Format	boot host retrycount *1-3*
Mode	Privileged EXEC

no boot host retrycount

Use this command to set the number of attempts to download a configuration file to the default value.

Format	no boot host retrycount
Mode	Privileged EXEC

boot host dhcp

Use this command to enable AutoInstall on the switch for the next reboot cycle. The command does not change the current behavior of AutoInstall and saves the command to NVRAM.

Default	enabled
Format	boot host dhcp
Mode	Privileged EXEC

no boot host dhcp

Use this command to disable AutoInstall for the next reboot cycle.

Format	no boot host dhcp
Mode	Privileged EXEC

boot host autosave

Use this command to automatically save the downloaded configuration file to the startup-config file on the switch. When autosave is disabled, you must explicitly save the downloaded configuration to non-volatile memory by using the `write memory` or `copy system:running-config nvram:startup-config` command. If the switch reboots and the downloaded configuration has not been saved, the AutoInstall process begins, if the feature is enabled.

Default	disabled

Format	boot host autosave
Mode	Privileged EXEC

no boot host autosave

Use this command to disable automatically saving the downloaded configuration on the switch.

Format	no boot host autosave
Mode	Privileged EXEC

erase startup-config

Use this command to erase the text-based configuration file stored in non-volatile memory. If the switch boots and no startup-config file is found, the AutoInstall process automatically begins.

Format	erase startup-config
Mode	Privileged EXEC

erase factory-defaults

Use this command to erase the text-based factory-defaults file stored in non-volatile memory.

Default	Disable
Format	erase factory-defaults
Mode	Privileged EXEC

show autoinstall

This command displays the current status of the AutoInstall process.

Format	show autoinstall
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(switch) #show autoinstall
AutoInstall Mode............................... Stopped
AutoInstall Persistent Mode.................... Disabled
AutoSave Mode.................................. Disabled
AutoInstall Retry Count........................ 3
```

Bonjour Commands

Bonjour is a protocol developed by Apple to provide zero-configuration networking over IP. The Bonjour protocol provides IP configuration without a server, name resolution without a name server, and the ability for a Bonjour-capable client to discover specific services in the network. The client does not need any information about the network to use the functionality that Bonjour provides.

Bonjour advertises the services (HTTP, HTTPS, Telnet, SSH) that are supported by the software. CE0128XB/CE0152XB does not parse the services available on the network; it publishes the list of the services that are available with the CE0128XB/CE0152XB-based device.

bonjour run

Use this command to enable Bonjour on the switch.

Default	enabled
Format	bonjour run
Mode	Global Config

no bonjour run

Use this command to disable Bonjour on the switch.

Format	no bonjour run
Mode	Global Config

show bonjour

Use this command to show information about the Bonjour service and configuration on the switch.

Format	show bonjour
Mode	Privileged EXEC

Example:

```
(Routing) #show bonjour

Bonjour Administration Mode: Enabled

Published Services:

 #  Service Name      Type           Domain       Port   TXT data
--- ----------------- --------------- ------------ ------ -------------------------------------
 1  switchD4B273      _http._tcp.     local.       80     path=/

 2  switchD4B273      _telnet._tcp.   local.       23
```

CLI Output Filtering Commands

show *xxx*|include “*string*”

The `command xxx` is executed and the output is filtered to only show lines containing the `"string"` match. All other non-matching lines in the output are suppressed.

Example: The following shows an example of the CLI command.

```
(Routing) #show running-config | include “spanning-tree”

spanning-tree configuration name "00-02-BC-42-F9-33"
spanning-tree bpduguard
spanning-tree bpdufilter default
```

show *xxx*|include “*string*” exclude “*string2*”

The command `xxx` is executed and the output is filtered to only show lines containing the `"string"` match and not containing the `"string2"` match. All other non-matching lines in the output are suppressed. If a line of output contains both the include and exclude strings then the line is not displayed.

Example: The following shows example of the CLI command.

```
(Routing) #show running-config | include “spanning-tree” exclude “configuration”

spanning-tree bpduguard
spanning-tree bpdufilter default
```

show *xxx*|exclude “*string*”

The command `xxx` is executed and the output is filtered to show all lines not containing the `"string"` match. Output lines containing the `"string"` match are suppressed.

Example: The following shows an example of the CLI command.

```
(Routing) #show interface 0/1

Packets Received Without Error................. 0
Packets Received With Error.................... 0
Broadcast Packets Received..................... 0
Receive Packets Discarded...................... 0
Packets Transmitted Without Errors............. 0
Transmit Packets Discarded..................... 0
Transmit Packet Errors......................... 0
Collision Frames............................... 0
Time Since Counters Last Cleared............... 281 day 4 hr 9 min 0 sec

(Routing) #show interface 0/1 | exclude “Packets”

Transmit Packet Errors......................... 0
Collision Frames............................... 0
Time Since Counters Last Cleared............... 20 day 21 hr 30 min 9 sec
```

show *xxx*|begin “*string*”

The command `xxx` is executed and the output is filtered to show all lines beginning with and following the first line containing the `"string"` match. All prior lines are suppressed.

Example: The following shows an example of the CLI command.

```
(Routing) #show port all | begin "1/1"

1/1     Enable          Down  Disable N/A   N/A
1/2     Enable          Down  Disable N/A   N/A
1/3     Enable          Down  Disable N/A   N/A
1/4     Enable          Down  Disable N/A   N/A
1/5     Enable          Down  Disable N/A   N/A
1/6     Enable          Down  Disable N/A   N/A

(Routing) #
```

show *xxx*|section "*string*"

The command `xxx` is executed and the output is filtered to show only lines included within the section(s) identified by lines containing the `"string"` match and ending with the first line containing the default end-of-section identifier (i.e. "exit").

Example: The following shows an example of the CLI command.

```
(Routing) #show running-config | section "interface 0/1"

interface 0/1
no spanning-tree port mode
exit
```

show *xxx*|section "*string*" "*string2*"

The command `xxx` is executed and the output is filtered to only show lines included within the section(s) identified by lines containing the "`string`" match and ending with the first line containing the "`string2`" match. If multiple sessions matching the specified string match criteria are part of the base output, then all instances are displayed.

show *xxx*|section "*string*" include "*string2*"

The command `xxx` is executed and the output is filtered to only show lines included within the section(s) identified by lines containing the "`string`" match and ending with the first line containing the default end-of-section identifier (i.e. "exit") and that include the "`string2`" match. This type of filter command could also include "`exclude`" or user-defined end-of-section identifier parameters as well.

Dual Image Commands

CE0128XB/CE0152XB software supports a dual image feature that allows the switch to have two software images in the permanent storage. You can specify which image is the active image to be loaded in subsequent reboots. This feature allows reduced down-time when you upgrade or downgrade the software.

delete

This command deletes the backup image file from the permanent storage or the core dump file from the local file system. This operation will take approximately two minutes. Do not remove power during this operation. The console is not available and commands may not be entered during this operation.

Deleting the backup image requires confirmation as follows:

```
Deleting image backup. This operation may take a few minutes.
The console prompt will return when the operation is complete.
Are you sure (y/n)?
```

Enter a **y** to confirm the operation.

The optional `unit` parameter is valid only on Stacks. Error will be returned, if this parameter is provided, on Standalone systems. In a stack, the `unit` parameter identifies the node on which this command must be executed. When this parameter is not supplied, the command is executed on all nodes in a Stack.

Format	delete [*unit*] backup delete core-dump-file *file-name* | all
Mode	Privileged EXEC

boot system

This command activates the specified image. It will be the active-image for subsequent reboots and will be loaded by the boot loader. The current active-image is marked as the backup-image for subsequent reboots. If the specified image doesn't exist on the system, this command returns an error message. The optional `unit` parameter is valid only in Stacking, where the `unit` parameter identifies the node on which this command must be executed. When this parameter is not supplied, the command is executed on all nodes in a Stack.

Format	boot system [*unit*] {active | backup}
Mode	Privileged EXEC

show bootvar

This command displays the version information and the activation status for the current active and backup images on the supplied unit (node) of the Stack. If you do not specify a unit number, the command displays image details for all nodes on the Stack. The command also displays any text description associated with an image. This command, when used on a Standalone system, displays the switch activation status. For a standalone system, the unit parameter is not valid.

Format	show bootvar *[unit]*
Mode	Privileged EXEC

update bootcode

This command updates the bootcode (boot loader) on the switch. The bootcode is read from the active-image for subsequent reboots.The optional *unit* parameter is valid only on Stacks. Error will be returned, if this parameter is provided, on Standalone systems. For Stacking, the *unit* parameter identifies the node on which this command must be executed. When this parameter is not supplied, the command is executed on all nodes in a Stack.

Format	update bootcode [*unit*]
Mode	Privileged EXEC

System Information and Statistics Commands

This section describes the commands you use to view information about system features, components, and configurations.

load-interval

This command changes the length of time for which data is used to compute load statistics. The value is given in seconds, and must be a multiple of 30. The allowable range for `interval` is from 30 to 600 seconds. The smaller the value of the load interval is, the more accurate is the instantaneous rate given by load statistics. Smaller values may affect system performance.

Default	300 seconds
Format	load-interval *interval*
Mode	Interface Config

Example:

```
(Routing) (Interface 0/1)#load-interval 30
```

no load-interval

This command resets the load interval on the interface to the default value.

Format	load-interval *interval*
Mode	Interface Config

show arp switch

This command displays the contents of the IP stack's Address Resolution Protocol (ARP) table. The IP stack only learns ARP entries associated with the management interfaces - network or service ports. ARP entries associated with routing interfaces are not listed.

Format	show arp switch
Mode	Privileged EXEC

Parameter	Definition
IP Address	IP address of the management interface or another device on the management network.
MAC Address	Hardware MAC address of that device.
Interface	For a service port the output is *`Management`*. For a network port, the output is the *`unit/slot/port`* of the physical interface.

show eventlog

This command displays the event log, which contains error messages from the system. The event log is not cleared on a system reset. The `unit` is the switch identifier.

Format	show eventlog [*unit*]
Mode	Privileged EXEC

Parameter	Definition
File	The file in which the event originated.
Line	The line number of the event.
Task Id	The task ID of the event.
Code	The event code.
Time	The time this event occurred.
Unit	The unit for the event.

Note: Event log information is retained across a switch reset.

show hardware

This command displays inventory information for the switch.

Note: The `show version` command and the `show hardware` command display the same information. In future releases of the software, the `show hardware` command will not be available. For a description of the command output, see the command "show version" on page 173.

Format	show hardware
Mode	Privileged EXEC

show version

This command displays inventory information for the switch.

Note: The `show version` command will replace the `show hardware` command in future releases of the software.

Format	show version
Mode	Privileged EXEC

Parameter	Definition
System Description	Text used to identify the product name of this switch.
Machine Type	The machine model as defined by the Vital Product Data.
Machine Model	The machine model as defined by the Vital Product Data
Serial Number	The unique box serial number for this switch.
Part Number	Manufacturing part number.

Parameter	Definition
Maintenance Level	Hardware changes that are significant to software.
Manufacturer	Manufacturer descriptor field.
Burned in MAC Address	Universally assigned network address.
Software Version	The release.version.revision number of the code currently running on the switch.
Operating System	The operating system currently running on the switch.
Network Processing Device	The type of the processor microcode.
Additional Packages	The additional packages incorporated into this system.

show platform vpd

This command displays vital product data for the switch.

Format	show platform vpd
Mode	User Privileged

The following information is displayed.

Parameter	Definition
Operational Code Image File Name	Build Signature loaded into the switch
Software Version	Release Version Maintenance Level and Build (RVMB) information of the switch.
Timestamp	Timestamp at which the image is built

Example: The following shows example CLI display output for the command.

```
(Routing) #show platform vpd
Operational Code Image File Name............... Lenovo-Campus-NOSr12v13m17b15
Software Version.............................. 8.4.3
Timestamp..................................... Thu Dec 13 17:17:00 EST 2018
```

show interface

This command displays a summary of statistics for a specific interface or a count of all CPU traffic based upon the argument.

Format	show interface {*unit/slot/port* | switchport | lag *lag-id*}
Mode	Privileged EXEC

The display parameters, when the argument is `unit/slot/port` or `lag lag-id`, are as follows:

Parameters	Definition
Packets Received Without Error	The total number of packets (including broadcast packets and multicast packets) received by the processor.
Packets Received With Error	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
Broadcast Packets Received	The total number of packets received that were directed to the broadcast address. Note that this does not include multicast packets.
Receive Packets Discarded	The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffered space.
Packets Transmitted Without Error	The total number of packets transmitted out of the interface.
Transmit Packets Discarded	The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.
Transmit Packets Errors	The number of outbound packets that could not be transmitted because of errors.
Collisions Frames	The best estimate of the total number of collisions on this Ethernet segment.
Load Interval	The length of time for which data is used to compute load statistics. The value is given in seconds, and must be a multiple of 30. The allowable range is from 30 to 600 seconds
Bits Per Second Received	Approximate number of bits per second received. This value is an exponentially weighted average and is affected by the configured load-interval.
Bits Per Second Transmitted.	Approximate number of bits per second transmitted. This value is an exponentially weighted average and is affected by the configured load-interval.
Packets Per Second Received	Approximate number of packets per second received. This value is an exponentially weighted average and is affected by the configured load-interval.
Packets Per Second Transmitted	Approximate number of packets per second transmitted. This value is an exponentially weighted average and is affected by the configured load-interval.
Percent Utilization Received	Value of link utilization in percentage representation for the RX line.
Percent Utilization Transmitted	Value of link utilization in percentage representation for the TX line.
Link Flaps	The number of link flaps (link up and down cycle) that have occurred.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds since the statistics for this port were last cleared.

The display parameters, when the argument is “switchport” are as follows:

Parameter	Definition
Packets Received Without Error	The total number of packets (including broadcast packets and multicast packets) received by the processor.

Parameter	Definition
Broadcast Packets Received	The total number of packets received that were directed to the broadcast address. Note that this does not include multicast packets.
Packets Received With Error	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
Packets Transmitted Without Error	The total number of packets transmitted out of the interface.
Broadcast Packets Transmitted	The total number of packets that higher-level protocols requested to be transmitted to the Broadcast address, including those that were discarded or not sent.
Transmit Packet Errors	The number of outbound packets that could not be transmitted because of errors.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds since the statistics for this switch were last cleared.

show interfaces status

Use this command to display interface information, including the description, port state, speed and auto-neg capabilities. The command is similar to `show port all` but displays additional fields like interface description and port-capability.

The description of the interface is configurable through the existing command `description <name>` which has a maximum length of 64 characters that is truncated to 28 characters in the output. The long form of the description can be displayed using `show port description`. The interfaces displayed by this command are physical interfaces, LAG interfaces and VLAN routing interfaces.

Format show interfaces status [{*unit/slot/port* | vlan *id*}]

Mode Privileged EXEC

Field	Description
Port	The interface associated with the rest of the data in the row.
Name	The descriptive user-configured name for the interface.
Link State	Indicates whether the link is up or down.
Physical Mode	The speed and duplex settings on the interface.
Physical Status	Indicates the port speed and duplex mode for physical interfaces. The physical status for LAGs is not reported. When a port is down, the physical status is unknown.
Media Type	The media type of the interface.
Flow Control Status	The 802.3x flow control status.
Flow Control	The configured 802.3x flow control mode.

show interface counters

This command reports key summary statistics for all the ports (physical/CPU/port-channel).

Format show interface counters

Mode Privileged EXEC

Parameter	Definition
Port	The interface associated with the rest of the data in the row.
InOctects	The total number of octets received on the interface.
InUcastPkts	The total number of unicast packets received on the interface.
InMcastPkts	The total number of multicast packets received on the interface.
InBcastPkts	The total number of broadcast packets received on the interface.
OutOctects	The total number of octets transmitted by the interface.
OutUcastPkts	The total number of unicast packets transmitted by the interface.
OutMcastPkts	The total number of multicast packets transmitted by the interface.
OutBcastPkts	The total number of broadcast packets transmitted by the interface.

Example: The following shows example CLI display output for the command.

```
(Routing) #show interface counters

Port        InOctets     InUcastPkts     InMcastPkts     InBcastPkts
--------- ---------------- ---------------- ---------------- ----------------

0/1              0              0              0              0

Port        InOctets     InUcastPkts     InMcastPkts     InBcastPkts
--------- ---------------- ---------------- ---------------- ----------------
0/1                                                       0   0    0 0
0/2                                                        0   0    0     0
0/3                                                       150980        3139
0/4                                                        000    0
0/5                                                        000    0
...
...
ch1                                                        0000
ch2                                                        0000
...
ch64                                                       0 000
CPU                                                       3595330 3044217

Port        OutOctets     OutUcastPkts     OutMcastPkts     OutBcastPkts
--------- ---------------- ---------------- ---------------- ----------------
0/1                                                        0000
0/2                                                       00 00
0/3                                                       131369             0 1189
0/4                                                        000 0
0/5                                                        0000
...
...
ch1                                                        0000
ch2                                                        0000
...
ch64                                                       0000
CPU                                                       40252930 32910120
```

show interface ethernet

This command displays detailed statistics for a specific interface or for all CPU traffic based upon the argument.

Format	show interface ethernet {*unit/slot/port* | all}
Mode	Privileged EXEC

When you specify a value for `unit/slot/port`, the command displays the following information.

Parameter	Definition
Packets Received	• **Total Packets Received (Octets)** - The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including Frame Check Sequence (FCS) octets). This object can be used as a reasonable estimate of Ethernet utilization. If greater precision is desired, the etherStatsPkts and etherStatsOctets objects should be sampled before and after a common interval. The result of this equation is the value Utilization which is the percent utilization of the Ethernet segment on a scale of 0 to 100 percent. • **Packets Received 64 Octets** - The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets). • **Packets Received 65–127 Octets** - The total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets). • **Packets Received 128–255 Octets** - The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets). • **Packets Received 256–511 Octets** - The total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets). • **Packets Received 512–1023 Octets** - The total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets). • **Packets Received 1024–1518 Octets** - The total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets). • **Packets Received > 1518 Octets** - The total number of packets received that were longer than 1522 octets (excluding framing bits, but including FCS octets) and were otherwise well formed.
	• **Packets RX and TX 64 Octets** - The total number of packets (including bad packets) received and transmitted that were 64 octets in length (excluding framing bits but including FCS octets). • **Packets RX and TX 65–127 Octets** - The total number of packets (including bad packets) received and transmitted that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets). • **Packets RX and TX 128–255 Octets** - The total number of packets (including bad packets) received and transmitted that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets). • **Packets RX and TX 256–511 Octets** - The total number of packets (including bad packets) received and transmitted that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).

Parameter	Definition
Packets Received (con't)	• **Packets RX and TX 512–1023 Octets** - The total number of packets (including bad packets) received and transmitted that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets). • **Packets RX and TX 1024–1518 Octets** - The total number of packets (including bad packets) received and transmitted that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets). • **Packets RX and TX 1519–2047 Octets** - The total number of packets received and transmitted that were between 1519 and 2047 octets in length inclusive (excluding framing bits, but including FCS octets) and were otherwise well formed. • **Packets RX and TX 1523–2047 Octets** - The total number of packets received and transmitted that were between 1523 and 2047 octets in length inclusive (excluding framing bits, but including FCS octets) and were otherwise well formed. • **Packets RX and TX 2048–4095 Octets** - The total number of packets received that were between 2048 and 4095 octets in length inclusive (excluding framing bits, but including FCS octets) and were otherwise well formed. • **Packets RX and TX 4096–9216 Octets** - The total number of packets received that were between 4096 and 9216 octets in length inclusive (excluding framing bits, but including FCS octets) and were otherwise well formed.
Packets Received Successfully	• **Total Packets Received Without Error** - The total number of packets received that were without errors. • **Unicast Packets Received** - The number of subnetwork-unicast packets delivered to a higher-layer protocol. • **Multicast Packets Received** - The total number of good packets received that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address. • **Broadcast Packets Received** - The total number of good packets received that were directed to the broadcast address. Note that this does not include multicast packets.
Receive Packets Discarded	The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.

Parameter	Definition
Received Packet Error Counts	• **Total Packets Received with MAC Errors** - The total number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol. • **Jabbers Received** - The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). Note that this definition of jabber is different than the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition where any packet exceeds 20 ms. The allowed range to detect jabber is between 20 ms and 150 ms. • **Fragments/Undersize Received** - The total number of packets received that were less than 64 octets in length (excluding framing bits but including FCS octets). • **Alignment Errors** - The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad Frame Check Sequence (FCS) with a non-integral number of octets. • **FCS Errors -** The total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad Frame Check Sequence (FCS) with an integral number of octets. • **Overruns** - The total number of frames discarded as this port was overloaded with incoming packets, and could not keep up with the inflow.
Received Packets Not Forwarded	• **Total Received Packets Not Forwarded** - A count of valid frames received which were discarded (in other words, filtered) by the forwarding process • **802.3x Pause Frames Received** - A count of MAC Control frames received on this interface with an opcode indicating the PAUSE operation. This counter does not increment when the interface is operating in half-duplex mode. • **Unacceptable Frame Type** - The number of frames discarded from this port due to being an unacceptable frame type.

Parameter	Definition
Packets Transmitted Octets	- **Total Packets Transmitted (Octets)** - The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets). This object can be used as a reasonable estimate of Ethernet utilization. If greater precision is desired, the etherStatsPkts and etherStatsOctets objects should be sampled before and after a common interval. - **Packets Transmitted 64 Octets** - The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets). - **Packets Transmitted 65-127 Octets** - The total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets). - **Packets Transmitted 128-255 Octets** - The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets). - **Packets Transmitted 256-511 Octets** - The total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets). - **Packets Transmitted 512-1023 Octets** - The total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets). - **Packets Transmitted 1024-1518 Octets** - The total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets). - **Packets Transmitted > 1518 Octets** - The total number of packets transmitted that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed. - **Max Frame Size** - The maximum size of the Info (non-MAC) field that this port will receive or transmit. - **Maximum Transmit Unit** - The maximum Ethernet payload size.
Packets Transmitted Successfully	- **Total Packets Transmitted Successfully**- The number of frames that have been transmitted by this port to its segment. - **Unicast Packets Transmitted** - The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent. - **Multicast Packets Transmitted** - The total number of packets that higher-level protocols requested be transmitted to a Multicast address, including those that were discarded or not sent. - **Broadcast Packets Transmitted** - The total number of packets that higher-level protocols requested be transmitted to the Broadcast address, including those that were discarded or not sent.
Transmit Packets Discarded	The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.
Transmit Errors	- **Total Transmit Errors** - The sum of Single, Multiple, and Excessive Collisions. - **FCS Errors** - The total number of packets transmitted that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had a bad Frame Check Sequence (FCS) with an integral number of octets. - **Underrun Errors** - The total number of frames discarded because the transmit FIFO buffer became empty during frame transmission.

Parameter	Definition
Transmit Discards	- **Total Transmit Packets Discards** - The sum of single collision frames discarded, multiple collision frames discarded, and excessive frames discarded. - **Single Collision Frames** - A count of the number of successfully transmitted frames on a particular interface for which transmission is inhibited by exactly one collision. - **Multiple Collision Frames** - A count of the number of successfully transmitted frames on a particular interface for which transmission is inhibited by more than one collision. - **Excessive Collisions** - A count of frames for which transmission on a particular interface fails due to excessive collisions. - **Port Membership Discards** - The number of frames discarded on egress for this port due to egress filtering being enabled.
Protocol Statistics	- **802.3x Pause Frames Transmitted** - A count of MAC Control frames transmitted on this interface with an opcode indicating the PAUSE operation. This counter does not increment when the interface is operating in half-duplex mode. - **GVRP PDUs Received** - The count of GVRP PDUs received in the GARP layer. - **GVRP PDUs Transmitted** - The count of GVRP PDUs transmitted from the GARP layer. - **GVRP Failed Registrations** - The number of times attempted GVRP registrations could not be completed. - **GMRP PDUs Received** - The count of GMRP PDUs received in the GARP layer. - **GMRP PDUs Transmitted** - The count of GMRP PDUs transmitted from the GARP layer. - **GMRP Failed Registrations** - The number of times attempted GMRP registrations could not be completed. - **STP BPDUs Transmitted** - Spanning Tree Protocol Bridge Protocol Data Units sent. - **STP BPDUs Received** - Spanning Tree Protocol Bridge Protocol Data Units received. - **RST BPDUs Transmitted** - Rapid Spanning Tree Protocol Bridge Protocol Data Units sent. - **RSTP BPDUs Received** - Rapid Spanning Tree Protocol Bridge Protocol Data Units received. - **MSTP BPDUs Transmitted** - Multiple Spanning Tree Protocol Bridge Protocol Data Units sent. - **MSTP BPDUs Received** - Multiple Spanning Tree Protocol Bridge Protocol Data Units received. - **SSTP BPDUs Transmitted** - Shared Spanning Tree Protocol Bridge Protocol Data Units sent. - **SSTP BPDUs Received** - Shared Spanning Tree Protocol Bridge Protocol Data Units received.
Dot1x Statistics	- **EAPOL Frames Transmitted** - The number of EAPOL frames of any type that have been transmitted by this authenticator. - **EAPOL Start Frames Received** - The number of valid EAPOL start frames that have been received by this authenticator.

Parameter	Definition
Traffic Load Statistics	• **Load Interval** - The length of time for which data is used to compute load statistics. The value is given in seconds, and must be a multiple of 30. The allowable range is from 30 to 600 seconds • **Bits Per Second Received** - Approximate number of bits per second received. This value is an exponentially weighted average and is affected by the configured load-interval. • **Bits Per Second Transmitted**. - Approximate number of bits per second transmitted. This value is an exponentially weighted average and is affected by the configured load-interval. • **Packets Per Second Received**- Approximate number of packets per second received. This value is an exponentially weighted average and is affected by the configured load-interval. • **Packets Per Second Transmitted** - Approximate number of packets per second transmitted. This value is an exponentially weighted average and is affected by the configured load-interval. • **Percent Utilization Received** - Value of link utilization in percentage representation for the RX line. • **Percent Utilization Transmitted** - Value of link utilization in percentage representation for the TX line.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds since the statistics for this port were last cleared.

If you use the `all` keyword, the following information appears for all interfaces on the switch.

Parameter	Definition
Port	The Interface ID.
Bytes Tx	The total number of bytes transmitted by the interface.
Bytes Rx	The total number of bytes transmitted by the interface.
Packets Tx	The total number of packets transmitted by the interface.
Packets Rx	The total number of packets transmitted by the interface.

show interface lag

Use this command to display configuration information about the specified LAG interface.

Format	show interface lag *lag-intf-num*
Mode	Privileged EXEC

Parameters	Definition
Packets Received Without Error	The total number of packets (including broadcast packets and multicast packets) received on the LAG interface
Packets Received With Error	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
Broadcast Packets Received	The total number of packets received that were directed to the broadcast address. Note that this does not include multicast packets.

Parameters	Definition
Receive Packets Discarded	The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.
Packets Transmitted Without Error	The total number of packets transmitted out of the LAG.
Transmit Packets Discarded	The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. A possible reason for discarding a packet could be to free up buffer space.
Transmit Packets Errors	The number of outbound packets that could not be transmitted because of errors.
Collisions Frames	The best estimate of the total number of collisions on this Ethernet segment.
Time Since Counters Last Cleared	The elapsed time, in days, hours, minutes, and seconds since the statistics for this LAG were last cleared.

show fiber-ports optical-transceiver

This command displays the diagnostics information of the SFP like Temp, Voltage, Current, Input Power, Output Power, Tx Fault, and LOS. The values are derived from the SFP's A2 (Diagnostics) table using the I^{2}C interface.

Format	show fiber-ports optical-transceiver {all | *unit/slot/port*}
Mode	Privileged EXEC

Field	Description
Temp	Internally measured transceiver temperature.
Voltage	Internally measured supply voltage.
Current	Measured TX bias current.
Output Power	Measured optical output power relative to 1mW.
Input Power	Measured optical power received relative to 1mW.
TX Fault	Transmitter fault.
LOS	Loss of signal.

Example: The following information shows an example of the command output:

```
(Switch) #show fiber-ports optical-transceiver all

                                  Output  Input
Port   Physical Port/  Temp  Voltage  Current  Power   Power    TX    LOS
       Lane Number     [C]   [Volt]    [mA]   [dBm]   [dBm]    Fault
------ -------------- ---- ------- -------  ------- -------  ----- ---
1/0/25  1/0/25-Lane1   26.3   3.302     5.5  -40.000  -2.204  No    No
1/0/27  1/0/27-Lane1   26.5   3.298     5.0   -2.257 -40.000  No    Yes
1/0/28  1/0/28-Lane1   29.0   3.303     7.0   -2.346 -40.000  No    Yes

 Temp - Internally measured transceiver temperatures.
 Voltage - Internally measured supply voltage.
 Current - Measured TX bias current.
 Output Power - Measured optical output power relative to 1mW.
```

Input Power - Measured optical power received relative to 1mW.
TX Fault - Transmitter fault.
LOS - Loss of signal.

show fiber-ports optical-transceiver-info

This command displays the SFP vendor related information like Vendor Name, Serial Number of the SFP, Part Number of the SFP. The values are derived from the SFP's A0 table using the I^2C interface.

Format	show fiber-ports optical-transceiver-info {all | *slot/port*}
Mode	Privileged EXEC

Field	Description
Vendor Name	The vendor name is a 16 character field that contains ASCII characters, left-aligned and padded on the right with ASCII spaces (20h). The vendor name shall be the full name of the corporation, a commonly accepted abbreviation of the name of the corporation, the SCSI company code for the corporation, or the stock exchange code for the corporation.
Length (50um, OM2)	This value specifies link length that is supported by the transceiver while operating in compliance with applicable standards using 50 micron multimode OM2 [500MHz*km at 850nm] fiber. A value of zero means that the transceiver does not support 50 micron multimode fiber or that the length information must be determined from the transceiver technology.
Length (62.5um, OM1)	This value specifies link length that is supported by the transceiver while operating in compliance with applicable standards using 62.5 micron multimode OM1 [200 MHz*km at 850nm, 500 MHz*km at 1310nm] fiber. A value of zero means that the transceiver does not support 62.5 micron multimode fiber or that the length information must determined from the transceiver technology
Vendor SN	The vendor serial number (vendor SN) is a 16 character field that contains ASCII characters, left-aligned and padded on the right with ASCII spaces (20h), defining the vendor's serial number for the transceiver. A value of all zero in the 16-byte field indicates that the vendor SN is unspecified.
Vendor PN	The vendor part number (vendor PN) is a 16-byte field that contains ASCII characters, left aligned and added on the right with ASCII spaces (20h), defining the vendor part number or product name. A value of all zero in the 16-byte field indicates that the vendor PN is unspecified.
BR, nominal	The nominal bit (signaling) rate (BR, nominal) is specified in units of 100 MBd, rounded off to the nearest 100 MBd. The bit rate includes those bits necessary to encode and delimit the signal as well as those bits carrying data information. A value of 0 indicates that the bit rate is not specified and must be determined from the transceiver technology. The actual information transfer rate will depend on the encoding of the data, as defined by the encoding value.
Vendor Rev	The vendor revision number (vendor rev) contains ASCII characters, left aligned and padded on the right with ASCII spaces (20h), defining the vendor's product revision number. A value of all zero in this field indicates that the vendor revision is unspecified.

Example: The following information shows an example of the command output:

```
(Switch) #show fiber-ports optical-transceiver-info all
                                                  Link Link                    Nominal
                Length Length                  Bit Rate
    Number            50um 62.5um                  Per Lane
Port   of Lanes Vendor Name     [m] [m]  Serial Number   Part Number    [Mbps]   Rev  Compliance
------ -------- ---------------- --- ---- ---------------- ---------------- -----   ---- ----------------
1/0/49   1    IBM-Avago      0  0   Y250UC755C2E    78P3177-N81713   1200      1000T
1/0/50   1    Blade Network   55  27  BNTM732ULJ      BN-CKM-S-SX      1200      1000SX
1/0/51   1    IBM-Avago      0  0   Y250UC87LC5K    78P3824-N82178   1200      1000T
1/0/52   1    LENV-Finisar    8  3    Y050RV75300P    00MY033-N32872W  10300  01  10GBase-SR
```

show mac-addr-table

This command displays the forwarding database entries. These entries are used by the transparent bridging function to determine how to forward a received frame.

Enter `all` or no parameter to display the entire table. Enter a MAC Address and VLAN ID to display the table entry for the requested MAC address on the specified VLAN. Enter the *`count`* parameter to view summary information about the forwarding database table. Use the *`interface unit/slot/port`* parameter to view MAC addresses on a specific interface.

Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number. Use the *`vlan vlan_id`* parameter to display information about MAC addresses on a specified VLAN.

Format	show mac-addr-table [{*macaddr vlan_id* | all | count | interface {*unit/slot/port* | *lag lag-id* | vlan *vlan_id*} | vlan *vlan_id*}]
Mode	Privileged EXEC

The following information displays if you do not enter a parameter, the keyword all, or the MAC address and VLAN ID.

Parameter	Definition
VLAN ID	The VLAN in which the MAC address is learned.
MAC Address	A unicast MAC address for which the switch has forwarding and or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example `67:89:AB`.
Interface	The port through which this address was learned.
Interface Index	This object indicates the ifIndex of the interface table entry associated with this port.

Parameter	Definition
Status	The status of this entry. The meanings of the values are: • *Static*—The value of the corresponding instance was added by the system or a user when a static MAC filter was defined. It cannot be relearned. • *Learned*—The value of the corresponding instance was learned by observing the source MAC addresses of incoming traffic, and is currently in use. • *Management*—The value of the corresponding instance (system MAC address) is also the value of an existing instance of dot1dStaticAddress. It is identified with interface 0/1. and is currently used when enabling VLANs for routing. • *Self*—The value of the corresponding instance is the address of one of the switch's physical interfaces (the system's own MAC address). • *GMRP Learned*—The value of the corresponding was learned via GMRP and applies to Multicast. • *Other*—The value of the corresponding instance does not fall into one of the other categories.

If you enter `vlan vlan_id`, only the MAC Address, Interface, and Status fields appear. If you enter the `interface unit/slot/port` parameter, in addition to the MAC Address and Status fields, the VLAN ID field also appears.

The following information displays if you enter the `count` parameter:

Parameter	Definition
Dynamic Address count	Number of MAC addresses in the forwarding database that were automatically learned.
Static Address (User-defined) count	Number of MAC addresses in the forwarding database that were manually entered by a user.
Total MAC Addresses in use	Number of MAC addresses currently in the forwarding database.
Total MAC Addresses available	Number of MAC addresses the forwarding database can handle.

process cpu threshold

Use this command to configure the CPU utilization thresholds. The Rising and Falling thresholds are specified as a percentage of CPU resources. The utilization monitoring time period can be configured from 5 seconds to 86400 seconds in multiples of 5 seconds. The CPU utilization threshold configuration is saved across a switch reboot. Configuring the falling utilization threshold is optional. If the falling CPU utilization parameters are not configured, then they take the same value as the rising CPU utilization parameters.

Format	process cpu threshold type total rising *1-100* interval
Mode	Global Config

Parameter	Description
rising threshold	The percentage of CPU resources that, when exceeded for the configured rising interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled).
rising interval	The duration of the CPU rising threshold violation, in seconds, that must be met to trigger a notification. The range is 5 to 86400. The default is 0 (disabled).
falling threshold	The percentage of CPU resources that, when usage falls below this level for the configured interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled). A notification is triggered when the total CPU utilization falls below this level for a configured period of time. The falling utilization threshold notification is made only if a rising threshold notification was previously done. The falling utilization threshold must always be equal or less than the rising threshold value. The CLI does not allow setting the falling threshold to be greater than the rising threshold.
falling interval	The duration of the CPU falling threshold, in seconds, that must be met to trigger a notification. The range is 5 to 86400. The default is 0 (disabled).

show process app-list

This command displays the user and system applications.

Note: This command is available in Linux 2.6 only.

Format	show process app-list
Mode	Privileged EXEC

Parameter	Description
ID	The application identifier.
Name	The name that identifies the process.
PID	The number the software uses to identify the process.
Admin Status	The administrative status of the process.
Auto Restart	Indicates whether the process will automatically restart if it stops.
Running Status	Indicates whether the process is currently running or stopped.

Example: The following shows example CLI display output for the command.

```
                       Admin    Auto     Running
ID   Name          PID  Status   Restart  Status
---- ---------------- ----- --------- --------- -------
   1 dataplane       15309 Enabled   Disabled  Running
   2 switchdrvr      15310 Enabled   Disabled  Running
   3 syncdb          15314 Enabled   Disabled  Running
   4 lighttpd        18718 Enabled   Enabled   Running
   5 syncdb-test         0 Disabled  Disabled  Stopped
   6 proctest            0 Disabled  Enabled   Stopped
   7 user.start          0 Enabled   Disabled  Stopped
```

show process app-resource-list

This command displays the configured and in-use resources of each application.

Note: This command is available in Linux 2.6 only.

Format	show process app-resource-list
Mode	Privileged EXEC

Parameter	Description
ID	The application identifier.
Name	The name that identifies the process.
PID	The number the software uses to identify the process.
Memory Limit	The maximum amount of memory the process can consume.
CPU Share	The maximum percentage of CPU utilization the process can consume.
Memory Usage	The amount of memory the process is currently using.
Max Mem Usage	The maximum amount of memory the process has used at any given time since it started.

```
(Routing) #show process app-resource-list
                    Memory     CPU      Memory     Max Mem
ID   Name            PID  Limit      Share     Usage      Usage
---- ---------------- ---- ----------- --------- ----------- -----------
   1 switchdrvr       251   Unlimited Unlimited     380 MB     381 MB
   2 syncdb         252   Unlimited Unlimited       0 MB       0 MB
   3 syncdb-test       0   Unlimited Unlimited       0 MB       0 MB
   4 proctest        0       10 MB       20%       0 MB       0 MB
   5 utelnetd         0   Unlimited Unlimited       0 MB       0 MB
   6 lxshTelnetd       0   Unlimited Unlimited       0 MB       0 MB
   7 user.start       0   Unlimited Unlimited       0 MB       0 MB
```

show process cpu

This command provides the percentage utilization of the CPU by different tasks.

Note: Note the following:

- It is not necessarily the traffic to the CPU, but different tasks that keep the CPU busy.
- This command is available in Linux 2.6 only.

Format	show process cpu [*1-n* | all]
Mode	Privileged EXEC

Parameter	Description
Free	System wide free memory
Alloc	System wide allocated memory (excluding cache, file system used space)
Pid	Process or Thread Id
Name	Process or Thread Name
5Secs	CPU utilization sampling in 5Secs interval
60Secs	CPU utilization sampling in 60Secs interval
300Secs	CPU utilization sampling in 300Secs interval

Parameter	Description
Total CPU Utilization	Total CPU utilization % within the specified window of 5Secs, 60Secs and 300Secs.

Example: The following shows example CLI display output for the command using Linux.

```
(Routing) #show process cpu
Memory and Process CPU Utilization Info of Unit:1
Memory Utilization Report
status    KBytes
------ ----------
free      343856
alloc     672752
CPU Utilization:
PID       Name               5 Secs  60 Secs 300 Secs
---------- ------------------ -------- -------- --------
6        (kworker/u2:0)       0.00%    0.02%    0.02%
7        (rcu_preempt)        0.00%    0.05%    0.05%
1387     (procmgr)            0.41%    0.29%    0.28%
1474     bspTimer             0.00%    0.02%    0.00%
1496     osapiTimer           0.20%    0.16%    0.15%
1498     bcmINTR              0.00%    0.01%    0.02%
1499     socdmadesc.0         0.20%    0.19%    0.18%
1500     bcmMEM_SCAN.0        0.62%    0.32%    0.30%
1502     bcmL2X.0             3.32%    3.68%    3.68%
1503     bcmCNTR.0            1.03%    0.94%    0.94%
1509     bcmRX                0.00%    0.05%    0.05%
1523     bcmLINK.0            1.45%    1.50%    1.48%
1524     cpuUtilMonitorTask   0.62%    0.46%    0.46%
1526     tL7Timer0            0.00%    0.00%    0.01%
1538     simPts_task          0.20%    0.26%    0.27%
1550     emWeb                0.20%    0.03%    0.00%
1565     hapiBroadBfdCtrlTas  0.20%    0.34%    0.35%
1571     trafficStormControl  0.00%    0.00%    0.01%
1574     DHCP_snoop           0.00%    0.01%    0.01%
1575     DHCPV6_snoop         0.00%    0.02%    0.01%
1587     dot1s_timer_task     0.20%    0.20%    0.20%
1591     radius_task          0.00%    0.02%    0.01%
1596     unitMgrTask          0.00%    0.03%    0.01%
1600     snoopTask            0.00%    0.09%    0.11%
1609     dhcpsPingTask        0.00%    0.01%    0.02%
1616     sFlowTask            0.00%    0.01%    0.00%
1617     tUISM                0.00%    0.01%    0.00%
1628     spmTask              0.00%    0.01%    0.01%
1641     openrTask            0.62%    0.60%    0.62%
1644     (vr_agent_app)       0.00%    0.02%    0.01%
1659     (ospf_app)           0.00%    0.03%    0.03%
1660     IPSLAtask            0.00%    0.02%    0.02%
1682     lldpTask             0.00%    0.00%    0.01%
1690     isdpTask             0.00%    0.02%    0.01%
1692     RMONTask             2.07%    0.63%    0.51%
1693     boxs_Req             0.20%    0.32%    0.34%
1702     StatsAppTask         0.41%    0.32%    0.31%
1703     openConfigSyncTask   0.20%    0.03%    0.02%
1723     bonjourTask          0.20%    0.03%    0.01%
1733     envMonitorTask       0.20%    0.04%    0.03%
1748     poe_monitor          0.00%    0.09%    0.10%
1765     (lighttpd)           0.20%    0.03%    0.01%
1773     (netsnmp_app)        0.00%    0.00%    0.01%
------------------------------ -------- -------- --------
Total CPU Utilization         12.86%   11.12%   10.96%
```

show process proc-list

This application displays the processes started by applications created by the Process Manager.

Note: This command is available in Linux 2.6 only.

Format	show process proc-list
Mode	Privileged EXEC

Parameter	Description
PID	The number the software uses to identify the process.
Process Name	The name that identifies the process.
Application ID-Name	The application identifier and its associated name.
Child	Indicates whether the process has spawned a child process.
VM Size	Virtual memory size.
VM Peak	The maximum amount of virtual memory the process has used at a given time.
FD Count	The file descriptors count for the process.

Example: The following shows example CLI display output for the command.

```
(Routing) #show process proc-list
Process        Application               VM Size  VM Peak          Process
PID    Name           ID-VRID-Name           Chld  (KB)     (KB)    FD Count Up Time
----- ---------------- ----------------------- ---- -------- -------- -------- -----------------
 1387 procmgr         0-0-procmgr           No      2156     2156       8 1days-3:33:36
 1461 switchdrvr      1-0-switchdrvr        No    587708  589828      76 1days-3:33:34
 1462 syncdb          2-0-syncdb            No      5676     5676      32 1days-3:33:34
 1644 vr_agent_app    12-0-vr-agent-0       No     39072    40096      20 1days-3:33:19
 1659 ospf_app        13-0-ospf-00          No     48424    48424      17 1days-3:33:17
 1710 ping_app        14-0-ping-0           No     11540    11540      12 1days-3:33:14
 1717 traceroute_app  15-0-traceroute-0     No     11540    11540      12 1days-3:33:13
 1765 lighttpd        3-0-lighttpd          No      6968     6968      11 1days-3:33:6
 1769 lua_magnet      3-0-lighttpd          Yes    18788    18788       7 1days-3:33:5
 1771 lua_magnet      3-0-lighttpd          Yes    18788    18788       7 1days-3:33:5
 1773 netsnmp_app     4-0-netsnmp           No     14004    14004      14 1days-3:33:4
 1788 utelnetd        8-0-lxshTelnetd       No      1500     1500       7 0days-2:1:52
```

show running-config

Use this command to display or capture the current setting of different protocol packages supported on the switch. This command displays or captures commands with settings and configurations that differ from the default value. To display or capture the commands with settings and configurations that are equal to the default value, include the `all` option.

Note: Show running-config does not display the User Password, even if you set one different from the default.

The output is displayed in script format, which can be used to configure another switch with the same configuration. If the optional *`scriptname`* is provided with a file name extension of ".scr", the output is redirected to a script file.

Note: Note the following:

- If you issue the `show running-config` command from a serial connection, access to the switch through remote connections (such as Telnet) is suspended while the output is being generated and displayed.
- If you use a text-based configuration file, the `show running-config` command only displays configured physical interfaces (i.e. if any interface only contains the default configuration, that interface will be skipped from the `show running-config` command output). This is true for any configuration mode that contains nothing but default configuration. That is, the command to enter a particular config mode, followed immediately by its exit command, are both omitted from the `show running-config` command output (and hence from the startup-config file when the system configuration is saved.)

Use the following keys to navigate the command output.

Key	Action
Enter	Advance one line.
Space Bar	Advance one page.
q	Stop the output and return to the prompt.

Note that `--More-- or (q)uit` is displayed at the bottom of the output screen until you reach the end of the output.

This command captures the current settings of OSPFv2 and OSPFv3 trapflag status:

- If all the flags are enabled, then the command displays `trapflags all`.
- If all the flags in a particular group are enabled, then the command displays `trapflags` *`group name`* `all`.
- If some, but not all, of the flags in that group are enabled, the command displays `trapflags` *`groupname flag-name.`*

Format	show running-config [all | *scriptname*]
Mode	Privileged EXEC

show running-config interface

Use this command to display the running configuration for a specific interface. Valid interfaces include physical, LAG, loopback, tunnel and VLAN interfaces.

Format	show running-config interface {*interface* | lag {*lag-intf-num*} | loopback {*loopback-id*} | vlan {*vlan-id*}}
Mode	Privileged EXEC

Parameter	Description
interface	Running configuration for the specified interface.
lag-intf-num	Running configuration for the LAG interface.
loopback-id	Running configuration for the loopback interface.

Parameter	Description
vlan-id	Running configuration for the VLAN routing interface.

The following information is displayed for the command.

Parameter	Description
unit|slot|port	Enter an interface in unit/slot/port format.
lag	Display the running config for a specified lag interface.
loopback	Display the running config for a specified loopback interface.
tunnel	Display the running config for a specified tunnel interface.
vlan	Display the running config for a specified vlan routing interface.

Example: The following shows example CLI display output for the command.

```
(Routing) #show running-config interface 0/1
!Current Configuration:
!
interface  0/1
addport 3/1
exit
(Routing) #
```

show

This command displays the content of text-based configuration files from the CLI. The text-based configuration files (startup-config, backup-config and factory-defaults) are saved compressed in flash. With this command, the files are decompressed while displaying their content.

Format	show { startup-config | backup-config }
Mode	Privileged EXEC

Parameter	Description
startup-config	Display the content of the startup-config file.
backup-config	Display the content of the backup-config file.

Example: The following shows example CLI display output for the command using the startup-config parameter.

```
(Routing) #show startup-config
!Current Configuration:
!
!System Description "Lenovo CE0128PB Switch, 1.7.14.14, Linux 4.4.145, U-Boot 2012.10-0"
!System Software Version "8.4.3.14"
!System Up Time         "0 days 17 hrs 1 mins 34 secs"
!Additional Packages     QOS, Multicast,IPv6, IPv6 Management, Stacking, Routing
!Current SNTP Synchronized Time: SNTP Client Mode Is Disabled
!
hostname "dhcp-10-27-6-246"
vlan database
exit
ip http server
no ip http secure-server
ip telnet server enable
```

```
configure
stack
member 1 2
exit
slot 1/0 2
set slot power 1/0
no set slot disable 1/0
line console
exit
line telnet
exit
line ssh
exit
snmp-server sysname "dhcp-10-27-6-246"
!
router rip
exit
router ospf
exit
ipv6 router ospf
exit
exit
```

Example: The following shows example CLI display output for the command using the backup-config parameter.

```
(Routing) #show backup-config
!Current Configuration:
!
!System Description "Lenovo CE0128PB Switch, 8.4.3.14, Linux 4.4.145, U-Boot 2012.10-0"
!System Software Version "8.4.3.14"
!System Up Time          "0 days 17 hrs 1 mins 34 secs"
!Additional Packages     QOS, Multicast, IPv6,IPv6 Management, Stacking,Routing
!Current SNTP Synchronized Time: SNTP Client Mode Is Disabled
!
hostname "dhcp-10-27-6-246"
vlan database
exit
ip http server
no ip http secure-server
ip telnet server enable
configure
stack
member 1 2
exit
slot 1/0 2
set slot power 1/0
no set slot disable 1/0
line console
exit
line telnet
exit
line ssh
exit
snmp-server sysname "dhcp-10-27-6-246"
!
router rip
exit
router ospf
exit
ipv6 router ospf
exit
exit
```

dir

Use this command to list the files in the directory /mnt in flash from the CLI.

Format	dir
Mode	Privileged EXEC

show sysinfo

This command displays switch information.

Format	show sysinfo
Mode	Privileged EXEC

Parameter	Definition
Switch Description	Text used to identify this switch.
System Name	Name used to identify the switch.The factory default is blank. To configure the system name, see "snmp-server" on page 114.
System Location	Text used to identify the location of the switch. The factory default is blank. To configure the system location, see "snmp-server" on page 114.
System Contact	Text used to identify a contact person for this switch. The factory default is blank. To configure the system location, see "snmp-server" on page 114.
System ObjectID	The base object ID for the switch's enterprise MIB.
System Up Time	The time in days, hours and minutes since the last switch reboot.
Current SNTP Synchronized Time	The system time acquired from a network SNTP server.
MIBs Supported	A list of MIBs supported by this agent.

show tech-support

Use the `show tech-support` command to display system and configuration information when you contact technical support. The output of the `show tech-support` command combines the output of the following commands and includes log history files from previous runs:

- show version
- show sysinfo
- show hardware
- show interface ethernet switchport
- show port all
- show process cpu
- show process proc-list

- show process memory
- show mbuf total
- show switch
- show platform vpd
- show mac-addr-table
- show fiber-ports optical-transceivers-info all
- show interfaces debounce
- show debugging
- show vlan brief
- show vlan port all
- show port-channel all
- show arp
- show ip route
- show ip stats
- show ip vlan
- show routing heap summary
- show mac access-lists
- show ip access-lists
- show ipv6 access-lists
- show spanning-tree
- show spanning-tree active
- show stack-port
- show stack-port diag all
- show stack-port counters all
- show logging
- show logging buffered
- show logging persistent
- show logging traplogs
- show lldp remote-device all
- show isdp neighbors
- show link state group
- show running-config

Including the optional `ospf` parameter also displays OSPF information.

Format	show tech-support [ospf|ospfv3]
Mode	Privileged EXEC

length *value*

Use this command to set the pagination length to value number of lines for the sessions specified by configuring on different Line Config modes (telnet/ssh/console) and is persistent.

> **Example:** `Length` command on Line Console mode applies for Serial Console session.

Default	24
Format	length *value*
Mode	Line Config

no length *value*

Use this command to set the pagination length to the default value number of lines.

Format	no length *value*
Mode	Line Config

terminal length

Use this command to set the pagination length to *value* number of lines for the current session. This command configuration takes an immediate effect on the current session and is nonpersistent.

Default	24 lines per page
Format	terminal length *value*
Mode	Privileged EXEC

no terminal length

Use this command to set the *value* to the length value configured on Line Config mode depending on the type of session.

Format	no terminal length *value*
Mode	Privileged EXEC

show terminal length

Use this command to display all the configured terminal length values.

Format	show terminal length
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show terminal length
Terminal Length:
----------------------
For Current Session………………….. 24
```

memory free low-watermark processor

Use this command to get notifications when the CPU free memory falls below the configured threshold. A notification is generated when the free memory falls below the threshold. Another notification is generated once the available free memory rises to 10 percent above the specified threshold. To prevent generation of excessive notifications when the CPU free memory fluctuates around the configured threshold, only one Rising or Falling memory notification is generated over a period of 60 seconds. The threshold is specified in kilobytes. The CPU free memory threshold configuration is saved across a switch reboot.

Format memory free low-watermark processor *1-1016608*

Mode Global Config

Parameter	Description
low-watermark	When CPU free memory falls below this threshold, a notification message is triggered. The range is 1 to the maximum available memory on the switch. The default is 0 (disabled).

clear mac-addr-table

Use this command to dynamically clear learned entries from the forwarding database. Using the following options, the user can specify the set of dynamically-learned forwarding database entries to clear.

Default No default value.

Format clear mac-addr-table {all | vlan *vlanId* | interface *unit/slot/port* | *macAddr* [*macMask*]}

Mode Privileged EXEC

Parameter	Description
all	Clears dynamically learned forwarding database entries in the forwarding database table.
vlan *vlanId*	Clears dynamically learned forwarding database entries for this *vlanId*.
interface *unit/slot/port*	Clears forwarding database entries learned on for the specified interface.
macAddr macMask	Clears dynamically learned forwarding database entries that match the range specified by MAC address and MAC mask. When MAC mask is not entered, only specified MAC is removed from the forwarding database table.

Box Services Commands

This section describes the Box Services commands. Box services are services that provide support for features such as temperature, power supply status, fan control, and others. Each of these services is platform dependent. (For example, some platforms may have temperature sensors, but no fan controller. Or, others may have both while others have neither.)

Note: The bootloader version can only be supported on PowerPC platforms that use the u-boot loader.

environment temprange

Use this command to set the allowed temperature range for normal operation.

Format	environment temprange min *-100-100* max *-100-100*
Mode	Global Config

Parameter	Definition
min	Sets the minimum allowed temperature for normal operation. The range is between –100°C and 100°C. The default is 0°C.
max	Sets the maximum allowed temperature for normal operation. The range is between –100°C and 100°C. The default is 0°C.

environment trap

Use this command to configure environment status traps.

Format	environment trap {fan|powersupply|temperature}
Mode	Global Config

Parameter	Definition
fan	Enables or disables the sending of traps for fan status events. The default is enable.
powersupply	Enables or disables the sending of traps for power supply status events. The default is enable.
temperature	Enables or disables the sending of traps for temperature status events. The default is enable.

show environment

This command displays information about system disk space and usage.

Format	show environment
Mode	Privileged EXEC

Parameter	Definition
Unit	The system unit number.
Total Space	The total amount of disk space on the system, in KB.
Free Space	The amount of available disk space on the system, in KB.
Used Space	The amount of disk space in use on the system, in KB.
Utilization	The amount of disk space in use on the system, as a percentage of total disk space.

Example:

```
(Routing)(Config)#show environment
Temp (C)....................................... 17
Fan Speed, RPM................................. 5730
Fan Duty Level................................. 50%
Temperature traps range: 0 to 45 degrees (Celsius)
Temperature Sensors:
Unit    Sensor  Description      Temp (C)    State          Max_Temp (C)
----    ------  ----------------  ----------  -----------------  --------------
1       1       LM75             17          Normal         18
Fans:
Unit Fan Description    Type     Speed       Duty level   State
---- --- -------------- --------- ------------- ------------- --------------
1    1   Fan-1          Fixed    5730        50%          Operational
1    2   Fan-2          Fixed    5730        50%          Operational
1    3   Fan-3          Fixed    5730        50%          Operational
Power Modules:
Unit    Power supply   Description      Type        State
----    ------------   ----------------  ----------   --------------
1       1              PS-1             Fixed       Operational
1       2              PS-2             Removable   Not present
Disk usage information:
Unit   Total space (KB)   Free space (KB)   Used space (KB)   Utilization (%)
----   ----------------   ---------------   ---------------   ---------------
1            27,584            26,516            1,068              3
```

Logging Commands

This section describes the commands you use to configure system logging, and to view logs and the logging settings.

logging buffered

This command enables logging to an in-memory log.

Default	disabled; critical when enabled
Format	logging buffered
Mode	Global Config

no logging buffered

This command disables logging to in-memory log.

Format	no logging buffered
Mode	Global Config

logging buffered wrap

This command enables wrapping of in-memory logging when the log file reaches full capacity. Otherwise when the log file reaches full capacity, logging stops.

Default	enabled
Format	logging buffered wrap
Mode	Privileged EXEC

no logging buffered wrap

This command disables wrapping of in-memory logging and configures logging to stop when the log file capacity is full.

Format	no logging buffered wrap
Mode	Privileged EXEC

logging cli-command

This command enables the CLI command logging feature, which enables the CE0128XB/CE0152XB software to log all CLI commands issued on the system. The commands are stored in a persistent log. Use the "show logging persistent" on page 207 command to display the stored history of CLI commands.

Default	enabled
Format	logging cli-command
Mode	Global Config

no logging cli-command

This command disables the CLI command Logging feature.

Format	no logging cli-command
Mode	Global Config

logging console

This command enables logging to the console. You can specify the `severitylevel` value as either an integer from 0 to 7 or symbolically through one of the following keywords: `emergency` (0), `alert` (1), `critical` (2), `error` (3), `warning` (4), `notice` (5), `info` (6), or `debug` (7).

Default	disabled; critical when enabled
Format	logging console *[severitylevel]*
Mode	Global Config

no logging console

This command disables logging to the console.

Format	no logging console
Mode	Global Config

logging host

This command configures the logging host parameters. You can configure up to eight hosts.

Default	• port: 514 (for UDP) and 6514 (for TLS) • authentication mode: anonymous • certificate index: 0 • level: critical (2)
Format	logging host {*hostaddress|hostname*} *addresstype tls [anon|x509name] certificate-index {port severitylevel}*
Mode	Global Config

Parameter	Description
hostaddress|hostname	The IP address of the logging host.
address-type	Indicates the type of address being passed: DNS or IPv4.
tls	Enables TLS security for the host.
anon|x509name	The type of authentication mode: anonymous or x509name.
certificate-index	The certificate number to be used for authentication. The valid range is 0–8. Index 0 is used to the default file.
port	A port number from 1 to 65535.

Parameter	Description
severitylevel	Specify this value as either an integer from 0 to 7, or symbolically through one of the following keywords: `emergency` (0), `alert` (1), `critical` (2), `error` (3), `warning` (4), `notice` (5), `info` (6), or `debug` (7).

Example: The following shows examples of the command.

```
(Routing) (Config)# logging host google.com dns 214
(Routing) (Config)# logging host 10.130.64.88 ipv4 214 6
(Routing) (Config)# logging host 5.5.5.5 ipv4 tls anon 6514 debug
(Routing) (Config)# logging host 5.5.5.5 ipv4 tls x509name 3 6514 debug
```

logging host reconfigure

This command enables logging host reconfiguration.

Format	logging host reconfigure *hostindex*
Mode	Global Config

Parameter	Description
hostindex	Enter the Logging Host Index for which to change the IP address.

logging host remove

This command disables logging to host. See "show logging hosts" on page 206 for a list of host indexes.

Format	logging host remove *hostindex*
Mode	Global Config

logging protocol

Use this command to configure the logging protocol version number as 0 or 1. RFC 3164 uses version 0 and RFC 5424 uses version 1.

Default	The default is version 0 (RFC 3164).
Format	logging protocol {0|1}
Mode	Global Config

logging syslog

This command enables syslog logging. Use the optional `facility` parameter to set the default facility used in syslog messages for components that do not have an internally assigned facility. The *`facility`* value can be one of the following keywords: `kernel, user, mail, system, security, syslog, lpr, nntp, uucp, cron, auth, ftp, ntp, audit, alert, clock, local0, local1, local2, local3, local4, local5, local6, local7`. The default facility is `local7`.

Default	disabled
Format	logging syslog [facility *facility*]
Mode	Global Config

no logging syslog

This command disables syslog logging.

Format	no logging syslog [facility]
Mode	Global Config

logging syslog port

This command enables syslog logging. The `portid` parameter is an integer with a range of 1-65535.

Default	disabled
Format	logging syslog port *portid*
Mode	Global Config

no logging syslog port

This command disables syslog logging.

Format	no logging syslog port
Mode	Global Config

logging syslog source-interface

This command configures the syslog source-interface (source IP address) for syslog server configuration. The selected source-interface IP address is used for filling the IP header of management protocol packets. This allows security devices (firewalls) to identify the source packets coming from the specific switch. If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as the source address.

Format	logging syslog source-interface {*unit/slot/port* | {loopback *loopback-id*} | {network *network-id*} | {serviceport *serviceport-id*} | {vlan *vlan-id*}}
Mode	Global Config

Parameter	Description
unit/slot/port	VLAN or port-based routing interface.
loopback-id	Configures the loopback interface to use as the source IP address. The range of the loopback ID is 0 to 7.
network	Use network source IP address.
serviceport	Use serviceport source IP address.

Parameter	Description
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

Example: The following shows examples of the command.

```
(config)#logging syslog source-interface loopback 0
(config)#logging syslog source-interface tunnel 0
(config)#logging syslog source-interface 0/4/1
(config)#logging syslog source-interface 1/0/1
```

no logging syslog source-interface

This command disables syslog logging.

Format	no logging syslog
Mode	Global Config

show logging

This command displays logging configuration information.

Format	show logging
Mode	Privileged EXEC

Parameter	Definition
Logging Client Local Port	Port on the collector/relay to which syslog messages are sent.
Logging Client Source Interface	Shows the configured syslog source-interface (source IP address).
CLI Command Logging	Shows whether CLI Command logging is enabled.
Logging Protocol	The logging protocol version number. • 0: RFC 3164 • 1: RFC 5424
Console Logging	Shows whether console logging is enabled.
Console Logging Severity Filter	The minimum severity to log to the console log. Messages with an equal or lower numerical severity are logged.
Buffered Logging	Shows whether buffered logging is enabled.
Persistent Logging	Shows whether persistent logging is enabled.
Persistent Logging Severity Filter	The minimum severity at which the logging entries are retained after a system reboot.
Syslog Logging	Shows whether syslog logging is enabled.
Syslog Logging Facility	Shows the value set for the facility in syslog messages.
Log Messages Received	Number of messages received by the log process. This includes messages that are dropped or ignored.
Log Messages Dropped	Number of messages that could not be processed due to error or lack of resources.
Log Messages Relayed	Number of messages sent to the collector/relay.

Example: The following shows example CLI display output for the command.

```
(Routing) #show logging

Logging Client Local Port          : 514
Logging Client Source Interface     : (not configured)
CLI Command Logging                : disabled
Console Logging                    : enabled
Console Logging Severity Filter     : error
Buffered Logging                   : enabled
Buffered Logging Severity Filter    : info
Persistent Logging                 : disabled
Persistent Logging Severity Filter  : alert

Syslog Logging                     : disabled
Syslog Logging Facility            : local7

Log Messages Received              : 229
Log Messages Dropped               : 0
Log Messages Relayed               : 0
```

show logging buffered

This command displays buffered logging (system startup and system operation logs).

Format show logging buffered

Mode Privileged EXEC

Parameter	Definition
Buffered (In-Memory) Logging	Shows whether the In-Memory log is enabled or disabled.
Buffered Logging Wrapping Behavior	The behavior of the In Memory log when faced with a log full situation.
Buffered Log Count	The count of valid entries in the buffered log.

show logging hosts

This command displays all configured logging hosts. Use the “|” character to display the output filter options.

Format show logging hosts

Mode Privileged EXEC

Parameter	Definition
Host Index	(Used for deleting hosts.)
IP Address / Hostname	IP address or hostname of the logging host.
Severity Level	The minimum severity to log to the specified address. The possible values are emergency (0), alert (1), critical (2), error (3), warning (4), notice (5), info (6), or debug (7).
Port	The server port number, which is the port on the local host from which syslog messages are sent.

Parameter	Definition
Status	Status field provides the current status of snmp row status. (Active, Not in Service, Not Ready).
Mode	The type of security: UDP or TLS.
Auth	The type of authentication mode: anonymous or x509name.
Cert #	The certificate number to be used for authentication. The valid range is 0–8. Index 0 is used to the default file.

Example: The following shows example CLI display output for the command.

```
(Routing) #show logging hosts
Index  IP Address/Hostname  Severity   Port   Status    Mode
----- -------------------- ---------- ------ --------- -----
1     1.1.1.17            critical   514    Active    udp
2     10.130.191.90        debug     10514  Active    tls
3     5.5.5.5             debug     333    Active    tls

Auth     Cert#
-------- -----

x509name 6
x509name 4
```

show logging persistent

Use the `show logging persistent` command to display persistent log entries. If `log-files` is specified, the system persistent log files are displayed.

Format	show logging persistent [log-files]
Mode	Privileged EXEC

Parameter	Description
Persistent Logging	If persistent logging is enabled or disabled.
Persistent Log Count	The number of persistent log entries.
Persistent Log Files	The list of persistent log files in the system. Only displayed if `log-files` is specified.

Example: The following shows example CLI display output for the command.

```
(Switching) #show logging persistent

Persistent Logging                        : disabled
Persistent Log Count                      : 0

(Switching) #show logging persistent log-files

Persistent Log Files:

slog0.txt
slog1.txt
slog2.txt
olog0.txt
olog1.txt
olog2.txt
```

show logging traplogs

This command displays SNMP trap events and statistics.

Format show logging traplogs

Mode Privileged EXEC

Parameter	Definition
Number of Traps Since Last Reset	The number of traps since the last boot.
Trap Log Capacity	The number of traps the system can retain.
Number of Traps Since Log Last Viewed	The number of new traps since the command was last executed.
Log	The log number.
System Time Up	How long the system had been running at the time the trap was sent.
Trap	The text of the trap message.

clear logging buffered

This command clears buffered logging (system startup and system operation logs).

Format clear logging buffered

Mode Privileged EXEC

Email Alerting and Mail Server Commands

logging email

This command enables email alerting and sets the lowest severity level for which log messages are emailed. If you specify a severity level, log messages at or above this severity level, but below the urgent severity level, are emailed in a non-urgent manner by collecting them together until the log time expires. You can specify the *`severitylevel`* value as either an integer from 0 to 7 or symbolically through one of the following keywords: `emergency` (0), `alert` (1), `critical` (2), `error` (3), `warning` (4), `notice` (5), `info` (6), or `debug` (7).

Default	disabled; when enabled, log messages at or above severity Warning (4) are emailed
Format	logging email *[severitylevel]*
Mode	Global Config

no logging email

This command disables email alerting.

Format	no logging email
Mode	Global Config

logging email urgent

This command sets the lowest severity level at which log messages are emailed immediately in a single email message. Specify the *`severitylevel`* value as either an integer from 0 to 7 or symbolically through one of the following keywords: `emergency` (0), `alert` (1), `critical` (2), `error` (3), `warning` (4), `notice` (5), `info` (6), or `debug` (7). Specify `none` to indicate that log messages are collected and sent in a batch email at a specified interval.

Default	Alert (1) and emergency (0) messages are sent immediately.
Format	logging email urgent {*severitylevel* | none}
Mode	Global Config

no logging email urgent

This command resets the urgent severity level to the default value.

Format	no logging email urgent
Mode	Global Config

logging email message-type to-addr

This command configures the email address to which messages are sent. The message types supported are `urgent`, `non-urgent`, and `both`. For each supported severity level, multiple email addresses can be configured. The ***`to-email-addr`*** variable is a standard email address, for example admin@yourcompany.com.

Format	logging email message-type {urgent |non-urgent |both} to-addr *to-email-addr*
Mode	Global Config

no logging email message-type to-addr

This command removes the configured to-addr field of email.

Format	no logging email message-type {urgent |non-urgent |both} to-addr *to-email-addr*
Mode	Global Config

logging email from-addr

This command configures the email address of the sender (the switch).

Default	switch@lenovo.com
Format	logging email from-addr *from-email-addr*
Mode	Global Config

no logging email from-addr

This command removes the configured email source address.

Format	no logging email from-addr *from-email-addr*
Mode	Global Config

logging email message-type subject

This command configures the subject line of the email for the specified type.

Default	For urgent messages: Urgent Log Messages For non-urgent messages: Non Urgent Log Messages
Format	logging email message-type {urgent |non-urgent |both} subject *subject*
Mode	Global Config

no logging email message-type subject

This command removes the configured email subject for the specified message type and restores it to the default email subject.

Format	no logging email message-type {urgent |non-urgent |both} subject
Mode	Global Config

logging email logtime

This command configures how frequently non-urgent email messages are sent. Non-urgent messages are collected and sent in a batch email at the specified interval. The valid range is every 30 to 1440 minutes.

Default	30 minutes
Format	logging email logtime *minutes*
Mode	Global Config

no logging email logtime

This command resets the non-urgent log time to the default value.

Format	no logging email logtime
Mode	Global Config

logging traps

This command sets the severity at which SNMP traps are logged and sent in an email. Specify the `severitylevel` value as either an integer from 0 to 7 or symbolically through one of the following keywords: `emergency` (0), `alert` (1), `critical` (2), `error` (3), `warning` (4), `notice` (5), `info` (6), or `debug` (7).

Default	Info (6) messages and higher are logged.
Format	logging traps *severitylevel*
Mode	Global Config

no logging traps

This command resets the SNMP trap logging severity level to the default value.

Format	no logging traps
Mode	Global Config

logging email test message-type

This command sends an email to the SMTP server to test the email alerting function.

Format	logging email test message-type {urgent |non-urgent |both} message-body *message-body*
Mode	Global Config

show logging email config

This command displays information about the email alert configuration.

Format	show logging email config

Mode Privileged EXEC

Parameter	Definition
Email Alert Logging	The administrative status of the feature: enabled or disabled
Email Alert From Address	The email address of the sender (the switch).
Email Alert Urgent Severity Level	The lowest severity level that is considered urgent. Messages of this type are sent immediately.
Email Alert Non Urgent Severity Level	The lowest severity level that is considered non-urgent. Messages of this type, up to the urgent level, are collected and sent in a batch email. Log messages that are less severe are not sent in an email message at all.
Email Alert Trap Severity Level	The lowest severity level at which traps are logged.
Email Alert Notification Period	The amount of time to wait between non-urgent messages.
Email Alert To Address Table	The configured email recipients.
Email Alert Subject Table	The subject lines included in urgent (Type 1) and non-urgent (Type 2) messages.
For Msg Type urgent, subject is	The configured email subject for sending urgent messages.
For Msg Type non-urgent, subject is	The configured email subject for sending non-urgent messages.

show logging email statistics

This command displays email alerting statistics.

Format show logging email statistics

Mode Privileged EXEC

Parameter	Definition
Email Alert Operation Status	The operational status of the email alerting feature.
No of Email Failures	The number of email messages that have attempted to be sent but were unsuccessful.
No of Email Sent	The number of email messages that were sent from the switch since the counter was cleared.
Time Since Last Email Sent	The amount of time that has passed since the last email was sent from the switch.

clear logging email statistics

This command resets the email alerting statistics.

Format clear logging email statistics

Mode Privileged EXEC

mail-server

This command configures the SMTP server to which the switch sends email alert messages and changes the mode to Mail Server Configuration mode. The server address can be in the IPv4, IPv6, or DNS name format.

Format	mail-server {*ip-address* | *ipv6-address* | *hostname*}
Mode	Global Config

no mail-server

This command removes the specified SMTP server from the configuration.

Format	no mail-server {*ip-address* | *ipv6-address* | *hostname*}
Mode	Global Config

security

This command sets the email alerting security protocol by enabling the switch to use TLS authentication with the SMTP Server. If the TLS mode is enabled on the switch but the SMTP sever does not support TLS mode, no email is sent to the SMTP server.

Default	none
Format	security {tlsv1 | none}
Mode	Mail Server Config

port

This command configures the TCP port to use for communication with the SMTP server. The recommended port for TLSv1 is 465, and for no security (i.e. none) it is 25. However, any nonstandard port in the range 1 to 65535 is also allowed.

Default	25
Format	port {465 | 25 | 1–65535}
Mode	Mail Server Config

username (Mail Server Config)

This command configures the login ID the switch uses to authenticate with the SMTP server.

Default	admin
Format	username *name*
Mode	Mail Server Config

password

This command configures the password the switch uses to authenticate with the SMTP server.

Default	admin
Format	password *password*
Mode	Mail Server Config

show mail-server config

This command displays information about the email alert configuration.

Format	show mail-server {*ip-address* | *hostname* | all} config
Mode	Privileged EXEC

Parameter	Definition
No of mail servers configured	The number of SMTP servers configured on the switch.
Email Alert Mail Server Address	The IPv4/IPv6 address or DNS hostname of the configured SMTP server.
Email Alert Mail Server Port	The TCP port the switch uses to send email to the SMTP server
Email Alert Security Protocol	The security protocol (TLS or none) the switch uses to authenticate with the SMTP server.
Email Alert Username	The username the switch uses to authenticate with the SMTP server.
Email Alert Password	The password the switch uses to authenticate with the SMTP server.

System Utility and Clear Commands

This section describes the commands you use to help troubleshoot connectivity issues and to restore various configurations to their factory defaults.

traceroute

Use the `traceroute` command to discover the routes that IPv4 or IPv6 packets actually take when traveling to their destination through the network on a hop-by-hop basis. Traceroute continues to provide a synchronous response when initiated from the CLI.

The user may specify the source IP address or the virtual router of the traceroute probes. Recall that traceroute works by sending packets that are expected not to reach their final destination, but instead trigger ICMP error messages back to the source address from each hop along the forward path to the destination. By specifying the source address, the user can determine where along the forward path there is no route back to the source address. Note that this is only useful if the route from source to destination and destination to source is symmetric.) It would be common, for example, to send a traceroute from an edge router to a target higher in the network using a source address from a host subnet on the edge router. This would test reachability from within the network back to hosts attached to the edge router. Alternatively, one might send a traceroute with an address on a loopback interface as a source to test reachability back to the loopback interface address.

In the CLI, the user may specify the source as an IPv4 address, IPv6 address, a virtual router, or as a routing interface. When the source is specified as a routing interface, the traceroute is sent using the primary IPv4 address on the source interface. With SNMP, the source must be specified as an address. The source cannot be specified in the web UI.

CE0128XB/CE0152XB will not accept an incoming packet, such as a traceroute response, that arrives on a routing interface if the packet’s destination address is on one of the out-of-band management interfaces (service port or network port). Similarly, CE0128XB/CE0152XB will not accept a packet that arrives on a management interface if the packet’s destination is an address on a routing interface. Thus, it would be futile to send a traceroute on a management interface using a routing interface address as source, or to send a traceroute on a routing interface using a management interface as source. When sending a traceroute on a routing interface, the source must be that routing interface or another routing interface. When sending a traceroute on a management interface, the source must be on that management interface. For this reason, the user cannot specify the source as a management interface or management interface address. When sending a traceroute on a management interface, the user should not specify a source address, but instead let the system select the source address from the outgoing interface.

Default

- count: 3 probes
- interval: 3 seconds
- size: 0 bytes
- port: 33434
- maxTtl: 30 hops
- maxFail: 5 probes
- initTtl: 1 hop

Format traceroute {*ip-address* | [ipv6] {*ipv6-address* | *hostname*}} [initTtl *initTtl*] [maxTtl *maxTtl*] [maxFail *maxFail*] [interval *interval*] [count *count*] [port *port*] [size *size*] [source {*ip-address* | | *ipv6-address* | *unit/slot/port*}]

Mode Privileged EXEC

Using the options described below, you can specify the initial and maximum time-to-live (TTL) in probe packets, the maximum number of failures before termination, the number of probes sent for each TTL, and the size of each probe.

Parameter	Description
ipaddressf	The `ipaddress` value should be a valid IP address.
ipv6-address	The *ipv6-address* value should be a valid IPv6 address.
hostname	The *hostname* `value should be a valid hostname.`
ipv6	The optional *ipv6* keyword can be used before *ipv6-address* or *hostname*. Giving the *ipv6* keyword before the *hostname* tries it to resolve to an IPv6 address.
initTtl	Use `initTtl` to specify the initial time-to-live (TTL), the maximum number of router hops between the local and remote system. Range is 0 to 255.
maxTtl	Use `maxTtle` to specify the maximum TTL. Range is 1 to 255.
maxFail	Use `maxFail` to terminate the traceroute after failing to receive a response for this number of consecutive probes. Range is 0 to 255.
interval	Use the optional `interval` parameter to specify the time between probes, in seconds. If a response is not received within this interval, then traceroute considers that probe a failure (printing *) and sends the next probe. If traceroute does receive a response to a probe within this interval, then it sends the next probe immediately. Range is 1 to 60 seconds.
count	Use the optional `count` parameter to specify the number of probes to send for each TTL value. Range is 1 to 10 probes.
port	Use the optional `port` parameter to specify destination UDP port of the probe. This should be an unused port on the remote destination system. Range is 1 to 65535.
size	Use the optional `size` parameter to specify the size, in bytes, of the payload of the Echo Requests sent. Range is 0 to 65507 bytes.
source	Use the optional *source* parameter to specify the source IP address or interface for the traceroute.

The following are examples of the CLI command.

Example: traceroute Success:

```
(Routing) # traceroute 10.240.10.115 initTtl 1 maxTtl 4 maxFail 0 interval 1 count 3 port 33434 size 43
 Traceroute to 10.240.10.115 ,4 hops max 43 byte packets:
1 10.240.4.1   708 msec    41 msec    11 msec
2 10.240.10.115   0 msec    0 msec    0 msec
```

```
Hop Count = 1 Last TTL = 2 Test attempt = 6 Test Success = 6
```

Example: traceroute ipv6 Success

```
(Routing) # traceroute 2001::2 initTtl 1 maxTtl 4 maxFail 0 interval 1 count 3 port 33434 size 43

Traceroute to 2001::2 hops max 43 byte packets:
1                                               2001::2   708 msec     41 msec     11 msec
```

The above command can also be execute with the optional ipv6 parameter as follows:

```
(Routing) # traceroute ipv6 2001::2 initTtl 1 maxTtl 4 maxFail 0 interval 1 count 3 port 33434 size 43
```

Example: traceroute Failure:

```
(Routing) # traceroute 10.40.1.1 initTtl 1 maxFail 0 interval 1 count 3
port 33434 size 43
Traceroute to 10.40.1.1 ,30 hops max 43 byte packets:
1 10.240.4.1   19 msec     18 msec     9 msec
2 10.240.1.252   0 msec     0 msec     1 msec
3 172.31.0.9   277 msec     276 msec     277 msec
4 10.254.1.1   289 msec     327 msec     282 msec
5 10.254.21.2   287 msec     293 msec     296 msec
6 192.168.76.2   290 msec     291 msec     289 msec
7 0.0.0.0   0 msec *
Hop Count = 6 Last TTL = 7 Test attempt = 19 Test Success = 18
```

Example: traceroute ipv6 Failure

```
(Routing)# traceroute 2001::2 initTtl 1 maxFail 0 interval 1 count 3 port 33434 size 43

Traceroute to 2001::2 hops max 43 byte packets:
1                                               3001::1   708 msec     41 msec     11 msec
2                                               4001::2   250 msec     200 msec    193 msec
3                                               5001::3   289 msec     313 msec    278 msec
4                                               6001::4   651 msec     41 msec     270 msec
5        0          0 msec *
Hop Count = 4 Last TTL = 5 Test attempt = 1 Test Success = 0
```

clear config

This command resets the configuration to the factory defaults without powering off the switch. When you issue this command, a prompt appears to confirm that the reset should proceed. When you enter y, you automatically reset the current configuration on the switch to the default values. It does not reset the switch.

Format	clear config
Mode	Privileged EXEC

clear config interface

This command resets the configuration in the specified interface or range of interfaces to the factory defaults without powering off the switch. When you issue this command, a prompt appears to confirm that the reset should proceed. When you enter y, you automatically reset the current configuration on the interface or interfaces to the default values. It does not reset the switch.

The `clear config interface` command clears the configuration only for commands issued in Interface Config mode. Interface-related commands which were not issued in Interface Config mode, such as enabling routing on a VLAN interface, cannot be cleared using this command

Format	clear config interface {*unit/slot/port* | lag *lag_id* | vlan *vlan_id* | loopback *loopback_id}*
Mode	Privileged EXEC

clear counters

This command clears the statistics for a specified ***`unit/slot/port,`*** for all the ports, or for an interface on a VLAN based on the argument, including the loop protection counters. If no router is specified, the information for the default router will be displayed.

Format	clear counters {*unit/slot/port* | all | vlan *id*}
Mode	Privileged EXEC

clear igmpsnooping

This command clears the tables managed by the IGMP Snooping function and attempts to delete these entries from the Multicast Forwarding Database.

Format	clear igmpsnooping
Mode	Privileged EXEC

clear ip access-list counters

This command clears the counters of the specified IP ACL and IP ACL rule.

Format	clear ip access-list counters *acl-ID* | *acl-name rule-id*
Mode	Privileged EXEC

clear ipv6 access-list counters

This command clears the counters of the specified IP ACL and IP ACL rule.

Format	clear ipv6 access-list counters *acl-name rule-id*
Mode	Privileged EXEC

clear mac access-list counters

This command clears the counters of the specified MAC ACL and MAC ACL rule.

Format	clear mac access-list counters *acl-name rule-id*
Mode	Privileged EXEC

clear pass

This command resets all user passwords to the factory defaults without powering off the switch. You are prompted to confirm that the password reset should proceed.

Format	clear pass
Mode	Privileged EXEC

clear traplog

This command clears the trap log.

Format	clear traplog
Mode	Privileged EXEC

clear vlan

This command resets VLAN configuration parameters to the factory defaults. When the VLAN configuration is reset to the factory defaults, there are some scenarios regarding GVRP and MVRP that happen due to this:

1. Static VLANs are deleted.
2. GVRP is restored to the factory default as a result of handling the VLAN RESTORE NOTIFY event. Since GVRP is disabled by default, this means that GVRP should be disabled and all of its dynamic VLANs should be deleted.
3. MVRP is restored to the factory default as a result of handling the VLAN RESTORE NOTIFY event. Since MVRP is enabled by default, this means that any VLANs already created by MVRP are unaffected. However, for customer platforms where MVRP is disabled by default, then the MVRP behavior should match GVRP. That is, MVRP is disabled and the MVRP VLANs are deleted.

Format	clear vlan
Mode	Privileged EXEC

logout

This command closes the current telnet connection or resets the current serial connection.

Note: Save configuration changes before logging out.

Format	logout
Modes	• Privileged EXEC • User EXEC

ping

Use this command to determine whether another computer is on the network. Ping provides a synchronous response when initiated from the CLI and Web interfaces.

Note: For information about the `ping` command for IPv6 hosts, see "ping ipv6" on page 754.

Default
- The default count is 1.
- The default interval is 3 seconds.
- The default size is 0 bytes.

Format ping {*ip-address*| *hostname* | {ipv6 {interface {*unit/slot/port* | vlan *1-4093* | loopback *loopback-id* | network | serviceport } *link-local-address*} | *ip6addr* | *hostname*} [count *count*] [interval 1-60] [size *size*] [source *ip-address* | *ip6addr* | {*unit/slot/port* | vlan *1-4093* | serviceport | network}] [outgoing-interface {*unit/slot/port* | vlan 1-4093 | serviceport | network}]

Modes
- Privileged EXEC
- User EXEC

Using the options described below, you can specify the number and size of Echo Requests and the interval between Echo Requests.

Parameter	Description
address	IPv4 or IPv6 addresses to ping.
count	Use the `count` parameter to specify the number of ping packets (ICMP Echo requests) that are sent to the destination address specified by the `ip-address` field. The range for `count` is 1 to 15 requests.
size	Use the `size` parameter to specify the size, in bytes, of the payload of the Echo Requests sent. Range is 0 to 65507 bytes.
source	Use the *source* parameter to specify the source IP/IPv6 address or interface to use when sending the Echo requests packets.
hostname	Use the *hostname* parameter to resolve to an IPv4 or IPv6 address. The *ipv6* keyword is specified to resolve the hostname to IPv6 address. The IPv4 address is resolved if no keyword is specified.
ipv6	The optional keyword *ipv6* can be used before the *ipv6-address* or *hostname* argument. Using the *ipv6* optional keyword before *hostname* tries to resolve it directly to the IPv6 address. Also used for pinging a link-local IPv6 address.
interface	Use the *interface* keyword to ping a link-local IPv6 address over an interface.
link-local-address	The link-local IPv6 address to ping over an interface.
outgoing-interface	Use the outgoing-interface parameter to specify the outgoing interface for multicast IP/IPv6 ping.

The following are examples of the CLI command.

Example: IPv4 ping success:

```
(Routing) #ping 10.254.2.160 count 3 interval 1 size 255
Pinging 10.254.2.160 with 255 bytes of data:

Received response for icmp_seq = 0. time = 275268 usec
Received response for icmp_seq = 1. time = 274009 usec
Received response for icmp_seq = 2. time = 279459 usec
```

```
----10.254.2.160 PING statistics----
3 packets transmitted, 3 packets received, 0% packet loss
round-trip (msec) min/avg/max = 274/279/276
```

Example: IPv6 ping success

```
(Routing) #ping 2001::1
 Pinging 2001::1 with 64 bytes of data:

Send count=3, Receive count=3 from 2001::1
Average round trip time = 3.00 ms
```

Example: IPv4 ping failure:

In Case of Unreachable Destination:

```
(Routing) # ping 192.168.254.222 count 3 interval 1 size 255
Pinging 192.168.254.222 with 255 bytes of data:
Received Response: Unreachable Destination
Received Response :Unreachable Destination
Received Response :Unreachable Destination
----192.168.254.222  PING statistics----
3 packets transmitted,3 packets received, 0% packet loss
round-trip (msec) min/avg/max = 0/0/0
```

In Case Of Request TimedOut:

```
(Routing) # ping 1.1.1.1 count 1 interval 3
Pinging 1.1.1.1 with 0 bytes of data:

----1.1.1.1 PING statistics----
1 packets transmitted,0 packets received, 100% packet loss
round-trip (msec) min/avg/max = 0/0/0
```

Example: IPv6 ping failure

```
(Routing) #ping ipv6 2001::4
 Pinging 2001::4 with 64 bytes of data:

Send count=3, Receive count=0 from 2001::4
Average round trip time = 0.00 ms
```

quit

This command closes the current telnet connection or resets the current serial connection. The system asks you whether to save configuration changes before quitting.

Format	quit
Modes	• Privileged EXEC • User EXEC

reload

This command resets the switch without powering it off. Reset means that all network connections are terminated and the boot code executes. The switch uses the stored configuration to initialize the switch. You are prompted to confirm that the reset should proceed. The LEDs on the switch indicate a successful reset.

Format	reload [configuration [*scriptname*]]
Mode	Privileged EXEC

Parameter	Description
configuration	Gracefully reloads the configuration. If no configuration file is specified, the startup-config file is loaded.
scriptname	The configuration file to load. The scriptname must include the extension.

copy

The `copy` command uploads and downloads files to and from the switch. You can also use the `copy` command to manage the dual images (active and backup) on the file system. Upload and download files from a server using FTP, TFTP, Xmodem, Ymodem, and Zmodem. If FTP is used, a password is required.

SFTP and SCP are available as additional transfer methods if the software package supports secure management. CLI-based file transfers using the HTTP and HTTPS protocols are supported on selected platforms where a native wget utility is available.

Format	copy *source destination [source option]*
Mode	Privileged EXEC

Replace the *`source`* and *`destination`* parameters with the options in Table 9, “Copy Parameters,” on page 223. For the *`url`* source or destination, use one of the following values:

<url> Downloads code/config/key/certificate/CLIbanner
using {xmodem | ymodem | zmodem |
tftp://<ipaddress|hostname>/<filepath>/<filename>|
ftp://<user>@<ipaddr|hostname>/<path>/<filename> |
scp://<user>@<ipaddr|hostname>/<path>/<filename> |
sftp://<user>@<ipaddr|hostname>/<path>/<filename>}

The optional *`source option`* parameters specify the source-interface or source IP address for the `copy` command. The selected source-interface IP address is to be used for filling the IP header of management protocol packets (SCP, SFTP and TFTP). This allows security devices (firewalls) to identify the source packets coming from the specific switch. If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as source address. When the user selects the source interface for SCP, SFTP, TFTP applications, it (re)bind the interface source IP address with the server. The source interface is not supported for HTTP/HTTPS protocols.

The keyword `ias-users` supports the downloading of the IAS user database file. When the IAS users file is downloaded, the switch IAS user’s database is replaced with the users and its attributes available in the downloaded file. In the command `copy` *`url`* `ias-users`, for *url* one of the following is used for IAS users file:

{ { tftp://<ipaddr | hostname> | <ipv6address | hostname> /<filepath>/<filename> }
| { sftp | scp://<username>@<ipaddress>/<filepath>/<filename>} }

Note: The maximum length for the file path is 255 characters, and the maximum length for the file name is 64 characters.

For FTP, TFTP, SFTP, and SCP, the `ipaddr|hostname` parameter is the IP address or host name of the server, `filepath` is the path to the file, and `filename` is the name of the file you want to upload or download. For SFTP and SCP, the `username` parameter is the username for logging into the remote server via SSH.

Note: *`ip6address`* is also a valid parameter for routing packages that support IPv6.

For platforms that include stacking, use the optional `[unit` *`unit id`*`]` parameter (when available) to specify the stack member to use as the source for the item to copy. If no unit is specified, the item is copied from the stack master.

Table 9. *Copy Parameters*

Source	Destination	Description
nvram:backup-config	nvram:startup-config	Copies the backup configuration to the startup configuration.
nvram:clibanner	*url*	Copies the CLI banner to a server.
nvram: core-dump [unit *unit id*]	tftp://<ipaddress|hostname>/<filepath>/<filename>| ftp://<user>@<ipaddr|hostname>/<path>/<filename> | scp://<user>@<ipaddr|hostname>/<path>/<filename> | sftp://<user>@<ipaddr|hostname>/<path>/<filename>}	Uploads the core dump file on the local system to an external TFTP/FTP/SCP/SFTP server.
nvram:cpupktcapture.pcap[unit *unit id*]	*url*	Uploads CPU packets capture file.
nvram:crash-log	url	Copies the crash log to a server.
nvram:errorlog	*url*	Copies the error log file to a server.
nvram:factory-defaults	*url*	Uploads factory defaults file.
nvram:fastpath.cfg	*url*	Uploads the binary config file to a server.
nvram:log	*url*	Copies the log file to a server.
nvram:operational-log[unit *unitid*]	url	Copies the operational log file to a server.
nvram:script *scriptname*	*url*	Copies a specified configuration script file to a server.
nvram:startup-config	nvram:backup-config	Copies the startup configuration to the backup configuration.
nvram:startup-config	*url*	Copies the startup configuration to a server.
nvram:startup-log [unit *unit id*]	url	Uploads the startup log file.
nvram: tech-support [unit *unit id*]	url	Uploads the system and configuration information for technical support.
nvram:traplog	*url*	Copies the trap log file to a server.

Table 9. *Copy Parameters (continued)*

Source	Destination	Description
system:running-config	nvram:startup-config	Saves the running configuration to NVRAM.
system:running-config	nvram:factory-defaults	Saves the running configuration to NVRAM to the `factory-defaults` file.
system:image	url	Saves the system image to a server.
url	nvram:ca-root *index*	Downloads the CA certificate file to the /mnt/fastpath directory and uses the index number name the downloaded file to CA*index*.pem.
url	nvram:clibanner	Downloads the CLI banner to the system.
url	nvram:client-key *index*	Downloads the client key file to the /mnt/fastpath directory and uses the index number name the downloaded file to CA*index*.key.
url	nvram:client-ssl-cert *1-8*	Downloads the client certificate to the /mnt/fastpath directory and uses the index number to name the downloaded file to CA*index*.pem.
url	nvram:fastpath.cfg	Downloads the binary config file to the system.
url	nvram:script *destfilename*	Downloads a configuration script file to the system. During the download of a configuration script, the `copy` command validates the script. In case of any error, the command lists all the lines at the end of the validation process and prompts you to confirm before copying the script file.
url	nvram:script *destfilename* noval	When you use this option, the `copy` command will not validate the downloaded script file. An example of the CLI command follows:
(Routing) #copy tftp://1.1.1.1/file.scr nvram:script file.scr noval		
url	nvram:sshkey-dsa	Downloads an SSH key file. For more information, see "Secure Shell Commands" on page 66.
url	nvram:sshkey-rsa1	Downloads an SSH key file.
url	nvram:sshkey-rsa2	Downloads an SSH key file.

Table 9. *Copy Parameters (continued)*

Source	Destination	Description
url	nvram:sslpem-dhweak	Downloads an HTTP secure-server certificate.
url	nvram:sslpem-dhstrong	Downloads an HTTP secure-server certificate.
url	nvram:sslpem-root	Downloads an HTTP secure-server certificate. For more information, see "duration" on page 73.
url	nvram:sslpem-server	Downloads an HTTP secure-server certificate.
url	nvram:startup-config	Downloads the startup configuration file to the system.
url	ias-users	Downloads an IAS users database file to the system. When the IAS users file is downloaded, the switch IAS user's database is replaced with the users and their attributes available in the downloaded file.
url	nvram:tech-support-cmds	Downloads the file containing list of commands to be displayed using the `show tech-support` command.

Example: The following shows an example of downloading and applying ias users file.

```
(Routing) #copy tftp://10.131.17.104/aaa_users.txt ias-users

Mode........................................... TFTP
Set Server IP.................................. 10.131.17.104
Path........................................... ./
Filename....................................... aaa_users.txt
Data Type...................................... IAS Users

Management access will be blocked for the duration of the transfer
Are you sure you want to start? (y/n) y

File transfer operation completed successfully.

Validating and updating the users to the IAS users database.


Updated IAS users database successfully.


(Routing) #
```

ip scp server enable

This command enables SCP server functionality for SCP push operations on the CE0128XB/CE0152XB switch, which allows files to be transferred from the host device to the switch using the SCP protocol. During an SCP file transfer operation, the management operations on the switch are blocked. After the completion of file download to the CE0128XB/CE0152XB switch, the switch performs file validations similar to other download operations executed via the `copy` command.

To allow the SCP file transfers from the host system to the CE0128XB/CE0152XB switch, the SCP server must be enabled on the switch.

Default	Disabled
Format	ip scp server enable
Mode	Privileged EXEC

The transfer is initiated via the CLI on the host system, and not from the CE0128XB/CE0152XB CLI. The following examples show the syntax for SCP push commands executed on a PC host for configuration and firmware images.

- scp <config file> user@<scp server IP>:startup-config
- scp <config file> user@<scp server IP>:backup-config
- scp <config file> user@<scp server IP>:factory-defaults
- scp <config file> user@<scp server IP>:<scriptfile.scr>
- scp <image file> user@<scp server IP>:active
- scp <image file> user@<scp server IP>:backup

no ip scp server enable

This command resets the SCP server functionality for SCP push operations on the CE0128XB/CE0152XB switch to the default value (disabled).

Format	no ip scp server enable
Mode	Privileged EXEC

write memory

Use this command to save running configuration changes to NVRAM so that the changes you make will persist across a reboot. This command is the same as `copy system:running-config nvram:startup-config`. Use the `confirm` keyword to directly save the configuration to NVRAM without prompting for a confirmation.

Format	write memory [confirm]
Mode	Privileged EXEC

Power Over Ethernet Commands

This section describes the commands used to configure and monitor Power Over Ethernet (PoE). POE allows IP telephones, wireless LAN access points, and other appliances to receive power as well as data over existing LAN cabling without modifying the existing Ethernet infrastructure. PoE is only available on switches that contain a PoE controller.

PoE implements the PoE+ specification (IEEE 802.3at) for power sourcing equipment (PSE). IEEE 802.3at allows power to be supplied to Class 4 PD devices that require power greater than 15.4 Watts and up to 34.2 Watts. This allows the PoE+ enabled network switches and routers to be used for deployment with devices that require more power than the 802.3AF specification allows. PoE+ 802.3at is compatible with 802.1AF.

Flexible Power Management

PoE provides power management that supports power reservation, power prioritization and power limiting. The operator can assign a priority to each PoE port. When the power budget of the PoE switch has been exhausted, the higher priority ports are given preference over the lower priority ports. Lower priority ports are forcibly stopped to supply power in order to provide power to higher priority ports.

The static power management feature allows operators to reserve a guaranteed amount of power for a PoE port. This is useful for powering up devices which draw variable amounts of power and provide them an assured power range within which to operate. Class-based power management allocates power at class limits as opposed to user defined limits.

In the Dynamic Power management feature, power is not reserved for a given port at any point of time. The power available with the PoE switch is calculated by subtracting the instantaneous power drawn by all the ports from the maximum available power. Thus, more ports can be powered at the same time. This feature is useful to efficiently power up more devices when the available power with the PoE switch is limited.

PoE also provides a global usage threshold feature in order to limit the PoE switch from reaching an overload condition. The operator can specify the limit as a percentage of the maximum power.

Note: PoE commands are only applicable to copper ports.

poe

Use this command to enable/disable PoE admin mode. If enabled, all ports (Interface Config mode) or the selected port (Interface Config mode) are capable of delivering power to a PD. If disabled, none of the ports can deliver power to a PD.

Note: PoE admin mode does not impact the functionality of the Ethernet port itself; disabling admin mode only turns off the capability to deliver power.

Default	Enabled
Format	poe

Mode
- Global Configuration
- Interface Configuration

poe detection

Use this command to set the detection mode. Detection mode is used to set the type of devices that will be allowed for powering up. You can configure the PoE controller to detect only IEEE standard devices or pre-IEEE legacy devices (which were pre-standard). Use the `no` form of the command to bring detection mode back to the default setting of auto.

Default auto

Format `poe detection {auto | ieee | pre-ieee}`

Mode Interface Configuration

Parameter	Description
auto	Detects both standard and non-standard devices.
ieee	Detects IEEE standard devices.
pre-ieee	Detects legacy devices.

poe high-power

Use this command to enable high power mode for all ports in all units (Global Configuration) or for a specific unit (Interface Configuration mode). In high power mode, the switch negotiates the power budget with the powered device (PD). The maximum power a POE port is capable of delivering is 32W in dot3at mode and 60W in upoe mode.

Default Disable

Format poe high-power {dot3at | legacy | pre-dot3at | upoe}

Mode
- Global Configuration
- Interface Configuration

Parameter	Description
dot3at	High power device with LLDP support
legacy	Powered device with a high-inrush current
pre-dot3at	Powered device without LLDP support
upoe	Forces power to be delivered using four pairs of the cable.

no poe high-power

Disables high power mode.

Format no poe high-power

Mode
- Global Configuration
- Interface Configuration

poe power limit

Use this command to configure the type of power limit for all ports in all units (Global Configuration) or a specified port (Interface Configuration).

Default	User-defined value
Format	poe power limit {none| *value* | class-based}
Mode	• Global Configuration • Interface Configuration

Parameter	Description
none	There is no power limit.
value	A user-defined power limit from 3000 mW to 32000 mW power per port.
class-based	The power limit is class-based.

no power power limit

Use this command to set the power limit type to the default.

Default	User-defined value
Format	no poe power limit
Mode	• Global Configuration • Interface Configuration

poe power management

Use this command to set up the power management type.

Default	Dynamic
Format	poe power management {*unit/slot/port* | all} {dynamic | static}
Mode	Global Configuration

Parameter	Description
unit	Configures power management for an individual port.
all	Configures power management for all ports.
dynamic	Power management is done by the POE controller and the maximum power for a port is not reserved for each port.
static	Power management is done by the POE controller and maximum power for a port is reserved.

no poe power management

Use this command to set the management mode to the default.

Format	no poe power management
Mode	Global Configuration

poe priority

Use this command to configure the port priority level for the delivery of power to an attached device. The switch may not be able to supply power to all connected devices, so the port priority is used to determine which ports will supply power if adequate power capacity is not available for all enabled ports. For ports that have the same priority level the lower-numbered port has higher priority.

For a system delivering peak power to a certain number of devices, if a new device is attached to a high-priority port, power to a low-priority port is shut down and the new device is powered up.

Default	Low
Format	poe priority {Crit | Hig | Low}
Mode	Interface Configuration

no poe priority

Use this command to return the port priority level to the default value.

Default	Low
Format	no poe priority
Mode	• Global Configuration • Interface Configuration

poe reset

Use this command to reset all ports.

Default	Disable
Format	poe reset
Mode	Global Configuration

poe timer schedule

Use this command to attach a timer schedule to a port. It is useful to allow ports to automatically be configured to deliver power based on time intervals, etc. For example, if a user wants to allow ports to deliver power only on weekdays and not on weekends, a timer schedule can be configured and attached to the port such that PoE is disabled on the weekends automatically.

Default	auto
Format	poe timer schedule *name*
Mode	Interface Configuration

Parameter	Description
auto	Detects both standard and non-standard devices.
ieee	Detects IEEE standard devices.

Parameter	Description
pre-iee	Detects legacy devices.

poe traps

Use this command to enable/disable traps that indicate changes in the PoE status for the port.

Default	Enable
Format	poe traps
Mode	Global Configuration

poe usagethreshold

Use this command to configure the system power usage threshold level at which a trap is generated. The threshold is configured as a percentage of the total available power.

Default	90%
Format	poe usagethreshold {unit | all} *1-99*
Mode	Global Configuration

Parameter	Description
unit	Sets the threshold for the unit.
all	Sets the threshold for all units.
1-99	The power threshold at which a trap is generated. The range is 1-99%.

no poe usagethreshold

Use this command to set the threshold to the default value.

Format	no poe usagethreshold
Mode	Global Configuration

show poe

Use this command to display the current POE configuration and status information for all ports.

Format	show poe
Mode	Privileged EXEC

Parameter	Description
Firmware Version	Displays the firmware version on the controller. This cannot be changed/upgraded.

Parameter	Description
PSE Main Operational Status	The operational status of the PSE.
Total Power Available	The total power budget
Threshold Power	The total power minus the guard band. If usage goes above this value, new ports are not powered up.
Total Power Consumed	Total power delivered by all ports.
Usage Threshold	Threshold configured by the user. This is used for Guard band calculation.
Power Management Mode	The current power management mode: Dynamic or Static.
Traps	If PoE traps are enabled or disabled.

Example:

```
(Switching) #show poe

Firmware Version.............................. 1.3.0.7
PSE Main Operational Status.................... OFF
Total Power Available.......................... 900 Watts
Threshold Power............................... 459 W
Total Power Consumed........................... 0
Usage Threshold............................... 90
Power Management Mode.......................... Dynamic
Traps......................................... Enable
```

show poe mpsm

Use this command to display the current MPSM and Power Bank values. If a slot is selected, only the MPSM and Power Bank Values for that slot are displayed.

Format	show poe mpsm [*slot*]
Mode	Privileged EXEC

Example:

```
(Switching)# show poe mpsm

Current Active MPSM = 1

Slot                                              Power Bank
         Value (W)
 1          580
 2          610
 3          550

(Switching) show poe mpsm 2
Slot = 2
Current Active MPSM = 1

MPSM Number:            0     1     2     3     4     5     6     7
Power Bank Value (W):  260   610  1080  1430  1780  2130  2480  2830
```

show poe port configuration

Use this command to display POE port configuration information for individual ports or all ports.

Format show poe port configuration { all | *unit/slot/port* }

Mode Privileged EXEC

Example:

```
(Switching) #show poe port configuration 0/1

      Admin            Power   Power Limit   High Power     Detection       Timer Schedule
Intf    Mode   Priority Limit     Type          Mode              Type
                  (mW)
------ ------- -------- ------ -------------- ------------- --------------------- ----------------
0/1    Enable     Low    60000   User Defined    UPOE            auto                  None
```

show poe port info

Use this command to display PoE port information.

Format show poe port info { all | *unit/slot/port* }

Mode Privileged EXEC

Example:

```
#show poe port info all

      High     Max                  Output  Output
Intf    Power   Power      Class   Power    Current Voltage    Status         Fault
             (mW)                 (mW)      (mA)    (V)                   Status
------ ------- -------- -------- -------  ------- -------  ----------------- -----------------
2/0/1    Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/2    Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/3    Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/4    Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/5    Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/6    Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/7    Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/8    Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/9    Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/10   Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/11   Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/12   Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/13   Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/14   Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/15   Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/16   Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/17   Yes   32000    Unknown  0        0       0       Disabled         No Error
2/0/18   Yes   32000    Unknown  0        0       0       Disabled         No Error
```

Simple Network Time Protocol Commands

This section describes the commands you use to automatically configure the system time and date by using Simple Network Time Protocol (SNTP).

sntp broadcast client poll-interval

This command sets the poll interval for SNTP broadcast clients in seconds as a power of two where `poll-interval` can be a value from 6 to 10.

Default	6
Format	sntp broadcast client poll-interval *poll-interval*
Mode	Global Config

no sntp broadcast client poll-interval

This command resets the poll interval for SNTP broadcast client back to the default value.

Format	no sntp broadcast client poll-interval
Mode	Global Config

sntp client mode

This command enables Simple Network Time Protocol (SNTP) client mode and may set the mode to either broadcast or unicast.

Default	disabled
Format	sntp client mode [*broadcast* | *unicast*]
Mode	Global Config

no sntp client mode

This command disables Simple Network Time Protocol (SNTP) client mode.

Format	no sntp client mode
Mode	Global Config

sntp client port

This command sets the SNTP client port ID to 0, 123 or a value between 1025 and 65535. The default value is 0, which means that the SNTP port is not configured by the user. In the default case, the actual client port value used in SNTP packets is assigned by the underlying OS.

Default	0
Format	sntp client port *portid*
Mode	Global Config

no sntp client port

This command resets the SNTP client port back to its default value.

Format	no sntp client port
Mode	Global Config

sntp unicast client poll-interval

This command sets the poll interval for SNTP unicast clients in seconds as a power of two where *poll-interval* can be a value from 6 to 10.

Default	6
Format	sntp unicast client poll-interval *poll-interval*
Mode	Global Config

no sntp unicast client poll-interval

This command resets the poll interval for SNTP unicast clients to its default value.

Format	no sntp unicast client poll-interval
Mode	Global Config

sntp unicast client poll-timeout

This command sets the poll timeout for SNTP unicast clients in seconds to a value from 1-30.

Default	5
Format	sntp unicast client poll-timeout *poll-timeout*
Mode	Global Config

no sntp unicast client poll-timeout

This command will reset the poll timeout for SNTP unicast clients to its default value.

Format	no sntp unicast client poll-timeout
Mode	Global Config

sntp unicast client poll-retry

This command will set the poll retry for SNTP unicast clients to a value from 0 to 10.

Default	1
Format	sntp unicast client poll-retry *poll-retry*
Mode	Global Config

no sntp unicast client poll-retry

This command will reset the poll retry for SNTP unicast clients to its default value.

Format	no sntp unicast client poll-retry
Mode	Global Config

sntp server

This command configures an SNTP server (a maximum of three). The server address can be either an IPv4 address or an IPv6 address. The optional priority can be a value of 1-3, the version a value of 1-4, and the port id a value of 1-65535.

Format	sntp server {*ipaddress* | *ipv6address* | *hostname*} [*priority* [*version* [*portid*]]]
Mode	Global Config

no sntp server

This command deletes an server from the configured SNTP servers.

Format	no sntp server remove {*ipaddress* | *ipv6address* | *hostname*}
Mode	Global Config

sntp source-interface

Use this command to specify the physical or logical interface to use as the source interface (source IP address) for SNTP unicast server configuration. If configured, the address of source Interface is used for all SNTP communications between the SNTP server and the SNTP client. The selected source-interface IP address is used for filling the IP header of management protocol packets. This allows security devices (firewalls) to identify the source packets coming from the specific switch. If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as the source address. If the configured interface is down, the SNTP client falls back to its default behavior.

Format	sntp source-interface {*unit/slot/port* | loopback *loopback-id* | network *network-id* | serviceport *serviceport-id* | *vlan vlan-id*}
Mode	Global Config

Parameter	Description
unit/slot/port	The unit identifier assigned to the switch.
loopback-id	Configures the loopback interface. The range of the loopback ID is 0 to 7.
network	Use network source IP address.
serviceport	Use serviceport source IP address.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

no sntp source-interface

Use this command to reset the SNTP source interface to the default settings.

Format	no sntp source-interface
Mode	Global Config

show sntp

This command is used to display SNTP settings and status.

Format	show sntp
Mode	Privileged EXEC

Parameter	Definition
Last Update Time	Time of last clock update.
Last Attempt Time	Time of last transmit query (in unicast mode).
Last Attempt Status	Status of the last SNTP request (in unicast mode) or unsolicited message (in broadcast mode).
Broadcast Count	Current number of unsolicited broadcast messages that have been received and processed by the SNTP client since last reboot.

show sntp client

This command is used to display SNTP client settings.

Format	show sntp client
Mode	Privileged EXEC

Parameter	Definition
Client Supported Modes	Supported SNTP Modes (Broadcast or Unicast).
SNTP Version	The highest SNTP version the client supports.
Port	SNTP Client Port. The field displays the value 0 if it is default value. When the client port value is 0, if the client is in broadcast mode, it binds to port 123; if the client is in unicast mode, it binds to the port assigned by the underlying OS.
Client Mode	Configured SNTP Client Mode.

show sntp server

This command is used to display SNTP server settings and configured servers.

Format	show sntp server
Mode	Privileged EXEC

Parameter	Definition
Server Host Address	IP address or hostname of configured SNTP Server.
Server Type	Address type of server (IPv4, IPv6, or DNS).
Server Stratum	Claimed stratum of the server for the last received valid packet.
Server Reference ID	Reference clock identifier of the server for the last received valid packet.
Server Mode	SNTP Server mode.
Server Maximum Entries	Total number of SNTP Servers allowed.
Server Current Entries	Total number of SNTP configured.

For each configured server:

Parameter	Definition
IP Address / Host-name	IP address or hostname of configured SNTP Server.
Address Type	Address Type of configured SNTP server (IPv4, IPv6, or DNS).
Priority	IP priority type of the configured server.
Version	SNTP Version number of the server. The protocol version used to query the server in unicast mode.
Port	Server Port Number.
Last Attempt Time	Last server attempt time for the specified server.
Last Update Status	Last server attempt status for the server.
Total Unicast Requests	Number of requests to the server.
Failed Unicast Requests	Number of failed requests from server.

show sntp source-interface

Use this command to display the SNTP client source interface configured on the switch.

Format	show sntp source-interface
Mode	Privileged EXEC

Field	Description
SNTP Client Source Interface	The interface ID of the physical or logical interface configured as the SNTP client source interface.
SNTP Client Source IPv4 Address	The IP address of the interface configured as the SNTP client source interface.

Example: The following shows example CLI display output for the command.

```
(Routing) #show sntp source-interface

SNTP Client Source Interface.................. (not configured)

(Routing) #
```

Time Zone Commands

Use the Time Zone commands to configure system time and date, Time Zone and Summer Time (that is, Daylight Saving Time). Summer time can be recurring or non-recurring.

clock set

This command sets the system time and date.

Format	clock set *hh:mm:ss* clock set *mm/dd/yyyy*
Mode	Global Config

Parameter	Description
hh:mm:ss	Enter the current system time in 24-hour format in hours, minutes, and seconds. The range is hours: 0 to 23, minutes: 0 to 59, seconds: 0 to 59.
mm/dd/yyyy	Enter the current system date the format month, day, year. The range for month is 1 to 12. The range for the day of the month is 1 to 31. The range for year is 2010 to 2079.

Example: The following shows examples of the command.

```
(Routing) (Config)# clock set 03:17:00

(Routing) (Config)# clock set 11/01/2011
```

clock summer-time date

Use the clock summer-time date command to set the summer-time offset to Coordinated Universal Time (UTC). If the optional parameters are not specified, they are read as either `0` or `\0`, as appropriate.

Format	clock summer-time date {*date month year hh:mm date month year hh:mm*}[offset *offset*] [zone *acronym*]
Mode	Global Config

Parameter	Description
date	Day of the month. Range is 1 to 31.
month	Month. The range is the first three letters by name (for example, Jan).
year	Year. The range is 2000 to 2097.
hh:mm	Time in 24-hour format in hours and minutes. The range is hours: 0 to 23, minutes: 0 to 59.
offset	The number of minutes to add during the summertime. The range is 1 to 1440.
acronym	The acronym for the summer-time to be displayed when summertime is in effect. The range is up to four characters are allowed.

Example: The following shows examples of the command.

```
(Routing) (Config)# clock summer-time date 1 nov 2011 3:18 2 nov 2011 3:18
```

```
(Routing) (Config)# clock summer-time date 1 nov 2011 3:18 2 nov 2011 3:18 offset 120 zone INDA
```

clock summer-time recurring

This command sets the summer-time recurring parameters.

Format	clock summer-time recurring {*week day month hh:mm week day month hh:mm*} [offset *offset*] [zone *acronym*]
Mode	Global Config

Parameter	Description
EU	The system clock uses the standard recurring summer time settings used in countries in the European Union.
USA	The system clock uses the standard recurring daylight saving time settings used in the United States.
week	Week of the month. The range is 1 to 5, first, last.)
day	Day of the week. The range is the first three letters by name; sun, for example.
month	Month. The range is the first three letters by name; jan, for example.
hh:mm	Time in 24-hour format in hours and minutes. The range is hours: 0 to 23, minutes: 0 to 59.
offset	The number of minutes to add during the summertime. The range is 1 to 1440.
acronym	The acronym for the summertime to be displayed when summertime is in effect. Up to four characters are allowed.

Example: The following shows examples of the command.

```
(Routing) (Config)# clock summer-time recurring 2 sun nov 3:18 2 mon nov 3:18
(Routing) (Config)# clock summer-time recurring 2 sun nov 3:18 2 mon nov 3:18 offset 120 zone INDA
```

no clock summer-time

This command disables the summer-time settings.

Format	no clock summer-time
Mode	Global Config

Example: The following shows an example of the command.

```
(Routing) (Config)# no clock summer-time
```

clock timezone

Use this command to set the offset to Coordinated Universal Time (UTC). If the optional parameters are not specified, they will be read as either `0` or `\0` as appropriate.

Format	clock timezone {*hours*} [minutes *minutes*] [zone *acronym*]
Mode	Global Config

Parameter	Description
hours	Hours difference from UTC. The range is -12 to +14.
minutes	Minutes difference from UTC. The range is 0 to 59.
acronym	The acronym for the time zone. The range is up to four characters.

Example: The following shows an example of the command.

```
(Routing) (Config)# clock timezone 5 minutes 30 zone INDA
```

no clock timezone

Use this command to reset the time zone settings.

Format	no clock timezone
Mode	Global Config

Example: The following shows an example of the command.

```
(Routing) (Config)# no clock timezone
```

show clock

Use this command to display the time and date from the system clock.

Format	show clock
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) # show clock

15:02:09 (UTC+0:00) Nov 1 2011
No time source
```

Example: The following shows example CLI display output for the command.

With the above configuration the output appears as below:

```
(Routing) # show clock

10:55:40 INDA(UTC+7:30) Nov 1 2011
No time source
```

show clock detail

Use this command to display the detailed system time along with the time zone and the summertime configuration.

Format	show clock detail
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) # show clock detail

15:05:24 (UTC+0:00) Nov 1 2011
No time source
```

```
Time zone:
Acronym not configured
Offset is UTC+0:00

Summertime:
Summer-time is disabled
```

Example: The following shows example CLI display output for the command.

With the above configuration the output appears as below:

```
(Routing) # show clock detail

10:57:57 INDA(UTC+7:30) Nov 1 2011
No time source

 Time zone:
 Acronym is INDA
 Offset is UTC+5:30

 Summertime:
 Acronym is INDA
 Recurring every year
 Begins on second Sunday of Nov at 03:18
 Ends on second Monday of Nov at 03:18
 Offset is 120 minutes
 Summer-time is in effect.
```

DHCP Server Commands

This section describes the commands you to configure the DHCP server settings for the switch. DHCP uses UDP as its transport protocol and supports a number of features that facilitate in administration address allocations.

ip dhcp pool

This command configures a DHCP address pool name on a DHCP server and enters DHCP pool configuration mode.

Default	none
Format	ip dhcp pool *name*
Mode	Global Config

no ip dhcp pool

This command removes the DHCP address pool. The name should be previously configured pool name.

Format	no ip dhcp pool *name*
Mode	Global Config

client-identifier

This command specifies the unique identifier for a DHCP client. Unique-identifier is a valid notation in hexadecimal format. In some systems, such as Microsoft DHCP clients, the client identifier is required instead of hardware addresses. The unique-identifier is a concatenation of the media type and the MAC address. For example, the Microsoft client identifier for Ethernet address c819.2488.f177 is 01c8.1924.88f1.77 where 01 represents the Ethernet media type. For more information, refer to the "Address Resolution Protocol Parameters" section of RFC 1700, *Assigned Numbers* for a list of media type codes.

Default	none
Format	client-identifier *uniqueidentifier*
Mode	DHCP Pool Config

no client-identifier

This command deletes the client identifier.

Format	no client-identifier
Mode	DHCP Pool Config

client-name

This command specifies the name for a DHCP client. Name is a string consisting of standard ASCII characters.

Default	none
Format	client-name *name*
Mode	DHCP Pool Config

no client-name

This command removes the client name.

Format	no client-name
Mode	DHCP Pool Config

default-router

This command specifies the default router list for a DHCP client. `{address1, address2… address8}` are valid IP addresses, each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Default	none
Format	default-router *address1 [address2....address8]*
Mode	DHCP Pool Config

no default-router

This command removes the default router list.

Format	no default-router
Mode	DHCP Pool Config

dns-server

This command specifies the IP servers available to a DHCP client. Address parameters are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Default	none
Format	dns-server *address1 [address2....address8]*
Mode	DHCP Pool Config

no dns-server

This command removes the DNS Server list.

Format	no dns-server
Mode	DHCP Pool Config

hardware-address

This command specifies the hardware address of a DHCP client. Hardware-address is the MAC address of the hardware platform of the client consisting of 6 bytes in dotted hexadecimal format. Type indicates the protocol of the hardware platform. It is 1 for 10 MB Ethernet and 6 for IEEE 802.

Default	ethernet
Format	hardware-address *hardwareaddress type*
Mode	DHCP Pool Config

no hardware-address

This command removes the hardware address of the DHCP client.

Format	no hardware-address
Mode	DHCP Pool Config

host

This command specifies the IP address and network mask for a manual binding to a DHCP client. Address and Mask are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid. The prefix-length is an integer from 0 to 32.

Default	none
Format	host *address* [{*mask* | *prefix-length*}]
Mode	DHCP Pool Config

no host

This command removes the IP address of the DHCP client.

Format	no host
Mode	DHCP Pool Config

lease

This command configures the duration of the lease for an IP address that is assigned from a DHCP server to a DHCP client. The overall lease time should be between 1-86400 minutes. If you specify *`infinite`*, the lease is set for 60 days. You can also specify a lease duration. *`Days`* is an integer from 0 to 59. *`Hours`* is an integer from 0 to 23. *`Minutes`* is an integer from 0 to 59.

Default	1 (day)
Format	lease [{*days* [*hours*] [*minutes*] | infinite}]
Mode	DHCP Pool Config

no lease

This command restores the default value of the lease time for DHCP Server.

Format	no lease
Mode	DHCP Pool Config

network (DHCP Pool Config)

Use this command to configure the subnet number and mask for a DHCP address pool on the server. Network-number is a valid IP address, made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid. Mask is the IP subnet mask for the specified address pool. The prefix-length is an integer from 0 to 32.

Default	none
Format	network *networknumber* [{*mask* | *prefixlength*}]
Mode	DHCP Pool Config

no network

This command removes the subnet number and mask.

Format	no network
Mode	DHCP Pool Config

bootfile

The command specifies the name of the default boot image for a DHCP client. The *filename* specifies the boot image file.

Format	bootfile *filename*
Mode	DHCP Pool Config

no bootfile

This command deletes the boot image name.

Format	no bootfile
Mode	DHCP Pool Config

domain-name

This command specifies the domain name for a DHCP client. The *domain* specifies the domain name string of the client.

Default	none
Format	domain-name *domain*
Mode	DHCP Pool Config

no domain-name

This command removes the domain name.

Format	no domain-name
Mode	DHCP Pool Config

domain-name enable

This command enables the domain name functionality in CE0128XB/CE0152XB.

Format	domain-name enable [name *name]*
Mode	Global Config

Example: The following shows an example of the command.

```
(Switching) (Config)#domain-name enable
(Switching) (Config)#exit
```

no domain-name enable

This command disables the domain name functionality in CE0128XB/CE0152XB.

Format	no domain-name enable
Mode	Global Config

netbios-name-server

This command configures NetBIOS Windows Internet Naming Service (WINS) name servers that are available to DHCP clients.

One IP address is required, although one can specify up to eight addresses in one command line. Servers are listed in order of preference (address1 is the most preferred server, address2 is the next most preferred server, and so on).

Default	none
Format	netbios-name-server *address* [*address2...address8*]
Mode	DHCP Pool Config

no netbios-name-server

This command removes the NetBIOS name server list.

Format	no netbios-name-server
Mode	DHCP Pool Config

netbios-node-type

The command configures the NetBIOS node type for Microsoft Dynamic Host Configuration Protocol (DHCP) clients.type Specifies the NetBIOS node type. Valid types are:

- b-node—Broadcast
- p-node—Peer-to-peer
- m-node—Mixed
- h-node—Hybrid (recommended)

Default	none
Format	netbios-node-type *type*
Mode	DHCP Pool Config

no netbios-node-type

This command removes the NetBIOS node Type.

Format	no netbios-node-type
Mode	DHCP Pool Config

next-server

This command configures the next server in the boot process of a DHCP client.The ***`address`*** parameter is the IP address of the next server in the boot process, which is typically a TFTP server.

Default	inbound interface helper addresses
Format	next-server *address*
Mode	DHCP Pool Config

no next-server

This command removes the boot server list.

Format	no next-server
Mode	DHCP Pool Config

option

The `option` command configures DHCP Server options. The ***`code`*** parameter specifies the DHCP option code and ranges from 1-254. The ***`ascii string`*** parameter specifies an NVT ASCII character string. ASCII character strings that contain white space must be delimited by quotation marks. The ***`hex string`*** parameter specifies hexadecimal data. In hexadecimal, character strings are two hexadecimal digits. You can separate each byte by a period (for example, `a3.4f.22.0c`), colon (for example, `a3:4f:22:0c`), or white space (for example, `a3 4f 22 0c`).

Default	none
Format	option *code* {*ascii string* | *hex string1* [*string2...string8*] | ip *address1* [*address2...address8*]}
Mode	DHCP Pool Config

no option

This command removes the DHCP Server options. The `code` parameter specifies the DHCP option code.

Format	no option *code*
Mode	DHCP Pool Config

ip dhcp excluded-address

This command specifies the IP addresses that a DHCP server should not assign to DHCP clients. Low-address and high-address are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Default	none
Format	ip dhcp excluded-address *lowaddress [highaddress]*
Mode	Global Config

no ip dhcp excluded-address

This command removes the excluded IP addresses for a DHCP client. Low-address and high-address are valid IP addresses; each made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Format	no ip dhcp excluded-address *lowaddress [highaddress]*
Mode	Global Config

ip dhcp ping packets

Use this command to specify the number, in a range from 2-10, of packets a DHCP server sends to a pool address as part of a ping operation. By default the number of packets sent to a pool address is 2, which is the smallest allowed number when sending packets. Setting the number of packets to 0 disables this command.

Default	2
Format	ip dhcp ping packets *0,2-10*
Mode	Global Config

no ip dhcp ping packets

This command restores the number of ping packets to the default value.

Format	no ip dhcp ping packets
Mode	Global Config

service dhcp

This command enables the DHCP server.

Default	disabled
Format	service dhcp
Mode	Global Config

no service dhcp

This command disables the DHCP server.

Format	no service dhcp
Mode	Global Config

ip dhcp bootp automatic

This command enables the allocation of the addresses to the bootp client. The addresses are from the automatic address pool.

Default	disabled
Format	ip dhcp bootp automatic
Mode	Global Config

no ip dhcp bootp automatic

This command disables the allocation of the addresses to the bootp client. The address are from the automatic address pool.

Format	no ip dhcp bootp automatic
Mode	Global Config

ip dhcp conflict logging

This command enables conflict logging on DHCP server.

Default	enabled
Format	ip dhcp conflict logging
Mode	Global Config

no ip dhcp conflict logging

This command disables conflict logging on DHCP server.

Format	no ip dhcp conflict logging
Mode	Global Config

clear ip dhcp binding

This command deletes an automatic address binding from the DHCP server database. If "*" is specified, the bindings corresponding to all the addresses are deleted. `address` is a valid IP address made up of four decimal bytes ranging from 0 to 255. IP address 0.0.0.0 is invalid.

Format	clear ip dhcp binding {*address* | *}
Mode	Privileged EXEC

clear ip dhcp server statistics

This command clears DHCP server statistics counters.

Format	clear ip dhcp server statistics
Mode	Privileged EXEC

clear ip dhcp conflict

The command is used to clear an address conflict from the DHCP Server database. The server detects conflicts using a ping. DHCP server clears all conflicts If the asterisk (*) character is used as the address parameter.

Default	none
Format	clear ip dhcp conflict {*address* | *}
Mode	Privileged EXEC

show ip dhcp binding

This command displays address bindings for the specific IP address on the DHCP server. If no IP address is specified, the bindings corresponding to all the addresses are displayed.

Format	show ip dhcp binding [*address*]
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
IP address	The IP address of the client.
Hardware Address	The MAC Address or the client identifier.
Lease expiration	The lease expiration time of the IP address assigned to the client.
Type	The manner in which IP address was assigned to the client.

show ip dhcp global configuration

This command displays address bindings for the specific IP address on the DHCP server. If no IP address is specified, the bindings corresponding to all the addresses are displayed.

Format	show ip dhcp global configuration
Modes	- Privileged EXEC - User EXEC

Parameter	Definition
Service DHCP	The field to display the status of dhcp protocol.
Number of Ping Packets	The maximum number of Ping Packets that will be sent to verify that an ip address id not already assigned.
Conflict Logging	Shows whether conflict logging is enabled or disabled.
BootP Automatic	Shows whether BootP for dynamic pools is enabled or disabled.

show ip dhcp pool configuration

This command displays pool configuration. If `all` is specified, configuration for all the pools is displayed.

Format	show ip dhcp pool configuration {*name* | all}
Modes	- Privileged EXEC - User EXEC

Field	Definition
Pool Name	The name of the configured pool.
Pool Type	The pool type.
Lease Time	The lease expiration time of the IP address assigned to the client.
DNS Servers	The list of DNS servers available to the DHCP client.
Default Routers	The list of the default routers available to the DHCP client

The following additional field is displayed for Dynamic pool type:

Field	Definition
Network	The network number and the mask for the DHCP address pool.

The following additional fields are displayed for Manual pool type:

Field	Definition
Client Name	The name of a DHCP client.
Client Identifier	The unique identifier of a DHCP client.

Field	Definition
Hardware Address	The hardware address of a DHCP client.
Hardware Address Type	The protocol of the hardware platform.
Host	The IP address and the mask for a manual binding to a DHCP client.

show ip dhcp server statistics

This command displays DHCP server statistics.

Format	show ip dhcp server statistics
Modes	- Privileged EXEC - User EXEC

Field	Definition
Automatic Bindings	The number of IP addresses that have been automatically mapped to the MAC addresses of hosts that are found in the DHCP database.
Expired Bindings	The number of expired leases.
Malformed Bindings	The number of truncated or corrupted messages that were received by the DHCP server.

Message Received:

Message	Definition
DHCP DISCOVER	The number of DHCPDISCOVER messages the server has received.
DHCP REQUEST	The number of DHCPREQUEST messages the server has received.
DHCP DECLINE	The number of DHCPDECLINE messages the server has received.
DHCP RELEASE	The number of DHCPRELEASE messages the server has received.
DHCP INFORM	The number of DHCPINFORM messages the server has received.

Message Sent:

Message	Definition
DHCP OFFER	The number of DHCPOFFER messages the server sent.
DHCP ACK	The number of DHCPACK messages the server sent.
DHCP NACK	The number of DHCPNACK messages the server sent.

show ip dhcp conflict

This command displays address conflicts logged by the DHCP Server. If no IP address is specified, all the conflicting addresses are displayed.

Format show ip dhcp conflict [*ip-address*]

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
IP address	The IP address of the host as recorded on the DHCP server.
Detection Method	The manner in which the IP address of the hosts were found on the DHCP Server.
Detection time	The time when the conflict was found.

DNS Client Commands

These commands are used in the Domain Name System (DNS), an Internet directory service. DNS is how domain names are translated into IP addresses. When enabled, the DNS client provides a hostname lookup service to other components of CE0128XB/CE0152XB.

ip domain lookup

Use this command to enable the DNS client.

Default	enabled
Format	ip domain lookup
Mode	Global Config

no ip domain lookup

Use this command to disable the DNS client.

Format	no ip domain lookup
Mode	Global Config

ip domain name

Use this command to define a default domain name that CE0128XB/CE0152XB software uses to complete unqualified host names (names with a domain name). By default, no default domain name is configured in the system. *`name`* may not be longer than 255 characters and should not include an initial period. This *`name`* should be used only when the default domain name list, configured using the `ip domain list command,` is empty.

Default	none
Format	ip domain name *name*
Mode	Global Config

Example: The CLI command `ip domain name yahoo.com` will configure yahoo.com as a default domain name. For an unqualified hostname xxx, a DNS query is made to find the IP address corresponding to xxx.yahoo.com.

no ip domain name

Use this command to remove the default domain name configured using the `ip domain name` command.

Format	no ip domain name
Mode	Global Config

ip domain list

Use this command to define a list of default domain names to complete unqualified names. By default, the list is empty. Each name must be no more than 256 characters, and should not include an initial period. The default domain name, configured using the `ip domain name` command, is used only when the default domain name list is empty. A maximum of 32 names can be entered in to this list.

Default	none
Format	ip domain list *name*
Mode	Global Config

no ip domain list

Use this command to delete a name from a list.

Format	no ip domain list *name*
Mode	Global Config

ip name server

Use this command to configure the available name servers. Up to eight servers can be defined in one command or by using multiple commands. The parameter *`server-address`* is a valid IPv4 or IPv6 address of the server. The preference of the servers is determined by the order they were entered.

Format	ip name-server *server-address1* [*server-address2...server-address8*]
Mode	Global Config

no ip name server

Use this command to remove a name server.

Format	no ip name-server [*server-address1...server-address8*]
Mode	Global Config

ip name source-interface

Use this command to specify the physical or logical interface to use as the DNS client (IP name) source interface (source IP address) for the DNS client management application. If configured, the address of source Interface is used for all DNS communications between the DNS server and the DNS client. The selected source-interface IP address is used for filling the IP header of management protocol packets. This allows security devices (firewalls) to identify the source packets coming from the specific switch. If a source-interface is not specified, the primary IP address of the originating (outbound) interface is used as the source address. If the configured interface is down, the DNS client falls back to its default behavior.

Format ip name source-interface {*unit/slot/port* | loopback *loopback-id* | network *network-id* | serviceport *serviceport-id* | *vlan vlan-id*}

Mode Global Config

Parameter	Description
unit/slot/port	The unit identifier assigned to the switch.
loopback-id	Configures the loopback interface. The range of the loopback ID is 0 to 7.
network	Use network source IP address.
serviceport	Use serviceport source IP address.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

no ip name source-interface

Use this command to reset the DNS source interface to the default settings.

Format no ip name source-interface

Mode Global Config

ip host

Use this command to define static host name-to-address mapping in the host cache. The parameter `name` is host name and `ip address` is the IP address of the host. The hostname can include 1–255 alphanumeric characters, periods, hyphens, underscores, and non-consecutive spaces. Hostnames that include one or more space must be enclosed in quotation marks, for example “lab-pc 45”.

Default none

Format ip host *name ipaddress*

Mode Global Config

no ip host

Use this command to remove the name-to-address mapping.

Format no ip host *name*

Mode Global Config

ipv6 host

Use this command to define static host name-to-IPv6 address mapping in the host cache. The parameter `name` is host name and `v6 address` is the IPv6 address of the host. The hostname can include 1–255 alphanumeric characters, periods, hyphens, and spaces. Hostnames that include one or more space must be enclosed in quotation marks, for example “lab-pc 45”.

Default none

Format	ipv6 host *name v6 address*
Mode	Global Config

no ipv6 host

Use this command to remove the static host name-to-IPv6 address mapping in the host cache.

Format	no ipv6 host *name*
Mode	Global Config

ip domain retry

Use this command to specify the number of times to retry sending Domain Name System (DNS) queries. The parameter ***number*** indicates the number of times to retry sending a DNS query to the DNS server. This number ranges from 0 to 100.

Default	2
Format	ip domain retry *number*
Mode	Global Config

no ip domain retry

Use this command to return to the default.

Format	no ip domain retry *number*
Mode	Global Config

ip domain timeout

Use this command to specify the amount of time to wait for a response to a DNS query. The parameter ***seconds*** specifies the time, in seconds, to wait for a response to a DNS query. The parameter ***seconds*** ranges from 0 to 3600.

Default	3
Format	ip domain timeout *seconds*
Mode	Global Config

no ip domain timeout

Use this command to return to the default setting.

Format	no ip domain timeout *seconds*
Mode	Global Config

clear host

Use this command to delete entries from the host name-to-address cache. This command clears the entries from the DNS cache maintained by the software. This command clears both IPv4 and IPv6 entries.

Format	clear host {*name* | all}
Mode	Privileged EXEC

Field	Description
name	A particular host entry to remove. The parameter `name` ranges from 1-255 characters.
all	Removes all entries.

show hosts

Use this command to display the default domain name, a list of name server hosts, the static and the cached list of host names and addresses. The parameter `name` ranges from 1-255 characters. This command displays both IPv4 and IPv6 entries.

Format	show hosts *[name]*
Mode	Privileged EXEC User EXEC

Field	Description
Host Name	Domain host name.
Default Domain	Default domain name.
Default Domain List	Default domain list.
Domain Name Lookup	DNS client enabled/disabled.
Number of Retries	Number of time to retry sending Domain Name System (DNS) queries.
Retry Timeout Period	Amount of time to wait for a response to a DNS query.
Name Servers	Configured name servers.
DNS Client Source Interface	Shows the configured source interface (source IP address) used for a DNS client. The IP address of the selected interface is used as source IP for all communications with the server.

Example: The following shows example CLI display output for the command.

```
(Switching) show hosts

Host name......................... Device
Default domain.................... gm.com
Default domain list............... yahoo.com, Stanford.edu, rediff.com
Domain Name lookup................ Enabled
Number of retries................. 5
Retry timeout period.............. 1500
Name servers (Preference order)... 176.16.1.18 176.16.1.19
```

```
DNS Client Source Interface.......                    (not configured)

Configured host name-to-address mapping:

Host                    Addresses
------------------------------ ------------------------------
accounting.gm.com           176.16.8.8

Host                                                    Total  ElapsedTypeAddresses
--------------- --------                               ------    --------     --------------
www.stanford.edu   72                                     3       IP 171.64.14.203
```

IP Address Conflict Commands

The commands in this section help troubleshoot IP address conflicts.

ip address-conflict-detect run

This command triggers the switch to run active address conflict detection by sending gratuitous ARP packets for IPv4 addresses on the switch.

Format ip address-conflict-detect run

Mode
- Global Config
- Virtual Router Config

show ip address-conflict

This command displays the status information corresponding to the last detected address conflict.

Format show ip address-conflict

Modes Privileged EXEC

Parameter	Definition
Address Conflict Detection Status	Identifies whether the switch has detected an address conflict on any IP address.
Last Conflicting IP Address	The IP Address that was last detected as conflicting on any interface.
Last Conflicting MAC Address	The MAC Address of the conflicting host that was last detected on any interface.
Time Since Conflict Detected	The time in days, hours, minutes and seconds since the last address conflict was detected.

clear ip address-conflict-detect

This command clears the detected address conflict status information for the specified virtual router. If no router is specified, the command is executed for the default router.

Format clear ip address-conflict-detect

Modes Privileged EXEC

Serviceability Packet Tracing Commands

These commands improve the capability of network engineers to diagnose conditions affecting their CE0128XB/CE0152XB product.

CAUTION:
The output of “debug” commands can be long and may adversely affect system performance.

capture start

Use the command `capture start` to manually start capturing CPU packets for packet trace.

The packet capture operates in three modes:

- capture file
- remote capture
- capture line

The command is not persistent across a reboot cycle.

Format	capture start [{all | receive | transmit}]
Mode	Privileged EXEC

Parameter	Description
all	Capture all traffic.
receive	Capture only received traffic.
transmit	Capture only transmitted traffic.

capture stop

Use the command `capture stop` to manually stop capturing CPU packets for packet trace.

Format	capture stop
Mode	Privileged EXEC

capture file | remote | line

Use this command to configure file capture options. The command is persistent across a reboot cycle.

Format	capture {file|remote|line}
Mode	Global Config

Parameter	Description
file	In the capture file mode, the captured packets are stored in a file on NVRAM. The maximum file size defaults to 524288 bytes. The switch can transfer the file to a TFTP server via TFTP, SFTP, SCP via CLI, and SNMP. The file is formatted in pcap format, is named cpuPktCapture.pcap, and can be examined using network analyzer tools such as Wireshark or Ethereal. Starting a file capture automatically terminates any remote capture sessions and line capturing. After the packet capture is activated, the capture proceeds until the capture file reaches its maximum size, or until the capture is stopped manually using the CLI command `capture stop`.
remote	In the remote capture mode, the captured packets are redirected in real time to an external PC running the Wireshark tool for Microsoft Windows. A packet capture server runs on the switch side and sends the captured packets via a TCP connection to the Wireshark tool. The remote capture can be enabled or disabled using the CLI. There should be a Windows PC with the Wireshark tool to display the captured file. When using the remote capture mode, the switch does not store any captured data locally on its file system. You can configure the IP port number for connecting Wireshark to the switch. The default port number is 2002. If a firewall is installed between the Wireshark PC and the switch, then these ports must be allowed to pass through the firewall. You must configure the firewall to allow the Wireshark PC to initiate TCP connections to the switch. If the client successfully connects to the switch, the CPU packets are sent to the client PC, then Wireshark receives the packets and displays them. This continues until the session is terminated by either end. Starting a remote capture session automatically terminates the file capture and line capturing.
line	In the capture line mode, the captured packets are saved into the RAM and can be displayed on the CLI. Starting a line capture automatically terminates any remote capture session and capturing into a file. There is a maximum 128 packets of maximum 128 bytes that can be captured and displayed in line mode.

capture remote port

Use this command to configure file capture options. The command is persistent across a reboot cycle. The *`id`* parameter is a TCP port number from 1024 to 49151.

Format	capture remote port *id*
Mode	Global Config

capture file size

Use this command to configure file capture options. The command is persistent across a reboot cycle. The *`max-file-size`* parameter is the maximum size the pcap file can reach, which is 2 to 512 KB.

Format	capture file size *max file size*
Mode	Global Config

capture line wrap

This command enables wrapping of captured packets in line mode when the captured packets reaches full capacity.

Format	capture line wrap
Mode	Global Config

no capture line wrap

This command disables wrapping of captured packets and configures capture packet to stop when the captured packet capacity is full.

Format	no capture line wrap
Mode	Global Config

show capture packets

Use this command to display packets captured and saved to RAM. It is possible to capture and save into RAM, packets that are received or transmitted through the CPU. A maximum 128 packets can be saved into RAM per capturing session. A maximum 128 bytes per packet can be saved into the RAM. If a packet holds more than 128 bytes, only the first 128 bytes are saved; data more than 128 bytes is skipped and cannot be displayed in the CLI.

Capturing packets is stopped automatically when 128 packets are captured and have not yet been displayed during a capture session. Captured packets are not retained after a reload cycle.

Format	show capture packets
Mode	Privileged EXEC

cpu-traffic direction interface

Use this command to associate CPU filters to an interface or list of interfaces. The interfaces can be a physical or logical LAG. The statistics counters are updated only for the configured interfaces. The traces can also be obtained for the configured interfaces.

Note: The offset should consider the VLAN tag headers as the packet to the CPU is always a tagged packet.

Default	None
Format	cpu-traffic direction {tx|rx|both} interface *interface-range*
Mode	Global Config

no cpu-traffic direction interface

Use this command to remove all interfaces from the CPU filters.

Format	no cpu-traffic direction {tx|rx|both} interface *interface-range*

Mode	Global Config

cpu-traffic direction match cust-filter

Use this command to configure a custom filter. The statistics and/or traces for configured filters are obtained for the packet matching configured data at the specific offset. If the mask is not specified then the default mask is 0xFF. There can be three different offsets specified as match conditions. Each time a custom filter is configured, the switch overrides the previous configuration.

Note: The offset should consider the VLAN tag headers as the packet to the CPU is always a tagged packet.

Default	None
Format	cpu-traffic direction {tx|rx|both} match cust-filter *offset1 data1* [mask1 *mask1*] *offset2 data2* [mask2 *mask2*] *offset3 data3* [mask3 *mask3*]
Mode	Global Config

no cpu-traffic direction match cust-filter

Use this command to remove the configured custom filter.

Format	no cpu-traffic direction {tx|rx|both} match cust-filter *offset1 data1* [mask1 *mask1*] *offset2 data2* [mask2 *mask2*] *offset3 data3* [mask3 *mask3*]
Mode	Global Config

cpu-traffic direction match srcip

Use this command to configure the source IP address-specific filter. The statistics and/or the traces for configured filters are obtained for the packet matching configured source IP/Mask.

Default	None
Format	cpu-traffic direction {tx|rx|both} match srcip *ipaddress* [mask *mask*]
Mode	Global Config

no cpu-traffic direction match srcip

Use this command to disable the configured source IP address filter.

Format	no cpu-traffic direction {tx|rx|both} match srcip *ipaddress* [mask *mask*]
Mode	Global Config

cpu-traffic direction match dstip

Use this command to configure the destination IP address-specific filter. The statistics and/or the traces for configured filters are obtained for the packet matching configured destination IP/Mask.

Default	None

Format	cpu-traffic direction {tx|rx|both} match dstip *ipaddress* [mask *mask*]
Mode	Global Config

no cpu-traffic direction match dstip

Use this command to disable the configured destination IP address filter.

Format	no cpu-traffic direction {tx|rx|both} match dstip *ipaddress* [mask *mask*]
Mode	Global Config

cpu-traffic direction match tcp

Use this command to configure the source or destination TCP port-specific filter. The statistics and/or traces for configured filters are obtained for the packet matching configured source/destination TCP port.

Default	None
Format	cpu-traffic direction {tx|rx|both} match {srctcp|dsttcp} *port* [mask *mask*]
Mode	Global Config

no cpu-traffic direction match tcp

Use this command to remove the configured source/destination TCP port filter.

Format	no cpu-traffic direction {tx|rx|both} match {srctcp|dsttcp} *port* [mask *mask*]
Mode	Global Config

cpu-traffic direction match udp

Use this command to configure the source or destination UDP port-specific filter. The statistics and/or traces for configured filters are obtained for the packet matching configured source/destination UDP port.

Default	None
Format	cpu-traffic direction {tx|rx|both} match {srcudp|dstudp} *port* [mask *mask*]
Mode	Global Config

no cpu-traffic direction match udp

Use this command to remove the configured source/destination UDP port filter.

Format	no cpu-traffic direction {tx|rx|both} match {srcudp|dstudp} *port* [mask *mask*]
Mode	Global Config

cpu-traffic mode

Use this command to configure CPU-traffic mode. The packets in the RX/TX direction are matched when the mode is enabled.

Default	Disabled
Format	cpu-traffic mode
Mode	Global Config

no cpu-traffic mode

Use this command to disable CPU-traffic mode.

Format	no cpu-traffic mode
Mode	Global Config

cpu-traffic trace

Use this command to configure CPU packet tracing. The packet can be received by multiple components. If the feature is enabled and tracing configured, the packets are traced per the defined filter. If dump-pkt is enabled, the first 64 bytes of the packet are displayed along with the trace statistics.

Default	Disabled
Format	cpu-traffic trace {dump-pkt}
Mode	Global Config

no cpu-traffic trace

Use this command to disable CPU packet tracing and dump-pkt (if configured).

Format	no cpu-traffic trace {dump-pkt}
Mode	Global Config

show cpu-traffic

Use this command to display the current configuration parameters.

Default	None
Format	show cpu-traffic
Mode	Privileged EXEC

Example:

```
(Routing) #show cpu-traffic

Admin Mode..................................... Disable
Packet Trace................................... Disable
Packet Dump.................................... Disable

Direction TX:
Filter Options................................. N/A
Interface...................................... N/A
Src TCP parameters............................. 0 0
Dst TCP parameters............................. 0 0
Src UDP parameters............................. 0 0
```

```
Dst UDP parameters............................ 0 0
Src IP parameters............................. 0.0.0.0 0.0.0.0
Dst IP parameters............................. 0.0.0.0 0.0.0.0
Src MAC parameters............................ 00:00:00:00:00:00 00:00:00:00:00:00
Dst MAC parameters............................ 00:00:00:00:00:00 00:00:00:00:00:00
Custom filter parameters1..................... Offset=0x0 Value=0x0 Mask=0x0
Custom filter parameters2..................... Offset=0x0 Value=0x0 Mask=0x0
Custom filter parameters3..................... Offset=0x0 Value=0x0 Mask=0x0

Direction RX:
Filter Options................................ N/A
Interface..................................... N/A
Src TCP parameters............................ 0 0
Dst TCP parameters............................ 0 0
Src UDP parameters............................ 0 0
Dst UDP parameters............................ 0 0
Src IP parameters............................. 0.0.0.0 0.0.0.0
Dst IP parameters............................. 0.0.0.0 0.0.0.0
Src MAC parameters............................ 00:00:00:00:00:00 00:00:00:00:00:00
Dst MAC parameters............................ 00:00:00:00:00:00 00:00:00:00:00:00
Custom filter parameters1..................... Offset=0x0 Value=0x0 Mask=0x0
Custom filter parameters2..................... Offset=0x0 Value=0x0 Mask=0x0
Custom filter parameters3..................... Offset=0x0 Value=0x0 Mask=0x0
```

show cpu-traffic interface

Use this command to display per interface statistics for configured filters. The statistics can be displayed for a specific filter (e.g., stp, udld, arp etc). If no filter is specified, statistics are displayed for all configured filters. Similarly, source/destination IP, TCP, UDP or MAC along with custom filter can be used as command option to get statistics.

Default	None
Format	show cpu-traffic interface {all | *unit/slot/port* | cpu } *filter*
Mode	Privileged EXEC

show cpu-traffic summary

Use this command to display summary statistics for configured filters for all interfaces.

Default	None
Format	show cpu-traffic summary
Mode	Privileged EXEC

Example:

```
(Routing) #show cpu-traffic summary

Filter      Received   Transmitted
------------ ---------- -----------
STP         0         0
LACPDU      0         0
ARP         0         0
UDLD        0         0
LLDP        0         0
IP          0         0
OSPF        0         0
```

```
DHCP      0     0
BCAST     0     0
MCAST     0     0
UCAST     0     0
SRCIP     0     0
DSTIP     0     0
SRCMAC    0     0
DSTMAC    0     0
CUSTOM    0     0
SRCTCP    0     0
DSTTCP    0     0
SRCUDP    0     0
```

show cpu-traffic trace

Use this command to display traced information. The trace information can be displayed either for all available packets or for specific filter (e.g., stp, udld, arp etc). Similarly, source/destination IP or MAC along with custom filter can be used as command option to get specific traces from history. If enabled, packet dump information is displayed along with packet trace statistics. By default, packet dump buffer size is set to store first 64 bytes of packet.

Default	None
Format	show cpu-traffic trace *filter*
Mode	Privileged EXEC

Example:

```
(Routing) #show cpu-traffic summary
Filter      Received   Transmitted
------------ ---------- -----------
STP          0          0
LACPDU       0          0
ARP          0          0
UDLD         0          0
LLDP         0          0
IP           0          0
OSPF         0          0
DHCP         0          0
BCAST        0          0
MCAST        0          0
UCAST        0          0
SRCIP        0          0
DSTIP        0          0
SRCMAC       0          0
DSTMAC       0          0
CUSTOM       0          0
SRCTCP       0          0
DSTTCP       0          0
SRCUDP       0          0
DSTUDP       0          0
```

clear cpu-traffic

Use this command to clear cpu-traffic statistics or trace information on all interfaces.

Default	None

Format	clear cpu-traffic {counters | traces}
Mode	Global Config

debug aaa accounting

This command is useful to debug accounting configuration and functionality in User Manager.

Format	debug aaa accounting
Mode	Privileged EXEC

no debug aaa accounting

Use this command to turn off debugging of User Manager accounting functionality.

Format	no debug aaa accounting
Mode	Privileged EXEC

debug aaa authorization

Use this command to enable the tracing for AAA in User Manager. This is useful to debug authorization configuration and functionality in the User Manager. Each of the parameters are used to configure authorization debug flags.

Format	debug aaa authorization commands|exec
Mode	Privileged EXEC

no debug aaa authorization

Use this command to turn off debugging of the User Manager authorization functionality.

Format	no debug aaa authorization
Mode	Privileged EXEC

Example: The following is an example of the command.

```
(Switching) #debug aaa authorization
Tacacs authorization receive packet tracing enabled.

(Switching) #debug tacacs authorization packet transmit

authorization tracing enabled.

(Switching) #no debug aaa authorization

AAA authorization tracing enabled

(Switching) #
```

debug arp

Use this command to enable ARP debug protocol messages.

Default	disabled
Format	debug arp
Mode	Privileged EXEC

no debug arp

Use this command to disable ARP debug protocol messages.

Format	no debug arp
Mode	Privileged EXEC

debug authentication

This command displays either the debug trace for either a single event or all events for an interface

Default	none
Format	debug authentication packet {all | event} *interface*
Mode	Privileged EXEC

debug bonjour

Use this command to enable Bonjour tracing.

Default	disabled
Format	debug bonjour [{level1 | level2}]
Mode	Privileged EXEC

no debug bonjour

Use this command to disable Bonjour tracing.

Format	no debug bonjour [{level1 | level2}]
Mode	Privileged EXEC

debug clear

This command disables all previously enabled “debug” traces.

Default	disabled
Format	debug clear
Mode	Privileged EXEC

debug console

This command enables the display of “debug” trace output on the login session in which it is executed. Debug console display must be enabled in order to view any trace output. The output of debug trace commands will appear on all login sessions for which debug console has been enabled. The configuration of this command remains in effect for the life of the login session. The effect of this command is not persistent across resets.

Default	disabled
Format	debug console
Mode	Privileged EXEC

no debug console

This command disables the display of “debug” trace output on the login session in which it is executed.

Format	no debug console
Mode	Privileged EXEC

debug crashlog

Use this command to view information contained in the crash log file that the system maintains when it experiences an unexpected reset. The crash log file contains the following information:

- Call stack information in both primitive and verbose forms
- Log Status
- Buffered logging
- Event logging
- Persistent logging
- System Information (output of sysapiMbufDump)
- Message Queue Debug Information
- Memory Debug Information
- Memory Debug Status
- OS Information (output of osapiShowTasks)
- /proc information (meminfo, cpuinfo, interrupts, version and net/sockstat)

Default	disabled
Format	debug crashlog {[kernel] *crashlog-number* [upload *url*] | proc | verbose | deleteall}
Mode	Privileged EXEC

Parameter	Description
kernel	View the crash log file for the kernel

Parameter	Description
crashlog-number	Specifies the file number to view. The system maintains up to four copies, and the valid range is 1 to 4.
upload *url*	To upload the crash log (or crash dump) to a TFTP server, use the `upload` keyword and specify the required TFTP server information.
proc	View the application process crashlog.
verbose	Enable the verbose crashlog.
deleteall	Delete all crash log files on the system.
data	Crash log data recorder.
crashdump-number	Specifies the crash dump number to view. The valid range is 0 to 2.
download *url*	To download a crash dump to the switch, use the `download` keyword and specify the required TFTP server information.
component-id	The ID of the component that caused the crash.
item-number	The item number.
additional-parameter	Additional parameters to include.

debug dcbx packet

Use this command to enable debug tracing for DCBX packets that are transmitted or received.

Default	disabled
Format	debug dcbx packet {receive | transmit}
Mode	Privileged EXEC

debug debug-config

Use this command to download or upload the debug-config.ini file. The debug-config. ini file executes CLI commands (including devshell and drivshell commands) on specific predefined events. The debug config file is created manually and downloaded to the switch.

Default	disabled
Format	debug debug-config {download <*url*> | upload <*url*>}
Mode	Privileged EXEC

debug dhcp packet

This command displays “debug” information about DHCPv4 client activities and traces DHCPv4 packets to and from the local DHCPv4 client.

Default	disabled
Format	debug dhcp packet [transmit | receive]
Mode	Privileged EXEC

no debug dhcp

This command disables the display of “debug” trace output for DHCPv4 client activity.

Format	no debug dhcp packet [transmit | receive]
Mode	Privileged EXEC

debug dot1x packet

Use this command to enable dot1x packet debug trace.

Default	disabled
Format	debug dot1x
Mode	Privileged EXEC

no debug dot1x packet

Use this command to disable dot1x packet debug trace.

Format	no debug dot1x
Mode	Privileged EXEC

debug igmpsnooping packet

This command enables tracing of IGMP Snooping packets received and transmitted by the switch.

Default	disabled
Format	debug igmpsnooping packet
Mode	Privileged EXEC

no debug igmpsnooping packet

This command disables tracing of IGMP Snooping packets.

Format	no debug igmpsnooping packet
Mode	Privileged EXEC

debug igmpsnooping packet transmit

This command enables tracing of IGMP Snooping packets transmitted by the switch. Snooping should be enabled on the device and the interface in order to monitor packets for a particular interface.

Default	disabled
Format	debug igmpsnooping packet transmit
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 02:45:06 192.168.17.29-1 IGMPSNOOP[185429992]: igmp_snooping_debug.c(116) 908 % Pkt
TX - Intf: 1/0/20(20), Vlan_Id:1 Src_Mac: 00:03:0e:00:00:00 Dest_Mac: 01:00:5e:00:00:01 Src_IP: 9.1.1.1
Dest_IP: 225.0.0.1 Type: V2_Membership_Report Group: 225.0.0.1
```

The following parameters are displayed in the trace message.

Parameter	Definition
TX	A packet transmitted by the device.
Intf	The interface that the packet went out on. Format used is unit/slot/port (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
Src_Mac	Source MAC address of the packet.
Dest_Mac	Destination multicast MAC address of the packet.
Src_IP	The source IP address in the IP header in the packet.
Dest_IP	The destination multicast IP address in the packet.
Type	The type of IGMP packet. Type can be one of the following: • `Membership Query` – IGMP Membership Query • `V1_Membership_Report` – IGMP Version 1 Membership Report • `V2_Membership_Report` – IGMP Version 2 Membership Report • `V3_Membership_Report` – IGMP Version 3 Membership Report • `V2_Leave_Group` – IGMP Version 2 Leave Group
Group	Multicast group address in the IGMP header.

no debug igmpsnooping transmit

This command disables tracing of transmitted IGMP snooping packets.

Format	no debug igmpsnooping transmit
Mode	Privileged EXEC

debug igmpsnooping packet receive

This command enables tracing of IGMP Snooping packets received by the switch. Snooping should be enabled on the device and the interface in order to monitor packets for a particular interface.

Default	disabled
Format	debug igmpsnooping packet receive
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 02:45:06 192.168.17.29-1 IGMPSNOOP[185429992]: igmp_snooping_debug.c(116) 908 % Pkt
RX - Intf: 1/0/20(20), Vlan_Id:1 Src_Mac: 00:03:0e:00:00:10 Dest_Mac: 01:00:5e:00:00:05 Src_IP: 11.1.1.1
Dest_IP: 225.0.0.5 Type: Membership_Query Group: 225.0.0.5
```

The following parameters are displayed in the trace message:

Parameter	Definition
RX	A packet received by the device.

Parameter	Definition
Intf	The interface that the packet went out on. Format used is unit/slot/port (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
Src_Mac	Source MAC address of the packet.
Dest_Mac	Destination multicast MAC address of the packet.
Src_IP	The source IP address in the ip header in the packet.
Dest_IP	The destination multicast ip address in the packet.
Type	The type of IGMP packet. Type can be one of the following: • `Membership_Query` – IGMP Membership Query • `V1_Membership_Report` – IGMP Version 1 Membership Report • `V2_Membership_Report` – IGMP Version 2 Membership Report • `V3_Membership_Report` – IGMP Version 3 Membership Report • `V2_Leave_Group` – IGMP Version 2 Leave Group
Group	Multicast group address in the IGMP header.

no debug igmpsnooping receive

This command disables tracing of received IGMP Snooping packets.

Format	no debug igmpsnooping receive
Mode	Privileged EXEC

debug ip acl

Use this command to enable debug of IP Protocol packets matching the ACL criteria.

Default	disabled
Format	debug ip acl *acl Number*
Mode	Privileged EXEC

no debug ip acl

Use this command to disable debug of IP Protocol packets matching the ACL criteria.

Format	no debug ip acl acl Number
Mode	Privileged EXEC

debug ip dvmrp packet

Use this command to trace DVMRP packet reception and transmission. `receive` traces only received DVMRP packets and `transmit` traces only transmitted DVMRP packets. When neither keyword is used in the command, then all DVMRP packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console

Default	disabled
Format	debug ip dvmrp packet [receive | transmit]
Mode	Privileged EXEC

no debug ip dvmrp packet

Use this command to disable debug tracing of DVMRP packet reception and transmission.

Format	no debug ip dvmrp packet [receive | transmit]
Mode	Privileged EXEC

debug ip igmp packet

Use this command to trace IGMP packet reception and transmission. `receive` traces only received IGMP packets and `transmit` traces only transmitted IGMP packets. When neither keyword is used in the command, then all IGMP packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	debug ip igmp packet [receive | transmit]
Mode	Privileged EXEC

no debug ip igmp packet

Use this command to disable debug tracing of IGMP packet reception and transmission.

Format	no debug ip igmp packet [receive | transmit]
Mode	Privileged EXEC

debug ip mcache packet

Use this command for tracing MDATA packet reception and transmission. `receive` traces only received data packets and `transmit` traces only transmitted data packets. When neither keyword is used in the command, then all data packet traces are dumped. Vital information such as source address, destination address, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	debug ip mcache packet [receive | transmit]
Mode	Privileged EXEC

no debug ip mcache packet

Use this command to disable debug tracing of MDATA packet reception and transmission.

Format	no debug ip mcache packet [receive | transmit]
Mode	Privileged EXEC

debug ip pimdm packet

Use this command to trace PIMDM packet reception and transmission. `receive` traces only received PIMDM packets and `transmit` traces only transmitted PIMDM packets. When neither keyword is used in the command, then all PIMDM packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	debug ip pimdm packet [receive | transmit]
Mode	Privileged EXEC

no debug ip pimdm packet

Use this command to disable debug tracing of PIMDM packet reception and transmission.

Format	no debug ip pimdm packet [receive | transmit]
Mode	Privileged EXEC

debug ip pimsm packet

Use this command to trace PIMSM packet reception and transmission. `receive` traces only received PIMSM packets and `transmit` traces only transmitted PIMSM packets. When neither keyword is used in the command, then all PIMSM packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	debug ip pimsm packet [receive | transmit]
Mode	Privileged EXEC

no debug ip pimsm packet

Use this command to disable debug tracing of PIMSM packet reception and transmission.

Format	no debug ip pimsm packet [receive | transmit]
Mode	Privileged EXEC

debug ip vrrp

Use this command to enable debug tracing of VRRP events. Debug messages are sent to the system log at the DEBUG severity level. To print them on the console, enable console logging at the DEBUG level (`logging console debug`).

The debug options enabled for a specific peer are the union of the options enabled globally and the options enabled specifically for the peer. Enabling one of the packet type options enables packet tracing in both the inbound and outbound directions.

Default	Enabled
Format	debug ip vrrp
Mode	Privileged Exec

no debug ip vrrp

Use this command to disable debug tracing of VRRP events.

Format	no debug ip vrrp
Mode	Privileged Exec

debug ipv6 dhcp

This command displays “debug” information about DHCPv6 client activities and traces DHCPv6 packets to and from the local DHCPv6 client.

Default	disabled
Format	debug ipv6 dhcp
Mode	Privileged EXEC

no debug ipv6 dhcp

This command disables the display of “debug” trace output for DHCPv6 client activity.

Format	no debug ipv6 dhcp
Mode	Privileged EXEC

debug ipv6 mcache packet

Use this command for tracing MDATAv6 packet reception and transmission. `receive` traces only received data packets and `transmit` traces only transmitted data packets. When neither keyword is used in the command, then all data packet traces are dumped. Vital information such as source address, destination address, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	debug ipv6 mcache packet [receive | transmit]

Mode	Privileged EXEC

no debug ipv6 mcache packet

Use this command to disable debug tracing of MDATAv6 packet reception and transmission.

Format	no debug ipv6 mcache packet [receive | transmit]
Mode	Privileged EXEC

debug ipv6 mld packet

Use this command to trace MLDv6 packet reception and transmission. `receive` traces only received MLDv6 packets and `transmit` traces only transmitted MLDv6 packets. When neither keyword is used in the command, then all MLDv6 packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	debug ipv6 mld packet [receive | transmit]
Mode	Privileged EXEC

no debug ipv6 mld packet

Use this command to disable debug tracing of MLDv6 packet reception and transmission.

Format	no debug ipv6 mld packet [receive | transmit]
Mode	Privileged EXEC

debug ipv6 ospfv3 packet

Use this command to enable IPv6 OSPFv3 packet debug trace.

Default	disabled
Format	debug ipv6 ospfv3 packet
Mode	Privileged EXEC

no debug ipv6 ospfv3 packet

Use this command to disable tracing of IPv6 OSPFv3 packets.

Format	no debug ipv6 ospfv3 packet
Mode	Privileged EXEC

debug ipv6 pimdm packet

Use this command to trace PIMDMv6 packet reception and transmission. `receive` traces only received PIMDMv6 packets and `transmit` traces only transmitted PIMDMv6 packets. When neither keyword is used in the command, then all PIMDMv6 packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	debug ipv6 pimdm packet [receive | transmit]
Mode	Privileged EXEC

no debug ipv6 pimdm packet

Use this command to disable debug tracing of PIMDMv6 packet reception and transmission.

debug ipv6 pimsm packet

Use this command to trace PIMSMv6 packet reception and transmission. `receive` traces only received PIMSMv6 packets and `transmit` traces only transmitted PIMSMv6 packets. When neither keyword is used in the command, then all PIMSMv6 packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	debug ipv6 pimsm packet [receive | transmit]
Mode	Privileged EXEC

no debug ipv6 pimsm packet

Use this command to disable debug tracing of PIMSMv6 packet reception and transmission.

Format	no debug ipv6 pimsm packet [receive | transmit]
Mode	Privileged EXEC

debug lacp packet

This command enables tracing of LACP packets received and transmitted by the switch.

Default	disabled
Format	debug lacp packet
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 14:04:51 10.254.24.31-1 DOT3AD[183697744]: dot3ad_debug.c(385) 58 %%
 Pkt TX - Intf: 1/0/1(1), Type: LACP, Sys: 00:11:88:14:62:e1, State: 0x47, Key:
0x36
```

no debug lacp packet

This command disables tracing of LACP packets.

Format	no debug lacp packet
Mode	Privileged EXEC

debug mldsnooping packet

Use this command to trace MLD snooping packet reception and transmission. `receive` traces only received MLD snooping packets and `transmit` traces only transmitted MLD snooping packets. When neither keyword is used in the command, then all MLD snooping packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Default	disabled
Format	debug mldsnooping packet [receive | transmit]
Mode	Privileged EXEC

no debug mldsnooping packet

Use this command to disable debug tracing of MLD snooping packet reception and transmission.

debug ospf packet

This command enables tracing of OSPF packets received and transmitted by the switch or, optionally, a virtual router can be specified.

Default	disabled
Format	debug ospf packet
Mode	Privileged EXEC

Sample outputs of the trace messages are shown below.

```
<15> JAN 02 11:03:31 10.50.50.1-2 OSPF[46300472]: ospf_debug.c(297) 25430 % Pkt RX - Intf:2/0/48 Src
Ip:192.168.50.2 DestIp:224.0.0.5 AreaId:0.0.0.0 Type:HELLO NetMask:255.255.255.0 D
esigRouter:0.0.0.0 Backup:0.0.0.0

<15> JAN 02 11:03:35 10.50.50.1-2 OSPF[46300472]: ospf_debug.c(293) 25431 % Pkt TX - Intf:2/0/48 Src
Ip:10.50.50.1 DestIp:192.168.50.2 AreaId:0.0.0.0 Type:DB_DSCR Mtu:1500 Options:E
Flags: I/M/MS Seq:126166

<15> JAN 02 11:03:36 10.50.50.1-2 OSPF[46300472]: ospf_debug.c(297) 25434 % Pkt RX - Intf:2/0/48 Src
Ip:192.168.50.2 DestIp:192.168.50.1 AreaId:0.0.0.0 Type:LS_REQ Length: 1500

<15> JAN 02 11:03:36 10.50.50.1-2 OSPF[46300472]: ospf_debug.c(293) 25435 % Pkt TX - Intf:2/0/48 Src
Ip:10.50.50.1 DestIp:192.168.50.2 AreaId:0.0.0.0 Type:LS_UPD Length: 1500
```

```
<15> JAN 02 11:03:37 10.50.50.1-2 OSPF[46300472]: ospf_debug.c(293) 25441 % Pkt TX - Intf:2/0/48 Src
Ip:10.50.50.1 DestIp:224.0.0.6 AreaId:0.0.0.0 Type:LS_ACK Length: 1500
```

The following parameters are displayed in the trace message:

Parameter	Definition
TX/RX	TX refers to a packet transmitted by the device. RX refers to packets received by the device.
Intf	The interface that the packet came in or went out on. Format used is unit/slot/port (internal interface number).
SrcIp	The source IP address in the IP header of the packet.
DestIp	The destination IP address in the IP header of the packet.
AreaId	The area ID in the OSPF header of the packet.
Type	Could be one of the following: `HELLO` – Hello packet `DB_DSCR` – Database descriptor `LS_REQ` – LS Request `LS_UPD` – LS Update `LS_ACK` – LS Acknowledge

The remaining fields in the trace are specific to the type of OSPF Packet.

HELLO packet field definitions:

Parameter	Definition
Netmask	The netmask in the hello packet.
DesignRouter	Designated Router IP address.
Backup	Backup router IP address.

DB_DSCR packet field definitions:

Field	Definition
MTU	MTU
Options	Options in the OSPF packet.
Flags	Could be one or more of the following: • `I` – Init • `M` – More • `MS` – Master/Slave
Seq	Sequence Number of the DD packet.

LS_REQ packet field definitions.

Field	Definition
Length	Length of packet

LS_UPD packet field definitions.

Field	Definition
Length	Length of packet

LS_ACK packet field definitions.

Field	Definition
Length	Length of packet

no debug ospf packet

This command disables tracing of OSPF packets.

Format	no debug ospf packet
Mode	Privileged EXEC

debug ospfv3 packet

Use this command to enable OSPFv3 packet debug trace.

Default	disabled
Format	debug ospfv3 packet
Mode	Privileged EXEC

no debug ospfv3 packet

Use this command to disable tracing of OSPFv3 packets.

Format	no debug ospfv3 packet
Mode	Privileged EXEC

debug ping packet

This command enables tracing of ICMP echo requests and responses. The command traces pings on the network port/ service port for switching packages. For routing packages, pings are traced on the routing ports as well. If specified, pings can be traced on the virtual router.

Default	disabled
Format	debug ping packet
Mode	Privileged EXEC

Example: A sample output of the trace message is shown below.

```
<15> JAN 01 00:21:22 192.168.17.29-1 SIM[181040176]: sim_debug.c(128) 20 % Pkt TX - Intf: 1/0/1(1),
SRC_IP:10.50.50.2, DEST_IP:10.50.50.1, Type:ECHO_REQUEST


<15> JAN 01 00:21:22 192.168.17.29-1 SIM[182813968]: sim_debug.c(82) 21 % Pkt RX - Intf: 1/0/1(1), S
RC_IP:10.50.50.1, DEST_IP:10.50.50.2, Type:ECHO_REPLY
```

The following parameters are displayed in the trace message:

Parameter	Definition
TX/RX	TX refers to a packet transmitted by the device. RX refers to packets received by the device.
Intf	The interface that the packet came in or went out on. Format used is unit/slot/port (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
SRC_IP	The source IP address in the IP header in the packet.
DEST_IP	The destination IP address in the IP header in the packet.
Type	Type determines whether or not the ICMP message is a REQUEST or a RESPONSE.

no debug ping packet

This command disables tracing of ICMP echo requests and responses.

Format	no debug ping packet
Mode	Privileged EXEC

debug rip packet

This command turns on tracing of RIP requests and responses. This command takes no options. The output is directed to the log file.

Default	disabled
Format	debug rip packet
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 00:35:15 192.168.17.29-1 RIP[181783160]: rip_map_debug.c(96) 775 %
Pkt RX on Intf: 1/0/1(1), Src_IP:43.1.1.1 Dest_IP:43.1.1.2
Rip_Version: RIPv2 Packet_Type:RIP_RESPONSE
ROUTE 1): Network: 10.1.1.0 Mask: 255.255.255.0 Metric: 1
ROUTE 2): Network: 40.1.0.0 Mask: 255.255.0.0 Metric: 1
ROUTE 3): Network: 10.50.50.0 Mask: 255.255.255.0 Metric: 1
ROUTE 4): Network: 41.1.0.0 Mask: 255.255.0.0 Metric: 1
ROUTE 5): Network:42.0.0.0 Mask:255.0.0.0 Metric:1
Another 6 routes present in packet not displayed.
```

The following parameters are displayed in the trace message:

Parameter	Definition
TX/RX	TX refers to a packet transmitted by the device. RX refers to packets received by the device.
Intf	The interface that the packet came in or went out on. Format used is unit/slot/port (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
Src_IP	The source IP address in the IP header of the packet.
Dest_IP	The destination IP address in the IP header of the packet.
Rip_Version	RIP version used: RIPv1 or RIPv2.
Packet_Type	Type of RIP packet: RIP_REQUEST or RIP_RESPONSE.

Parameter	Definition
Routes	Up to 5 routes in the packet are displayed in the following format: `Network:` *a.b.c.d* `Mask` *a.b.c.d* `Next_Hop` *a.b.c.d* `Metric` *a* The next hop is only displayed if it is different from `0.0.0.0`. For RIPv1 packets, Mask is always `0.0.0.0`.
Number of routes not printed	Only the first five routes present in the packet are included in the trace. There is another notification of the number of additional routes present in the packet that were not included in the trace.

no debug rip packet

This command disables tracing of RIP requests and responses.

Format	no debug rip packet
Mode	Privileged EXEC

debug sflow packet

Use this command to enable sFlow debug packet trace.

Default	disabled
Format	debug sflow packet
Mode	Privileged EXEC

no debug sflow packet

Use this command to disable sFlow debug packet trace.

Format	no debug sflow packet
Mode	Privileged EXEC

debug spanning-tree bpdu

This command enables tracing of spanning tree BPDUs received and transmitted by the switch.

Default	disabled
Format	debug spanning-tree bpdu
Mode	Privileged EXEC

no debug spanning-tree bpdu

This command disables tracing of spanning tree BPDUs.

Format	no debug spanning-tree bpdu
Mode	Privileged EXEC

debug spanning-tree bpdu receive

This command enables tracing of spanning tree BPDUs received by the switch. Spanning tree should be enabled on the device and on the interface in order to monitor packets for a particular interface.

Default	disabled
Format	debug spanning-tree bpdu receive
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 01:02:04 192.168.17.29-1 DOT1S[191096896]: dot1s_debug.c(1249) 101 % Pkt RX - Intf:
1/0/9(9), Source_Mac: 00:11:88:4e:c2:10 Version: 3, Root Mac: 00:11:88:4e:c2:00, Root Priority: 0x8000 Path
Cost: 0
```

The following parameters are displayed in the trace message:

Parameter	Definition
RX	A packet received by the device.
Intf	The interface that the packet came in on. Format used is unit/port/slot (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
Source_Mac	Source MAC address of the packet.
Version	Spanning tree protocol version (0-3). 0 refers to STP, 2 RSTP and 3 MSTP.
Root_Mac	MAC address of the CIST root bridge.
Root_Priority	Priority of the CIST root bridge. The value is between 0 and 61440. It is displayed in hex in multiples of 4096.
Path_Cost	External root path cost component of the BPDU.

no debug spanning-tree bpdu receive

This command disables tracing of received spanning tree BPDUs.

Format	no debug spanning-tree bpdu receive
Mode	Privileged EXEC

debug spanning-tree bpdu transmit

This command enables tracing of spanning tree BPDUs transmitted by the switch. Spanning tree should be enabled on the device and on the interface in order to monitor packets on a particular interface.

Default	disabled
Format	debug spanning-tree bpdu transmit
Mode	Privileged EXEC

A sample output of the trace message is shown below.

```
<15> JAN 01 01:02:04 192.168.17.29-1 DOT1S[191096896]: dot1s_debug.c(1249) 101 % Pkt TX - Intf:
1/0/7(7), Source_Mac: 00:11:88:4e:c2:00 Version: 3, Root_Mac: 00:11:88:4e:c2:00, Root_Priority: 0x8000
Path_Cost: 0
```

The following parameters are displayed in the trace message:

Parameter	Definition
TX	A packet transmitted by the device.
Intf	The interface that the packet went out on. Format used is unit/port/slot (internal interface number). Unit is always shown as 1 for interfaces on a non-stacking device.
Source_Mac	Source MAC address of the packet.
Version	Spanning tree protocol version (0-3). 0 refers to STP, 2 RSTP and 3 MSTP.
Root_Mac	MAC address of the CIST root bridge.
Root_Priority	Priority of the CIST root bridge. The value is between 0 and 61440. It is displayed in hex in multiples of 4096.
Path_Cost	External root path cost component of the BPDU.

no debug spanning-tree bpdu transmit

This command disables tracing of transmitted spanning tree BPDUs.

Format	no debug spanning-tree bpdu transmit
Mode	Privileged EXEC

debug tacacs

Use the `debug tacacs packet` command to turn on TACACS+ debugging.

Format	debug tacacs {packet [receive | transmit] | accounting | authentication}
Mode	Global Config

Parameter	Description
packet receive	Turn on TACACS+ receive packet debugs.
packet transmit	Turn on TACACS+ transmit packet debugs.
accounting	Turn on TACACS+ authentication debugging.
authentication	Turn on TACACS+ authorization debugging.

debug telnetd start

Use this command to start the debug telnet daemon. The debug telnet daemon gives access to a Linux shell prompt. The telnet user ID is “root”. If the telnet daemon is already running when this command is issued, the command stops and restarts the telnet daemon.

Format	debug telnetd start [password][port]
Mode	Privileged EXEC

Parameter	Description
password	The optional telnet password. If no password is specified, the default password lvl7dbg is used.

Parameter	Description
port	The optional telnet port number. If no telnet port is specified, the default port 2323 is used.

debug telnetd stop

Use this command to stop the telnet daemon previously started by the "debug telnetd start" on page 288 command. If the daemon is not running when this command is issued, the command has no effect.

Format	debug telnetd stop
Mode	Privileged EXEC

debug transfer

This command enables debugging for file transfers.

Format	debug transfer
Mode	Privileged EXEC

no debug transfer

This command disables debugging for file transfers.

Format	no debug transfer
Mode	Privileged EXEC

show debugging

Use the `show debugging` command to display enabled packet tracing configurations.

Format	show debugging
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
console# debug arp
Arp packet tracing enabled.

console# show debugging
Arp packet tracing enabled.
```

no show debugging

Use the `no show debugging` command to disable packet tracing configurations.

Format	no show debugging
Mode	Privileged EXEC

exception protocol

Use this command to specify the protocol used to store the core dump file.

Note: This command is only available on selected Linux-based platforms.

Default	None
Format	exception protocol {nfs | tftp | ftp | local | none}
Mode	Global Config

no exception protocol

Use this command to reset the exception protocol configuration to its factory default value.

Note: This command is only available on selected Linux-based platforms.

Default	None
Format	no exception protocol
Mode	Global Config

exception dump tftp-server

Use this command to configure the IP address of a remote TFTP server in order to dump core files to an external server.

Note: This command is only available on selected Linux-based platforms.

Default	None
Format	exception dump tftp-server {*ip-address*}
Mode	Global Config

no exception dump tftp-server

Use this command to reset the exception dump remote server configuration to its factory default value.

Note: This command is only available on selected Linux-based platforms.

Default	None
Format	no exception dump tftp-server
Mode	Global Config

exception dump filepath

Use this command to configure a file-path to dump core file to a TFTP or FTP server or NFS mount subdirectory.

Note: This command is only available on selected Linux-based platforms.

Default	None
Format	exception dump filepath *dir*
Mode	Global Config

no exception dump filepath

Use this command to reset the exception dump filepath configuration to its factory default value.

Note: This command is only available on selected Linux-based platforms.

Default	None
Format	exception dump filepath
Mode	Global Config

exception core-file

Use this command to configure a prefix for a core-file name. The core file name is generated with the prefix as follows:

If `hostname` is selected:

file-name-prefix_hostname_Time_Stamp.bin

If `hostname` is not selected:

file-name-prefix_MAC_Address_Time_Stamp.bin

If `hostname` is configured the core file name takes the `hostname`, otherwise the core-file names uses the MAC address when generating a core dump file. The prefix length is 15 characters.

Note: This command is only available on selected Linux-based platforms.

Default	Core
Format	exception core-file {*file-name-prefix* | [hostname] | [time-stamp]}
Mode	Global Config

no exception core-file

Use this command to reset the exception core file prefix configuration to its factory default value. The hostname and time-stamp are disabled.

Note: This command is only available on selected Linux-based platforms.

Default	Core
Format	no exception core-file
Mode	Global Config

exception switch-chip-register

This command enables or disables the switch-chip-register dump in case of an exception. The switch-chip-register dump is taken only for a master unit and not for member units

Note: This command is only available on selected Linux-based platforms.

Default	Disable
Format	exception switch-chip-register {enable | disable}
Mode	Global Config

exception dump ftp-server

This command configures the IP address of remote FTP server to dump core files to an external server. If the username and password are not configured, the switch uses anonymous FTP. (The FTP server should be configured to accept anonymous FTP.)

Default	None
Format	exception dump ftp-server *ip-address* [{username *user-name* password *password*}]
Mode	Global Config

no exception dump ftp-server

This command resets exception dump remote FTP server configuration to its factory default value. This command also resets the FTP username and password to empty string.

Default	None
Format	no exception dump ftp-server
Mode	Global Config

exception dump compression

This command enables compression mode.

Default	Enabled
Format	exception dump compression
Mode	Global Config

no exception dump compression

This command disables compression mode.

Default	None
Format	no exception compression
Mode	Global Config

exception dump stack-ip-address protocol

This command configures protocol (dhcp or static) to be used to configure service port when a unit has crashed. If configured as dhcp then the unit gets the IP address from dhcp server available in the network.

Default	dhcp
Format	exception dump stack-ip-address protocol {dhcp | static}
Mode	Global Config

no exception dump stack-ip-address protocol

This command resets stack IP protocol configuration (dhcp or static) to its default value.

Default	None
Format	no exception dump stack-ip-address protocol
Mode	Global Config

exception dump stack-ip-address add

This command adds static IP address to be assigned to individual unit's service port in the stack when the switch has crashed. This IP address is used to perform the core dump.

Default	None
Format	exception dump stack-ip-address add *ip-address netmask* [*gateway*]
Mode	Global Config

exception dump stack-ip-address remove

This command removes stack IP address configuration. If this IP address is assigned to any unit in the stack then this IP is removed from the unit.

Default	None
Format	exception dump stack-ip-address remove *ip-address netmask*
Mode	Global Config

write core

Use the *write core* command to generate a core dump file on demand. The `write core test` command is helpful when testing the core dump setup. For example, if the TFTP protocol is configured, `write core test` communicates with the TFTP server and informs the user if the TFTP server can be contacted. Similarly, if protocol is configured as `nfs`, this command mounts and unmounts the file system and informs the user of the status.

Note: `write core` reloads the switch which is useful when the device malfunctions, but has not crashed.

For `write core test`, the destination file name is used for the TFTP test. Optionally, you can specify the destination file name when the protocol is configured as TFTP.

Note: This command is only available on selected Linux-based platforms.

Default	None
Format	write core [test [*dest_file_name*]]
Mode	Privileged EXEC

debug exception

The command displays core dump features support.

Default	None
Format	debug exception
Mode	Privileged EXEC

show exception

Use this command to display the configuration parameters for generating a core dump file.

Note: This command is only available on selected Linux-based platforms.

Default	None
Format	show exception
Mode	Privileged EXEC

Example: The following shows an example of this command.

```
show exception

Coredump file name              core
Coredump filename uses hostname   False
Coredump filename uses time-stamp TRUE
TFTP Server Address             TFTP server configuration
FTP Server IP               FTP server configuration
FTP user name                  FTP user name
FTP password                   FTP password
NFS Mount point                 NFS mount point configuration
File path                   Remote file path
Core File name prefix           Core file prefix configuration.
Hostname                                                                Core file name contains hostname if
enabled.
Timestamp                   Core file name contains timestamp if enabled.
Switch Chip Register Dump        Switch chip register dump configuration
Compression mode                TRUE/FALSE
Active network port                                                0/28
Stack IP Address Protocol        DHCP/Static
Stack IP Address                List of IP addresses configured
```

show exception core-dump-file

This command displays core dump files existing on the local file system.

Default	None
Format	show exception core-dump-file
Mode	Privileged EXEC, Config Mode

show exception log

This command displays core dump traces on the local file system.

Default	None
Format	show exception log [previous]
Mode	Privileged EXEC, Config Mode

logging persistent

Use this command to configure the Persistent logging for the switch. The severity level of logging messages is specified at severity level. Possible values for severity level are (emergency|0, alert|1, critical|2, error|3, warning|4, notice|5, info|6, debug|7).

Default	Disable
Format	logging persistent *severity level*
Mode	Global Config

no logging persistent

Use this command to disable the persistent logging in the switch.

Format	no logging persistent
Mode	Global Config

mbuf

Use this command to configure memory buffer (MBUF) threshold limits and generate notifications when MBUF limits have been reached.

Format	mbuf {falling-threshold | rising threshold | severity}
Mode	Global Config

Field	Description
Rising Threshold	The percentage of the memory buffer resources that, when exceeded for the configured rising interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled).
Falling Threshold	The percentage of memory buffer resources that, when usage falls below this level for the configured interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled).
Severity	The severity level at which Mbuf logs messages. The range is 1 to 7. The default is 5 (L7_LOG_SEVERITY_NOTICE).

show mbuf

Use this command to display the memory buffer (MBUF) Utilization Monitoring parameters.

Format	show mbuf
Mode	Privileged EXEC

Field	Description
Rising Threshold	The percentage of the memory buffer resources that, when exceeded for the configured rising interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled).
Falling Threshold	The percentage of memory buffer resources that, when usage falls below this level for the configured interval, triggers a notification. The range is 1 to 100. The default is 0 (disabled).
Severity	The severity level.

show mbuf total

Use this command to display memory buffer (MBUF) information.

Format	show mbuf total
Mode	Privileged EXEC

Field	Description
Mbufs Total	Total number of message buffers in the system.
Mbufs Free	Number of message buffers currently available.
Mbufs Rx Used	Number of message buffers currently in use.
Total Rx Norm Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class RX Norm.
Total Rx Mid2 Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class RX Mid2.
Total Rx Mid1 Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class RX Mid1.
Total Rx Mid0 Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class RX Mid0.
Total Rx High Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class RX High.
Total Tx Alloc Attempts	Number of times the system tried to allocate a message buffer allocation of class TX.
Total Rx Norm Alloc Failures	Number of message buffer allocation failures for RX Norm class of message buffer.
Total Rx Mid2 Alloc Failures	Number of message buffer allocation failures for RX Mid2 class of message buffer.

Field	Description
Total Rx Mid1 Alloc Failures	Number of message buffer allocation failures for RX Mid1 class of message buffer.
Total Rx Mid0 Alloc Failures	Number of message buffer allocation failures for RX Mid0 class of message buffer.
Total Rx High Alloc Failures	Number of message buffer allocation failures for RX High class of message buffer.
Total Tx Alloc Failures	Number of message buffer allocation failures for TX class of message buffer.

show msg-queue

Use this command to display the message queues.

Default	None
Format	show msg-queue
Mode	Privileged EXEC mode

session start

Use this command to initiate a console session from the stack master to another unit in the stack, or from a member unit to a manager or another member unit. During the session, troubleshooting and debugging commands can be issued on the member unit, and the output displays the relevant information from the member unit specified in the session. Commands are displayed on the member unit using the user help option ?.

Default	Disable
Format	session start {unit *unit-number* | manager}
Mode	Privileged EXEC mode

Parameter	Description
unit	Use to connect to the specified unit from the stack master.
manager	Use to connect directly to the manager unit from any member unit without entering the manager’s unit number.

session stop

Use this command to terminate a session started from a manager to a member, a member to a member, or a member to manager that was started with the `session start` command.

Default	Disable
Format	session stop {unit *unit-number* | manager}
Mode	Global Config

Parameter	Description
unit	Use to disconnect from the specified unit from the stack master.
manager	Use to disconnect from the manager unit from any member unit without entering the manager’s unit number.

Support Mode Commands

Support mode is hidden and available when the `techsupport enable` command is executed. techsupport mode is disabled by default. Configurations related to support mode are shown in the `show tech-support` command. They can be persisted by using the command `save` in support mode. Support configurations are stored in a separate binary config file, which cannot be uploaded or downloaded.

techsupport enable

Use this command to allow access to Support mode.

Default	Disabled
Format	techsupport enable
Mode	Privileged EXEC

console

Use this command to enable the display of support debug for this session.

Default	Disabled
Format	console
Mode	Support

save

Use this command to save the trace configuration to non-volatile storage.

Format	save
Mode	Support

snapshot ospf

Use this command in Support mode to dump a set of OSPF debug information to capture the current state of OSPF. The output is written to the console and can be extensive

Format	snapshot ospf
Mode	Support mode

snapshot routing

Use this command in Support mode to dump a set of routing debug information to capture the current state of routing on the switch. The output is written to the console and can be extensive.

Format	snapshot routing

Mode	Support

snapshot multicast

Use this command in Support mode to dump a set of IP multicast debug information to capture the current state of multicast on the switch. The output is written to the console and can be extensive.

Format	snapshot multicast
Mode	Support

snapshot system

Use this command in Support mode to dump a set of system debug information to capture the current state of the device. The output is written to the console and can be extensive.

Format	snapshot multicast
Mode	Support

telnetd

Use this command in Support mode to start or stop the Telnet daemon on the switch.

Format	telnetd {start | stop}
Mode	Support

BCM Shell Command

The BCM (SDK) shell is mainly used for debugging the Lenovo SDK. BCM shell commands can be executed directly from the CLI without entering the BCM shell itself by using the keyword `drivshell` before the BCM command. However, you can also enter the BCM shell to directly execute any of the BCM commands on the shell using the `bcmsh` command.

bcmsh

The `bcmsh` command is used to enter into the BCM shells from Privileged EXEC mode. Only users with Level 15 permissions can execute this command. Management is blocked during this mode; the user is notified and asked whether to continue. This command is only supported on the serial console and not via telnet/ssh. Blocking the console for extended periods of time can result in switch instability.

Format	bcmsh
Mode	Privileged EXEC

Note: To exit the shell and return to the CLI, enter `exit`.

Cable Test Command

The cable test feature enables you to determine the cable connection status on a selected port.

Note: Note the following:

- The cable test feature is supported only for copper cable. It is not supported for optical fiber cable.
- If the port has an active link while the cable test is run, the link can go down for the duration of the test.

cablestatus

This command returns the status of the specified port.

Format	cablestatus *unit/slot/port*
Mode	Privileged EXEC

Field	Description
Cable Status	One of the following statuses is returned: • **Normal**: The cable is working correctly. • **Open**: The cable is disconnected or there is a faulty connector. • **Short**: There is an electrical short in the cable. • **Cable Test Failed**: The cable status could not be determined. The cable may in fact be working. • **Crosstalk:** There is crosstalk present on the cable. • **No Cable:** There is no cable present.
Cable Length	If this feature is supported by the PHY for the current link speed, the cable length is displayed as a range between the shortest estimated length and the longest estimated length. Note that if the link is down and a cable is attached to a 10/100 Ethernet adapter, then the cable status may display as Open or Short because some Ethernet adapters leave unused wire pairs unterminated or grounded. Unknown is displayed if the cable length could not be determined.

Link Debounce Commands

In network deployments where the switch detects random spurious link flaps, network performance is affected due to the frequent unwanted re-convergence of topology for protocols like spanning tree, OSPF, and link aggregation.

The link debounce feature tries to solve this problem by delaying the link-down event notification to applications by waiting for a configurable duration of time known as the *debounce time*. During this time, the link may cycle through down-and-up states several times before it finally settles down. If the link goes down (and stays down), applications are notified after the debounce time period expires; otherwise it is ignored.

link debounce time

This command sets the duration of the link debounce timer. The link debounce timer starts when a link-down event occurs on an interface and runs for the configured amount of milliseconds. While the timer is running, any link flaps (up and down cycles) are ignored, and no link-down notifications are sent to higher-layer applications. After the debounce timer expires, if the link is still down, notifications are sent. The value for `milliseconds` is from 100 to 5000 in a multiple of 100 milliseconds.

Default	0 (No timer)
Format	link debounce time *milliseconds*
Mode	Interface Config

no link debounce time

This command resets the duration of the link debounce timer to the default value, effectively disabling the timer.

Format	no link debounce time
Mode	Interface Config

show interface debounce

This command displays the configured debounce time and occurrences of link flaps for all interfaces.

Format	show interface debounce
Mode	Privileged EXEC

Parameter	Definition
Interface	The physical port, LAG, or CPU interface associated with the rest of the data in the row.

Parameter	Definition
Debounce Time	The time, in milliseconds, to delay a link-down event notification to applications after a link-down event occurs on the interface. If the link goes down (and stays down), applications are notified after the debounce time period expires; otherwise it is ignored. While the debounce timer is running, link flaps (up and down cycles) are counted but ignored.
Flaps	The number of link flaps (up and down cycles) the interface experienced while the debounce time was running.

Example: The following shows example CLI display output for the command.

```
(Routing) #show interface debounce

Interface Debounce Time (ms) Flaps
--------- ------------------ -------
0/1       0                  0
0/2       0                  0
0/3       0                  0
0/4       0                  0
0/5       0                  0
0/6       0                  0
0/7       0                  0
0/8       0                  0
0/9       0                  0
0/10      0                  0
0/11      0                  0
0/12      0                  0
```

sFlow Commands

sFlow is the standard for monitoring high-speed switched and routed networks. sFlow technology is built into network equipment and gives complete visibility into network activity, enabling effective management and control of network resources.

sflow poller

A data source configured to collect counter samples is called a poller. Use this command to enable a new sFlow poller instance on an interface or range of interfaces for this data source if `rcvr_idx` is valid.

Format	sflow poller {*rcvr-indx* | interval *poll-interval*}
Mode	Interface Config

Field	Description
Receiver Index	Enter the sFlow Receiver associated with the sampler/poller. A value of zero (0) means that no receiver is configured. The range is 1-8. The default is 0.
Poll Interval	Enter the sFlow instance polling interval. A poll interval of zero (0) disables counter sampling. When set to zero (0), all the poller parameters are set to their corresponding default value. The range is 0-86400. The default is 0. A value of N means once in N seconds a counter sample is generated.

Note: The sFlow task is heavily loaded when the sFlow polling interval is configured at the minimum value (i.e., one second for all the sFlow supported interfaces). In this case, the sFlow task is always busy collecting the counters on all the configured interfaces. This can cause the device to hang for some time when the user tries to configure or issue show sFlow commands. To overcome this situation, sFlow polling interval configuration on an interface or range of interfaces is controlled as mentioned below:

1. The maximum number of allowed interfaces for the polling intervals max (1, (interval – 10)) to min ((interval + 10), 86400) is interval * 5.
2. For every one second increment in the polling interval that is configured, the number of allowed interfaces that can be configured increases by 5.

no sflow poller

Use this command to reset the sFlow poller instance to the default settings.

Format	no sflow poller [interval]
Mode	Interface Config

sflow receiver

Use this command to configure the sFlow collector parameters (owner string, receiver timeout, max datagram size, IP address, and port).

Format sflow receiver *rcvr_idx* {owner *owner-string* timeout *rcvr_timeout* | max datagram *size* | ip *ip* | port *port*}

Mode Global Config

Parameter	Description
Receiver Owner	The identity string for the receiver, the entity making use of this sFlowRcvrTable entry. The range is 127 characters. The default is a null string. The empty string indicates that the entry is currently unclaimed and the receiver configuration is reset to the default values. An entity wishing to claim an sFlowRcvrTable entry must ensure that the entry is unclaimed before trying to claim it. The entry is claimed by setting the owner string to a non-null value. The entry must be claimed before assigning a receiver to a sampler or poller.
Receiver Timeout	The time, in seconds, remaining before the sampler or poller is released and stops sending samples to receiver. A management entity wanting to maintain control of the sampler is responsible for setting a new value before the old one expires. The allowed range is 0-2147483647 seconds. The default is zero (0).
No Timeout	The configured entry will be in the config until you explicitly removes the entry.
Receiver Max Datagram Size	The maximum number of data bytes that can be sent in a single sample datagram. The management entity should set this value to avoid fragmentation of the sFlow datagrams. The allowed range is 200 to 9116). The default is 1400.
Receiver IP	The sFlow receiver IP address. If set to 0.0.0.0, no sFlow datagrams will be sent. The default is 0.0.0.0.
Receiver Port	The destination Layer4 UDP port for sFlow datagrams. The range is 1-65535. The default is 6343.

no sflow receiver

Use this command to set the sFlow collector parameters back to the defaults.

Format no sflow receiver *indx* {ip *ip-address* | maxdatagram *size* | owner *string* timeout *interval* | port *14-port*}

Mode Global Config

sflow receiver owner timeout

Use this command to configure a receiver as a timeout entry. As the sFlow receiver is configured as a timeout entry, information related to sampler and pollers are also shown in the running-config and are retained after reboot.

If a receiver is configured with a specific value, these configurations will not be shown in running-config. Samplers and pollers information related to this receiver will also not be shown in running-config.

Format sflow receiver *index* owner *owner-string* timeout

Mode Global Config

Field	Description
index	Receiver index identifier. The range is 1 to 8.
Receiver Owner	The owner name corresponds to the receiver name. The identity string for the receiver, the entity making use of this sFlowRcvrTable entry. The range is 127 characters. The default is a null string. The empty string indicates that the entry is currently unclaimed and the receiver configuration is reset to the default values. An entity wishing to claim an sFlowRcvrTable entry must ensure that the entry is unclaimed before trying to claim it. The entry is claimed by setting the owner string to a non-null value. The entry must be claimed before assigning a receiver to a sampler or poller.

sflow receiver owner notimeout

Use this command to configure a receiver as a non-timeout entry. Unlike entries configured with a specific timeout value, this command will be shown in show running-config and retained after reboot. As the sFlow receiver is configured as a non-timeout entry, information related to sampler and pollers will also be shown in the running-config and will be retained after reboot.

If a receiver is configured with a specific value, these configurations will not be shown in running-config. Samplers and pollers information related to this receiver will also not be shown in running-config.

Format	sflow receiver *index* owner *owner-string* notimeout
Mode	Global Config

Field	Description
index	Receiver index identifier. The range is 1 to 8.
Receiver Owner	The owner name corresponds to the receiver name. The identity string for the receiver, the entity making use of this sFlowRcvrTable entry. The range is 127 characters. The default is a null string. The empty string indicates that the entry is currently unclaimed and the receiver configuration is reset to the default values. An entity wishing to claim an sFlowRcvrTable entry must ensure that the entry is unclaimed before trying to claim it. The entry is claimed by setting the owner string to a non-null value. The entry must be claimed before assigning a receiver to a sampler or poller.

sflow remote-agent ip

Use this command to assign an IPv4 address to a remote agent. When sFlow hardware sampling is enabled, the switch/hardware sends sampled packets encapsulated in sFlow custom packet to this IP address.

Default	0.0.0.0
Format	sflow remote-agent *index* ip *ipv4-address*
Mode	Global Config

no sflow remote-agent ip

Use this command to remove the remote agent IPv4 address.

Format	no sflow remote-agent *index* ip
Mode	Global Config

sflow remote-agent monitor-session

Use this command to assign the monitor ID (MTP) for the remote agent session. The destination port is an outgoing interface for sFlow sampled packets. The sflow sampled packets are sent to all the configured destination ports, irrespective of monitor session index.

Default	0 for both monitor session and destination port
Format	sflow remote-agent *index* monitor-session *session id range 1-4* destination interface unit/slot/port
Mode	Global Config

no sflow remote-agent monitor-session

This command removes the remote-agent configuration.

Format	no sflow remote-agent *index* monitor-session
Mode	Global Config

sflow remote-agent port

This command configures the destination UDP port for the remote-agent.

Default	16343
Format	sflow remote-agent *index* port *value*
Mode	Global Config

no sflow remote-agent port

This command removes remote agent port configuration.

Format	no sflow remote-agent port
Mode	Global Config

sflow remote-agent source-interface

Use this command to specify the physical or logical interface to use as the sFlow client source interface for the remote-agent. If configured, the address of source interface is used for all sFlow communications between the sFlow receiver and the sFlow client. Otherwise, there is no change in behavior. If the configured interface is down, the sFlow client falls back to normal behavior.

Format	*sflow remote-agent source-interface {unit/slot/port | loopback loopback-id | vlan vlan-id}*
Mode	Global Config

no sflow remote-agent source-interface

Use this command to reset the sFlow source interface for the remote-agent to the default settings.

Format	no sflow remote-agent port
Mode	Global Config

sflow sampler

A data source configured to collect flow samples is called a poller. Use this command to configure a new sFlow sampler instance on an interface or range of interfaces for this data source if `rcvr_idx` is valid.

Format	sflow sampler {*rcvr-indx* | rate *sampling-rate* | maxheadersize *size*}
Mode	Interface Config

Field	Description
Receiver Index	The sFlow Receiver for this sFlow sampler to which flow samples are to be sent. A value of zero (0) means that no receiver is configured, no packets will be sampled. Only active receivers can be set. If a receiver expires, then all samplers associated with the receiver will also expire. Possible values are 1-8. The default is 0.
Maxheadersize	The maximum number of bytes that should be copied from the sampler packet. The range is 20-256. The default is 128. When set to zero (0), all the sampler parameters are set to their corresponding default value.
Sampling Rate	The statistical sampling rate for packet sampling from this source. A sampling rate of 1 counts all packets. A value of zero (0) disables sampling. A value of N means that out of N incoming packets, 1 packet will be sampled. The range is 1024-65536 and 0. The default is 0.

no sflow sampler

Use this command to reset the sFlow sampler instance to the default settings.

Format	no sflow sampler {*rcvr-indx* | rate *sampling-rate* | maxheadersize *size*}
Mode	Interface Config

sflow sampler rate

Use this command to set the sampling rate for ingress/egress/flow-based sampling on this interface.

Default	0 for the ingress sampling rate.
Format	sflow sampler rate *value* {ingress | egress | flow-based}
Mode	Interface Config

no sflow sample rate

Use this command to remove the sampling rate for ingress/egress/flow-based sampling on this interface.

Format	no sflow sampler rate *value* {ingress | egress | flow-based}
Mode	Interface Config

sflow sampler remote-agent

Use this command to enable a new sFlow sampler remote agent instance for this data source.

Default	None
Format	sflow sampler remote-agent *index*
Mode	Interface Config

no sflow sampler remote-agent

Use this command to disable an sFlow sampler remote agent instance for this data source.

Format	no sflow sampler remote-agent
Mode	Interface Config

sflow source-interface

Use this command to specify the physical or logical interface to use as the sFlow client source interface. If configured, the address of source Interface is used for all sFlow communications between the sFlow receiver and the sFlow client. Otherwise there is no change in behavior. If the configured interface is down, the sFlow client falls back to normal behavior.

Format	sflow source-interface {*unit/slot/port* | loopback *loopback-id* | *network network-id* | *serviceport serviceport-id* | *vlan vlan-id*}
Mode	Global Config

Parameter	Description
unit/slot/port	VLAN or port-based routing interface.
loopback-id	Configures the loopback interface to use as the source IP address. The range of the loopback ID is 0 to 7.
network	Use network source IP address.
serviceport	Use serviceport source IP address.
vlan-id	Configures the VLAN interface to use as the source IP address. The range of the VLAN ID is 1 to 4093.

no sflow source-interface

Use this command to reset the sFlow source interface to the default settings.

Format	no sflow source-interface
Mode	Global Config

show sflow agent

The sFlow agent collects time-based sampling of network interface statistics and flow-based samples. These are sent to the configured sFlow receivers. Use this command to display the sFlow agent information.

Format	show sflow agent
Mode	Privileged EXEC

Field	Description
sFlow Version	Uniquely identifies the version and implementation of this MIB. The version string must have the following structure: MIB Version; Organization; Software Revision where: • MIB Version: 1.3, the version of this MIB. • Organization: Lenovo • Revision: 1.0
IP Address	The IP address associated with this agent.

Example: The following shows example CLI display output for the command.

```
(switch) #show sflow agent

sFlow Version......................... 1.3;Lenovo Inc.;1.20.0.54
IP Address........................... 10.27.6.246
```

show sflow pollers

Use this command to display the sFlow polling instances created on the switch. Use “-” for range.

Format	show sflow pollers
Mode	Privileged EXEC

Field	Description
Poller Data Source	The sFlowDataSource (slot/port) for this sFlow sampler. This agent will support Physical ports only.
Receiver Index	The sFlowReceiver associated with this sFlow counter poller.
Poller Interval	The number of seconds between successive samples of the counters associated with this data source.

show sflow receivers

Use this command to display configuration information related to the sFlow receivers.

Format	show sflow receivers [*index*]

Mode Privileged EXEC

Parameter	Description
Receiver Index	The sFlow Receiver associated with the sampler/poller.
Owner String	The identity string for receiver, the entity making use of this sFlowRcvrTable entry.
Time Out	The time (in seconds) remaining before the receiver is released and stops sending samples to sFlow receiver. The **no timeout** value of this parameter means that the sFlow receiver is configured as a non-timeout entry.
Max Datagram Size	The maximum number of bytes that can be sent in a single sFlow datagram.
Port	The destination Layer4 UDP port for sFlow datagrams.
IP Address	The sFlow receiver IP address.
Address Type	The sFlow receiver IP address type. For an IPv4 address, the value is 1 and for an IPv6 address, the value is 2.
Datagram Version	The sFlow protocol version to be used while sending samples to sFlow receiver.

Example: The following shows example CLI display output for the `show sflow receivers` command.

```
(switch) #show sflow receivers 1
Receiver Index................................. 1
Owner String................................... tulasi
Time out....................................... 0
IP Address:.................................... 0.0.0.0
Address Type................................... 1
Port........................................... 6343
Datagram Version............................... 5
Maximum Datagram Size.......................... 1400
```

Example: The following examples show CLI display output for the command when a receiver is configured as a non-timeout entry.

```
(Routing) #show sflow receivers

Rcvr Owner                      Timeout    Max Dgram Port  IP Address
Indx String                                 Size
---- ------------------------------- ---------- --------- ----- ---------------
1    tulasi                  No Timeout 1400      6343  0.0.0.0
2                          0        1400     6343  0.0.0.0
3                          0        1400     6343  0.0.0.0
4                          0        1400     6343  0.0.0.0
5                          0        1400     6343  0.0.0.0
6                          0        1400     6343  0.0.0.0
7                          0        1400     6343  0.0.0.0
8                          0        1400     6343  0.0.0.0


(Routing) #show sflow receivers 1

Receiver Index................................. 1
Owner String................................... tulasi
Time out....................................... No Timeout
IP Address:.................................... 0.0.0.0
Address Type................................... 1
Port........................................... 6343
```

```
Datagram Version.............................. 5
Maximum Datagram Size......................... 1400
```

show sflow remote-agents

Use this command to display the details for configured sFlow remote agents.

Format	show sflow remote-agents
Mode	Privileged EXEC

Example:

```
(Routing) (Config)#show sflow remote-agents

Rem Agent  Port     IP Address       Monitor     Dest.
Index                        Session    Port
--------- --------   ---------------  ---------   ----------
1          16343    1.1.1.1          1          0/4
2          26343    2.2.1.1          2          0/8
3          16343    0.0.0.0
4          16343    0.0.0.0
```

show sflow remote-agents source-interface

Use this command to display the source interface configured on the switch for the sFlow remote agent.

Format	show sflow remote-agents
Mode	Privileged EXEC

Example:

```
(Routing) #show sflow remote-agents source-interface

sFlow Remote Agent Source Interface........... serviceport
sFlow Remote Agent Client Source IPv4 Address.. 10.130.86.191          [Up]
```

show sflow samplers

Use this command to display the sFlow sampling instances created on the switch.

Format	show sflow samplers
Mode	Privileged EXEC

Field	Description
Sampler Data Source	The sFlowDataSource (slot/port) for this sFlow sampler. This agent will support Physical ports only.
Receiver Index	The sFlowReceiver configured for this sFlow sampler.
Remote Agent	The remote agent instance index number.
Ingress Sampling Rate	The sampling rate for the ingress.
Flow Sampling Rate	The statistical sampling rate for packet sampling from this source.
Egress Sampling Rate	The sampling rate for the egress.
Max Header Size	The maximum number of bytes that should be copied from a sampled packet to form a flow sample.

Example:

```
(Routing) (Config)#show sflow samplers
Sampler     Receiver   Remote    Ingress     Flow       Egress      Max
Data        Index      Agent     Sampling    Sampling   Sampling    Header
Source                           Rate        Rate       Rate        Size
----------  ---------- --------  ----------- ------------ ---------- --------
 0/1         1          2         1024        2048        4096        128
```

show sflow source-interface

Use this command to display the sFlow source interface configured on the switch.

Format	show sflow source-interface
Mode	Privileged EXEC

Field	Description
sFlow Client Source Interface	The interface ID of the physical or logical interface configured as the sFlow client source interface.
sFlow Client Source IPv4 Address	The IP address of the interface configured as the sFlow client source interface.

Example: The following shows example CLI display output for the command.

```
(Routing) #show sflow source-interface

sFlow Client Source Interface................. (not configured)
```

Green Ethernet Commands

This section describes the commands you use to configure Green Ethernet modes on the system. The purpose of the Green Ethernet features is to save power. CE0128XB/CE0152XB software supports the following three Green Ethernet modes:

- Energy-detect mode
- Short-reach mode
- Energy-efficient Ethernet (EEE) mode

Note: Support for each Green Ethernet mode is platform dependent. The features and commands described in this section might not be available on your switch.

green-mode energy-detect

Use this command to enable energy-detect mode on an interface or on a range of interfaces. With this mode enabled, when the port link is down, the port automatically powers down for short period of time and then wakes up to check link pulses. In energy-detect mode, the port can perform auto-negotiation and consume less power when no link partner is present.

Default	disabled
Format	green-mode energy-detect
Mode	Interface Config

no green-mode energy-detect

Use this command to disable energy-detect mode on the interface(s).

Format	no green-mode energy-detect
Mode	Interface Config

green-mode short-reach

Use this command to enable short reach mode on an interface or on a range of interfaces. Short-reach mode enables the port to enter low-power mode if the length of the cable is less than 10m. Use the `auto` keyword to enable short-reach mode automatically on detection of cable length less than 10m, and/or use the `force` keyword to force the port into short-reach mode.

Note: The `green-mode short-reach` command allows you to enable both forced and auto short-reach modes simultaneously, but auto mode is practically ineffective when force mode is also enabled on the interface.

Default	disabled
Format	green-mode short-reach {[auto] [force]}
Mode	Interface Config

no green-mode short-reach

Use this command to disable short-reach mode on the interface(s).

Format	no green-mode short-reach {[auto] [force]}
Mode	Interface Config

green-mode eee

Use this command to enable EEE low-power idle mode on an interface or on a range of interfaces. The EEE mode enables both send and receive sides of the link to disable some functionality for power saving when lightly loaded. The transition to EEE low-power mode does not change the port link status. Frames in transit are not dropped or corrupted in transition to and from this mode.

Default	disabled
Format	green-mode eee
Mode	Interface Config

no green-mode eee

Use this command to disable EEE mode on the interface(s).

Format	no green-mode eee
Mode	Interface Config

green-mode eee tx-idle-time

Use this command to configure the EEE mode transmit idle time for an interface or range of interfaces. The idle time is in microseconds. The transmit idle time is the amount of time the port waits before moving to the MAC TX transitions to the LPI state.

Note: This command is not available on all systems, even if EEE mode is supported.

Default	0
Format	green-mode eee tx-idle-time *0–4294977295*
Mode	Interface Config

no green-mode eee tx-idle-time

Use this command to return the EEE idle time to the default value.

Format	no green-mode eee tx-idle-time
Mode	Interface Config

green-mode eee tx-wake-time

Use this command to configure the EEE mode transmit wake time for an interface or range of interfaces. The wake time is in microseconds. The transmit wake time is the amount of time the switch must wait to go back to the ACTIVE state from the LPI state when it receives a packet for transmission.

Note: This command is not available on all systems, even if EEE mode is supported.

Default	0
Format	green-mode eee tx-wake-time *0–65535*
Mode	Interface Config

no green-mode eee tx-wake-time

Use this command to return the EEE wake time to the default value.

Format	no green-mode eee tx-wake-time
Mode	Interface Config

green-mode eee-lpi-history sampling-interval

Use this command to configure global EEE LPI history collection interval for the system. The value specified in this command is applied globally on all interfaces in the switch or stack of switches. The sampling interval unit is seconds.

Note: The sampling interval takes effect immediately; the current and future samples are collected at this new sampling interval.

Default	3600 seconds
Format	green-mode eee-lpi-history sampling-interval *30–36000*
Mode	Global Config

no green-mode eee-lpi-history sampling-interval

Use this command to return the global EEE LPI history collection interval to the default value.

Format	no green-mode eee-lpi-history sampling-interval
Mode	Global Config

green-mode eee-lpi-history max-samples

Use this command to configure global EEE LPI history collection buffer size for the system. The value specified in this command is applied globally on all interfaces in the switch or stack of switches.

Default	168
Format	green-mode eee-lpi-history max-samples *1–168*}

Mode	Global Config

no green-mode eee-lpi-history max samples

Use this command to return the global EEE LPI history collection buffer size to the default value.

Format	no green-mode eee-lpi-history max-samples
Mode	Global Config

show green-mode

Use this command to display the green-mode configuration and operational status on all ports or on the specified port.

Note: The fields that display in the `show green-mode` command output depend on the Green Ethernet modes available on the hardware platform.

Format	show green-mode [*unit/slot/port*]
Mode	Privileged EXEC

If you do **not** specify a port, the command displays the information in the following table.

Parameter	Definition
Global	
Cumulative Energy Saving per Stack	Estimated Cumulative energy saved per stack in (Watts * hours) due to all green modes enabled
Current Power Consumption per Stack	Power Consumption by all ports in stack in mWatts.
Power Saving	Estimated Percentage Power saved on all ports in stack due to Green mode(s) enabled.
Unit	Unit Index of the stack member
Green Ethernet Features supported	List of Green Features supported on the given unit which could be one or more of the following: Energy-Detect (Energy Detect), Short-Reach (Short Reach), EEE (Energy Efficient Ethernet), LPI-History (EEE Low Power Idle History), LLDP-Cap-Exchg (EEE LLDP Capability Exchange), Pwr-Usg-Est (Power Usage Estimates).
Energy Detect	
Energy-detect Config	Energy-detect Admin mode is enabled or disabled
Energy-detect Opr	Energy detect mode is currently active or inactive. The energy detect mode may be administratively enabled, but the operational status may be inactive.
Short Reach	
Short-Reach- Config auto	Short reach auto Admin mode is enabled or disabled
Short-Reach- Config forced	Short reach forced Admin mode is enabled or disabled
Short-Reach Opr	Short reach mode is currently active or inactive. The short-reach mode may be administratively enabled, but the operational status may be inactive.

Parameter	Definition
EEE	
EEE Config	EEE Admin Mode is enabled or disabled.

Example: The following shows example CLI display output for on a system that supports all Green Ethernet features.

```
(Routing) #show green-mode

Current Power Consumption (mW).............. 11172
Power Saving (%)............................ 10
Cumulative Energy Saving /Stack (W * H)... 10

Unit  Green Ethernet Features Supported
----  --------------------------------
1     Energy-Detect Short-Reach EEE LPI-History LLDP-Cap-Exchg Pwr-Usg-Est

Interface    Energy-Detect      Short-Reach-Config    Short-Reach    EEE
          Config     Opr     Auto       Forced       Opr        Config
---------  ---------  ---------  ---------  ---------  -----------  --------
1/0/1      Enabled    Active     Enabled    Disabled   Inactive     Enabled
1/0/2      Enabled    Active     Enabled    Disabled   Inactive     Enabled
1/0/3      Enabled    Active     Enabled    Disabled   Inactive     Enabled
1/0/4      Enabled    Active     Enabled    Disabled   Inactive     Enabled
1/0/5      Enabled    Active     Enabled    Disabled   Inactive     Enabled
1/0/6      Enabled    Active     Enabled    Disabled   Inactive     Enabled
1/0/7      Enabled    Active     Enabled    Disabled   Inactive     Enabled
--More-- or (q)uit
```

If you specify the port, the command displays the information in the following table.

Parameter	Definition
Energy Detect	
Energy-detect admin mode	Energy-detect mode is enabled or disabled
Energy-detect operational status	Energy detect mode is currently active or inactive. The energy-detect mode may be administratively enabled, but the operational status may be inactive. The possible reasons for the status are described below.
Reason for Energy-detect current operational status	The energy detect mode may be administratively enabled, but the operational status may be inactive for one of the following reasons: • Port is currently operating in the fiber mode • Link is up. • Admin Mode Disabled If the energy-detect operational status is active, this field displays *No energy detected.*
Short Reach	
Short-reach auto Admin mode	Short reach auto mode is enabled or disabled
Short-reach force Admin mode	Short reach force mode is enabled or disabled
Short reach operational status	short reach mode is currently active or inactive. The short-reach mode may be administratively enabled, but the operational status may be inactive.

Parameter	Definition
Reason for Short Reach current operational status	The short-reach mode may be administratively enabled, but the operational status may be inactive for one of the following reasons: • Long cable >10m • Link Down • Fiber • Admin Mode Disabled • Not At GIG speed • Cable length Unknown If the short reach operational status is active, this field displays one of the following reasons: • Short cable < 10m • Forced
EEE	
EEE Admin Mode	EEE Admin Mode is enabled or disabled.
Transmit Idle Time	It is the time for which condition to move to LPI state is satisfied, at the end of which MAC TX transitions to LPI state. The Range is (0 to 429496729). The Default value is 0
Transmit Wake Time	It is the time for which MAC / switch has to wait to go back to ACTIVE state from LPI state when it receives packet for transmission. The Range is (0 to 65535).The Default value is 0.
Rx Low Power Idle Event Count	This field is incremented each time MAC RX enters LP IDLE state. Shows the total number of Rx LPI Events since EEE counters are last cleared.
Rx Low Power Idle Duration (µSec)	This field indicates duration of Rx LPI state in 10 µs increments. Shows the total duration of Rx LPI since the EEE counters are last cleared.
Tx Low Power Idle Event Count	This field is incremented each time MAC TX enters LP IDLE state. Shows the total number of Tx LPI Events since EEE counters are last cleared.
Rx Low Power Idle Duration (µSec)	This field indicates duration of Tx LPI state in 10 µs increments. Shows the total duration of Tx LPI since the EEE counters are last cleared.
Tw_sys_tx (µSec)	Integer that indicates the value of Tw_sys that the local system can support. This value is updated by the EEE DLL Transmitter state diagram.
Tw_sys Echo (µSec)	Integer that indicates the remote system's Transmit Tw_sys that was used by the local system to compute the Tw_sys that it wants to request from the remote system.
Tw_sys_rx (µSec)	Integer that indicates the value of Tw_sys that the local system requests from the remote system. This value is updated by the EEE Receiver L2 state diagram.
Tw_sys_rx Echo (µSec)	Integer that indicates the remote systems Receive Tw_sys that was used by the local system to compute the Tw_sys that it can support.
Fallback Tw_sys (µSec)	Integer that indicates the value of fallback Tw_sys that the local system requests from the remote system.
Remote Tw_sys_tx (µSec)	Integer that indicates the value of Tw_sys that the remote system can support.
Remote Tw_sys Echo (µSec)	Integer that indicates the value Transmit Tw_sys echoed back by the remote system.
Remote Tw_sys_rx (µSec)	Integer that indicates the value of Tw_sys that the remote system requests from the local system.

Parameter	Definition
Remote Tw_sys_rx Echo (µSec)	Integer that indicates the value of Receive Tw_sys echoed back by the remote system.
Remote Fallback Tw_sys (µSec)	Integer that indicates the value of fallback Tw_sys that the remote system is advertising.
Tx_dll_enabled	Initialization status of the EEE transmit Data Link Layer management function on the local system.
Tx_dll_ready	Data Link Layer ready: This variable indicates that the TX system initialization is complete and is ready to update/receive LLDPDU containing EEE TLV. This variable is updated by the local system software.
Rx_dll_enabled	Status of the EEE capability negotiation on the local system.
Rx_dll_ready	Data Link Layer ready: This variable indicates that the RX system initialization is complete and is ready to update/receive LLDPDU containing EEE TLV. This variable is updated by the local system software.
Cumulative Energy Saving	Estimated Cumulative energy saved on this port in (Watts × hours) due to all green modes enabled
Time Since Counters Last Cleared	Time Since Counters Last Cleared (since the time of power up, or after the `clear eee statistics` command is executed)

Example: The following shows example CLI display output for on a system that supports all Green Ethernet features.

```
(Routing) #show green-mode 1/0/1
Energy Detect Admin Mode................... Enabled
                                    Operational Status....................... Active
                                    Reason.................................. No Energy Detected

Auto Short Reach Admin Mode................ Enabled
                                    Forced Short Reach Admin Mode............... Enabled
                                    Operational Status....................... Active
                                    Reason.................................. Forced

EEE Admin Mode............................. Enabled
                                    Transmit Idle Time....................... 0
                                    Transmit Wake Time....................... 0
                                    Rx Low Power Idle Event Count............ 0
                                    Rx Low Power Idle Duration (uSec)........ 0
                                    Tx Low Power Idle Event Count............ 0
                                    Tx Low Power Idle Duration (uSec)........ 0
                                    Tw_sys_tx (usec)......................... XX
                                    Tw_sys_tx Echo(usec)..................... XX
                                    Tw_sys_rx (usec)......................... XX
                                    Tw_sys_tx Echo(usec)..................... XX
                                    Fallback Tw_sys (usec)................... XX
                                    Remote Tw_sys_tx (usec).................. XX
                                    Remote Tw_sys_tx Echo(usec).............. XX
                                    Remote Tw_sys_rx (usec).................. XX
                                    Remote Tw_sys_tx Echo(usec).............. XX
                                    Remote fallback Tw_sys (usec)............ XX
                                    Tx DLL enabled........................... Yes
Tx DLL ready............................ Yes
Rx DLL enabled.......................... Yes
Rx DLL ready............................ Yes
Cumulative Energy Saving (W * H).......... XX
Time Since Counters Last Cleared......... 1 day 20 hr 47 min 34 sec
```

clear green-mode statistics

Use this command to clear the following Green Ethernet mode statistics:

- EEE LPI event count and LPI duration
- EEE LPI history table entries
- Cumulative power-savings estimates

You can clear the statistics for a specified port or for all ports.

Note: Executing `clear eee statistics` clears only the EEE Transmit, Receive LPI event count, LPI duration, and Cumulative Energy Savings Estimates of the port. Other status parameters that display after executing `show green-mode` (see "show green-mode" on page 318) retain their data.

Format	clear green-mode statistics {*unit/slot/port* | all}
Mode	Privileged EXEC

show green-mode eee-lpi-history

Use this command to display interface green-mode EEE LPI history.

Format	green-mode eee-lpi-history interface *unit/slot/port*
Mode	Privileged EXEC

Parameter	Definition
Sampling Interval	Interval at which EEE LPI statistics is collected.
Total No. of Samples to Keep	Maximum number of samples to keep
Percentage LPI time per stack	Percentage of Total time spent in LPI mode by all port in stack when compared to total time since reset.
Sample No.	Sample Index
Sample Time	Time since last reset
%time spent in LPI mode since last sample	Percentage of time spent in LPI mode on this port when compared to sampling interval
%time spent in LPI mode since last reset	Percentage of total time spent in LPI mode on this port when compared to time since reset.

Example: The following shows example CLI display output for the command on a system with the EEE feature enabled.

```
(Routing) #show green-mode eee-lpi-history interface 1/0/1

Sampling Interval (sec)........................ 30
Total No. of Samples to Keep................... 168
Percentage LPI time per stack.................. 29

                         Percentage of    Percentage of
Sample     Time Since      Time spent in   Time spent in
 No.     The Sample      LPI mode since   LPI mode since
         Was Recorded      last sample      last reset
------ -------------------- -------------- --------------
10      0d:00:00:13          3               2
```

```
9     0d:00:00:44     3          2
8     0d:00:01:15     3          2
7     0d:00:01:46     3          2
6     0d:00:02:18     3          2
5     0d:00:02:49     3          2
4     0d:00:03:20     3          2
3     0d:00:03:51     3          1
2     0d:00:04:22     3          1
1     0d:00:04:53     3          1
```

Remote Monitoring Commands

Remote Monitoring (RMON) is a method of collecting a variety of data about network traffic. RMON supports 64-bit counters (RFC 3273) and High Capacity Alarm Table (RFC 3434).

Note: There is no configuration command for ether stats and high capacity ether stats. The data source for ether stats and high capacity ether stats are configured during initialization.

rmon alarm

This command sets the RMON alarm entry in the RMON alarm MIB group.

Format	rmon alarm *alarm number variable sample interval* {absolute|delta} rising-threshold *value* [*rising-event-index*] falling-threshold *value* [*falling-event-index*] [startup {*rising*|*falling*|*rising-falling*}] [owner *string*]
Mode	Global Config

Parameter	Description
Alarm Index	An index that uniquely identifies an entry in the alarm table. Each entry defines a diagnostic sample at a particular interval for an object on the device. The range is 1 to 65535.
Alarm Variable	The object identifier of the particular variable to be sampled. Only variables that resolve to an ASN.1 primitive type of integer.
Alarm Interval	The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. The range is 1 to 2147483647. The default is 1.
Alarm Absolute Value	The value of the statistic during the last sampling period. This object is a read-only, 32-bit signed value.
Alarm Rising Threshold	The rising threshold for the sample statistics. The range is 2147483648 to 2147483647. The default is 1.
Alarm Rising Event Index	The index of the eventEntry that is used when a rising threshold is crossed. The range is 1 to 65535. The default is 1.
Alarm Falling Threshold	The falling threshold for the sample statistics. The range is 2147483648 to 2147483647. The default is 1.
Alarm Falling Event Index	The index of the eventEntry that is used when a falling threshold is crossed. The range is 1 to 65535. The default is 2.
Alarm Startup Alarm	The alarm that may be sent. Possible values are **rising, falling** or both **rising-falling**. The default is **rising-falling**.
Alarm Owner	The owner string associated with the alarm entry. The default is **monitorAlarm**.

Example: The following shows an example of the command.

```
(Routing)(Config)#rmonalarm1ifInErrors.230absoluterising-threshold1001falling-threshold102startup
rising owner myOwner
```

no rmon alarm

This command deletes the RMON alarm entry.

Format	no rmon alarm *alarm number*

Mode	Global Config

Example: The following shows an example of the command.

```
(Routing) (Config)# no rmon alarm 1
```

rmon hcalarm

This command sets the RMON hcalarm entry in the High Capacity RMON alarm MIB group.

Format	rmon hcalarm *alarm number variable sample interval* {absolute|delta} rising-threshold high *value*low*value*status{positive|negative}[*rising-event-index*]falling-thresholdhigh*value*low *value* status {positive|negative} [*falling-event-index*] [startup {*rising*|*falling*|*rising-falling*}] [owner *string*]
Mode	Global Config

Parameter	Description
High Capacity Alarm Index	An arbitrary integer index value used to uniquely identify the high capacity alarm entry. The range is 1 to 65535.
High Capacity Alarm Variable	The object identifier of the particular variable to be sampled. Only variables that resolve to an ASN.1 primitive type of integer.
High Capacity Alarm Interval	The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. The range is 1 to 2147483647. The default is 1.
High Capacity Alarm Sample Type	The method of sampling the selected variable and calculating the value to be compared against the thresholds. Possible types are **Absolute Value** or **Delta Value**. The default is **Absolute Value**.
High Capacity Alarm Absolute Value	The absolute value (that is, the unsigned value) of the hcAlarmVariable statistic during the last sampling period. The value during the current sampling period is not made available until the period is complete. This object is a 64-bit unsigned value that is Read-Only.
High Capacity Alarm Absolute Alarm Status	This object indicates the validity and sign of the data for the high capacity alarm absolute value object (hcAlarmAbsValueobject). Possible status types are **valueNotAvailable**, **valuePositive**, or **valueNegative**. The default is **valueNotAvailable**.
High Capacity Alarm Startup Alarm	High capacity alarm startup alarm that may be sent. Possible values are **rising**, **falling**, or **rising-falling**. The default is **rising-falling**.
High Capacity Alarm Rising-Threshold Absolute Value Low	The lower 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 1.
High Capacity Alarm Rising-Threshold Absolute Value High	The upper 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 0.
High Capacity Alarm Rising-Threshold Value Status	This object indicates the sign of the data for the rising threshold, as defined by the objects hcAlarmRisingThresAbsValueLow and hcAlarmRisingThresAbsValueHigh. Possible values are **valueNotAvailable**, **valuePositive**, or **valueNegative**. The default is **valuePositive**.

Parameter	Description
High Capacity Alarm Falling-Threshold Absolute Value Low	The lower 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 1.
High Capacity Alarm Falling-Threshold Absolute Value High	The upper 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 0.
High Capacity Alarm Falling-Threshold Value Status	This object indicates the sign of the data for the falling threshold, as defined by the objects hcAlarmFallingThresAbsValueLow and hcAlarmFallingThresAbsValueHigh. Possible values are **valueNotAvailable**, **valuePositive**, or **valueNegative**. The default is **valuePositive**.
High Capacity Alarm Rising Event Index	The index of the eventEntry that is used when a rising threshold is crossed. The range is 1 to 65535. The default is 1.
High Capacity Alarm Falling Event Index	The index of the eventEntry that is used when a falling threshold is crossed. The range is 1 to 65535. The default is 2.
High Capacity Alarm Failed Attempts	The number of times the associated hcAlarmVariable instance was polled on behalf of the hcAlarmEntry (while in the active state) and the value was not available. This object is a 32-bit counter value that is read-only.
High Capacity Alarm Owner	The owner string associated with the alarm entry. The default is **monitorHCAlarm**.
High Capacity Alarm Storage Type	The type of non-volatile storage configured for this entry. This object is read-only. The default is **volatile**.

Example: The following shows an example of the command.

```
(Routing) (Config)# rmon hcalarm 1 ifInOctets.1 30 absolute rising-threshold high 1 low 100 status positive 1
falling-threshold high 1 low 10 status positive startup rising owner myOwner
```

no rmon hcalarm

This command deletes the rmon hcalarm entry.

Format	no rmon hcalarm *alarm number*
Mode	Global Config

Example: The following shows an example of the command.

```
(Routing) (Config)# no rmon hcalarm 1
```

rmon event

This command sets the RMON event entry in the RMON event MIB group.

Format	rmon event *event number* [description *string*|log|owner *string*|trap *community*]
Mode	Global Config

Parameter	Description
Event Index	An index that uniquely identifies an entry in the event table. Each such entry defines one event that is to be generated when the appropriate conditions occur. The range is 1 to 65535.
Event Description	A comment describing the event entry. The default is **alarmEvent**.
Event Type	The type of notification that the probe makes about the event. Possible values are **None**, **Log**, **SNMP Trap**, **Log and SNMP Trap**. The default is **None**.
Event Owner	Owner string associated with the entry. The default is **monitorEvent**.
Event Community	The SNMP community specific by this octet string which is used to send an SNMP trap. The default is **public**.

Example: The following shows an example of the command.

```
(Routing) (Config)# rmon event 1 log description test
```

no rmon event

This command deletes the rmon event entry.

Format	no rmon event *event number*
Mode	Global Config

Example: The following shows an example of the command.

```
(Routing) (Config)# no rmon event 1
```

rmon collection history

This command sets the history control parameters of the RMON historyControl MIB group.

Note: This command is not supported on interface range. Each RMON history control collection entry can be configured on only one interface. If you try to configure on multiple interfaces, DUT displays an error.

Format	rmon collection history *index number* [buckets *number* | interval *interval in sec* | owner *string*]
Mode	Interface Config

Parameter	Description
History Control Index	An index that uniquely identifies an entry in the historyControl table. Each such entry defines a set of samples at a particular interval for an interface on the device. The range is 1 to 65535.
History Control Data Source	The source interface for which historical data is collected.
History Control Buckets Requested	The requested number of discrete time intervals over which data is to be saved. The range is 1 to 65535. The default is 50.
History Control Buckets Granted	The number of discrete sampling intervals over which data shall be saved. This object is read-only. The default is 10.

Parameter	Description
History Control Interval	The interval in seconds over which the data is sampled. The range is 1 to 3600. The default is 1800.
History Control Owner	The owner string associated with the history control entry. The default is monitorHistoryControl.

Example: The following shows an example of the command.

```
(Routing) (Interface 1/0/1)# rmon collection history 1 buckets 10 interval 30 owner myOwner
```

Example: The following shows an example of the command.

```
(Routing) (Interface 1/0/1-1/0/10)#rmon collection history 1 buckets 10 interval 30 owner myOwner

Error: 'rmon collection history' is not supported on range of interfaces.
```

no rmon collection history

This command will delete the history control group entry with the specified index number.

Format	no rmon collection history *index number*
Mode	`Interface` Config

Example: The following shows an example of the command.

```
(Routing) (Interface 1/0/1-1/0/10)# no rmon collection history 1
```

show rmon

This command displays the entries in the RMON alarm table.

Format	show rmon {alarms | alarm *alarm-index*}
Mode	Privileged EXEC

Parameter	Description
Alarm Index	An index that uniquely identifies an entry in the alarm table. Each entry defines a diagnostic sample at a particular interval for an object on the device. The range is 1 to 65535.
Alarm Variable	The object identifier of the particular variable to be sampled. Only variables that resolve to an ASN.1 primitive type of integer.
Alarm Interval	The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. The range is 1 to 2147483647. The default is 1.
Alarm Absolute Value	The value of the statistic during the last sampling period. This object is a read-only, 32-bit signed value.
Alarm Rising Threshold	The rising threshold for the sample statistics. The range is 2147483648 to 2147483647. The default is 1.
Alarm Rising Event Index	The index of the eventEntry that is used when a rising threshold is crossed. The range is 1 to 65535. The default is 1.
Alarm Falling Threshold	The falling threshold for the sample statistics. The range is 2147483648 to 2147483647. The default is 1.
Alarm Falling Event Index	The index of the eventEntry that is used when a falling threshold is crossed. The range is 1 to 65535. The default is 2.

Parameter	Description
Alarm Startup Alarm	The alarm that may be sent. Possible values are **rising, falling** or both **rising-falling**. The default is **rising-falling**.
Alarm Owner	The owner string associated with the alarm entry. The default is **monitorAlarm**.

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon alarms

Index   OID                Owner
----------------------------------------------
1     alarmInterval.1         MibBrowser
2     alarmInterval.1         MibBrowser
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon alarm 1

Alarm 1
----------
OID: alarmInterval.1
Last Sample Value: 1
Interval: 1
Sample Type: absolute
Startup Alarm: rising-falling
Rising Threshold: 1
Falling Threshold: 1
Rising Event: 1
Falling Event: 2
Owner: MibBrowser
```

show rmon collection history

This command displays the entries in the RMON history control table.

Format	show rmon collection history [interfaces *unit/slot/port*]
Mode	Privileged EXEC

Parameter	Description
History Control Index	An index that uniquely identifies an entry in the historyControl table. Each such entry defines a set of samples at a particular interval for an interface on the device. The range is 1 to 65535.
History Control Data Source	The source interface for which historical data is collected.
History Control Buckets Requested	The requested number of discrete time intervals over which data is to be saved. The range is 1 to 65535. The default is 50.
History Control Buckets Granted	The number of discrete sampling intervals over which data shall be saved. This object is read-only. The default is 10.
History Control Interval	The interval in seconds over which the data is sampled. The range is 1 to 3600. The default is 1800.
History Control Owner	The owner string associated with the history control entry. The default is monitorHistoryControl.

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon collection history

Index   Interface    Interval  Requested   Granted     Owner
                      Samples   Samples
----------------------------------------------------------------------
1      1/0/1       30       10        10         myowner
2      1/0/1       1800      50        10         monitorHistoryControl
3      1/0/2       30       50        10         monitorHistoryControl
4      1/0/2       1800      50        10         monitorHistoryControl
5      1/0/3       30       50        10         monitorHistoryControl
6      1/0/3       1800      50        10         monitorHistoryControl
7      1/0/4       30       50        10         monitorHistoryControl
8      1/0/4       1800      50        10         monitorHistoryControl
9      1/0/5       30       50        10         monitorHistoryControl
10     1/0/5       1800      50        10         monitorHistoryControl
11     1/0/6       30       50        10         monitorHistoryControl
12     1/0/6       1800      50        10         monitorHistoryControl
13     1/0/7       30       50        10         monitorHistoryControl
14     1/0/7       1800      50        10         monitorHistoryControl
15     1/0/8       30       50        10         monitorHistoryControl
16     1/0/8       1800      50        10         monitorHistoryControl
17     1/0/9       30       50        10         monitorHistoryControl
18     1/0/9       1800      50        10         monitorHistoryControl
19     1/0/10      30       50        10         monitorHistoryControl
--More-- or (q)uit
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon collection history interfaces 1/0/1

Index   Interface    Interval  Requested   Granted     Owner
                      Samples   Samples
----------------------------------------------------------------------
1      1/0/1       30       10        10         myowner
2      1/0/1       1800      50        10         monitorHistoryControl
```

show rmon events

This command displays the entries in the RMON event table.

Format	show rmon events
Mode	Privileged EXEC

Parameter	Description
Event Index	An index that uniquely identifies an entry in the event table. Each such entry defines one event that is to be generated when the appropriate conditions occur. The range is 1 to 65535.
Event Description	A comment describing the event entry. The default is **alarmEvent**.
Event Type	The type of notification that the probe makes about the event. Possible values are **None**, **Log**, **SNMP Trap**, **Log and SNMP Trap**. The default is **None**.
Event Owner	Owner string associated with the entry. The default is **monitorEvent**.
Event Community	The SNMP community specific by this octet string which is used to send an SNMP trap. The default is **public**.
Owner	Event owner. The owner string associated with the entry.

Parameter	Description
Last time sent	The last time over which a log or a SNMP trap message is generated.

Example: The following shows example CLI display output for the command.

```
(Routing) # show rmon events

Index  Description      Type     Community   Owner      Last time sent
-------------------------------------------------------------------------------
1      test             log      public      MIB        0 days 0 h:0 m:0 s
```

show rmon history

This command displays the specified entry in the RMON history table.

Format	show rmon history *index* {errors |other |throughput | high-capacity}[period *seconds*]
Mode	Privileged EXEC

Parameter	Description
Common Fields	
Sample set	The index (identifier) for the RMON history entry within the RMON history group. Each such entry defines a set of samples at a particular interval for an interface on the device.
Owner	The owner string associated with the history control entry. The default is monitorHistoryControl.
Interface	The interface that was sampled.
Interval	The time between samples, in seconds.
Requested Samples	The number of samples (intervals) requested for the RMON history entry.
Granted Samples	The number of samples granted for the RMON history entry.
Maximum Table Size	Maximum number of entries that the history table can hold.
Output for Errors Parameter	
Time	Time at which the sample is collected, displayed as period seconds.
CRC Align	Number of CRC align errors.
Undersize Packets	Total number of undersize packets. Packets are less than 64 octets long (excluding framing bits, including FCS octets).
Oversize Packets	Total number of oversize packets. Packets are longer than 1518 octets (excluding framing bits, including FCS octets).
Fragments	Total number of fragment packets. Packets are not an integral number of octets in length or had a bad Frame Check Sequence (FCS), and are less than 64 octets in length (excluding framing bits, including FCS octets).
Jabbers	Total number of jabber packets. Packets are longer than 1518 octets (excluding framing bits, including FCS octets), and are not an integral number of octets in length or had a bad Frame Check Sequence (FCS).
Output for Others Parameter	
Time	Time at which the sample is collected, displayed as period seconds.
Dropped Collisions	Total number of dropped collisions.
Output for Throughput Parameter	
Time	Time at which the sample is collected, displayed as period seconds.

Parameter	Description
Octets	Total number of octets received on the interface.
Packets	Total number of packets received (including error packets) on the interface.
Broadcast	Total number of good broadcast packets received on the interface.
Multicast	Total number of good multicast packets received on the interface.
Util	Port utilization of the interface associated with the history index specified.
Output for High-Capacity Parameter	
Time	Time at which the sample is collected, displayed as period seconds.
Overflow Pkts	The number of times the associated packet counter has overflowed.
Pkts	The total number of packets (including bad packets, broadcast packets, and multicast packets) received.
Overflow Octets	The number of times the associated octet counter has overflowed.
Octets	The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets).

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon history 1 errors

Sample set: 1   Owner: myowner
Interface: 1/0/1   Interval: 30
Requested Samples: 10   Granted Samples: 10
Maximum table size: 1758

Time                 CRC Align  Undersize Oversize  Fragments  Jabbers
-------------------- ---------- --------- --------- ---------- -------
Jan 01 1970 21:41:43  0         0       0        0         0
Jan 01 1970 21:42:14  0         0       0        0         0
Jan 01 1970 21:42:44  0         0       0        0         0
Jan 01 1970 21:43:14  0         0       0        0         0
Jan 01 1970 21:43:44  0         0       0        0         0
Jan 01 1970 21:44:14  0         0       0        0         0
Jan 01 1970 21:44:45  0         0       0        0         0
Jan 01 1970 21:45:15  0         0       0        0         0
Jan 01 1970 21:45:45  0         0       0        0         0
Jan 01 1970 21:46:15  0         0       0        0         0
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon history 1 throughput

Sample set: 1   Owner: myowner
Interface: 1/0/1   Interval: 30
Requested Samples: 10   Granted Samples: 10
Maximum table size: 1758

Time                Octets     Packets   Broadcast Multicast  Util
-------------------- ---------- --------- --------- ---------- --------
Jan 01 1970 21:41:43 0         0       0        0         1
Jan 01 1970 21:42:14 0         0       0        0         1
Jan 01 1970 21:42:44 0         0       0        0         1
Jan 01 1970 21:43:14 0         0       0        0         1
Jan 01 1970 21:43:44 0         0       0        0         1
Jan 01 1970 21:44:14 0         0       0        0         1
Jan 01 1970 21:44:45 0         0       0        0         1
Jan 01 1970 21:45:15 0         0       0        0         1
Jan 01 1970 21:45:45 0         0        0        0        1
Jan 01 1970 21:46:15 0         0        0        0        1

(Routing) #show rmon history 1 other

Sample set: 1   Owner: myowner
Interface: 1/0/1   Interval: 30
Requested Samples: 10   Granted Samples: 10
Maximum table size: 1758

Time                Dropped Collisions
-------------------- ------- ----------
Jan 01 1970 21:41:43 0       0
Jan 01 1970 21:42:14 0       0
Jan 01 1970 21:42:44 0       0
Jan 01 1970 21:43:14 0       0
Jan 01 1970 21:43:44 0       0
Jan 01 1970 21:44:14 0       0
Jan 01 1970 21:44:45 0       0
Jan 01 1970 21:45:15 0       0
Jan 01 1970 21:45:45 0       0
Jan 01 1970 21:46:15 0       0
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon history 1 high-capacity

Sample set: 1   Owner: monitorHistoryControl
Interface: 0/1   Interval: 30
Requested Samples: 50   Granted Samples: 10
Maximum table size: 414

Time                 OverFlow Pkts    Pkts           Overflow Octets   Octets
--------------------  -------------    ----           -------------   ------

Jan 17 2017 09:12:56  0             0             0             0
Jan 17 2017 09:13:27  0             0             0             0
Jan 17 2017 09:13:57  0             0             0             0
Jan 17 2017 09:14:27  0             0             0             0
Jan 17 2017 09:14:57  0             0             0             0
Jan 17 2017 09:15:28  0             0             0             0
Jan 17 2017 09:15:58  0             0             0             0
Jan 17 2017 09:16:28  0             0             0             0
Jan 17 2017 09:16:58  0             0             0             0
Jan 17 2017 09:17:29  0             0             0             0
```

show rmon log

This command displays the entries in the RMON log table.

Format	show rmon log [*event-index*]
Mode	Privileged EXEC

Parameter	Description
Maximum table size	Maximum number of entries that the log table can hold.
Event	Event index for which the log is generated.

Parameter	Description
Description	A comment describing the event entry for which the log is generated.
Time	Time at which the event is generated.

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon log

Event   Description               Time
------------------------------------------------
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon log 1

Maximum table size: 10

Event   Description               Time
------------------------------------------------
```

show rmon statistics interfaces

This command displays the RMON statistics for the given interfaces.

Format	show rmon statistics interfaces *unit/slot/port*
Mode	Privileged EXEC

Parameter	Description
Port	unit/slot/port
Dropped	Total number of dropped events on the interface.
Octets	Total number of octets received on the interface.
Packets	Total number of packets received (including error packets) on the interface.
Broadcast	Total number of good broadcast packets received on the interface.
Multicast	Total number of good multicast packets received on the interface.
CRC Align Errors	Total number of packets received have a length (excluding framing bits, including FCS octets) of between 64 and 1518 octets inclusive.
Collisions	Total number of collisions on the interface.
Undersize Pkts	Total number of undersize packets. Packets are less than 64 octets long (excluding framing bits, including FCS octets).
Oversize Pkts	Total number of oversize packets. Packets are longer than 1518 octets (excluding framing bits, including FCS octets).
Fragments	Total number of fragment packets. Packets are not an integral number of octets in length or had a bad Frame Check Sequence (FCS), and are less than 64 octets in length (excluding framing bits, including FCS octets).
Jabbers	Total number of jabber packets. Packets are longer than 1518 octets (excluding framing bits, including FCS octets), and are not an integral number of octets in length or had a bad Frame Check Sequence (FCS).
64 Octets	Total number of packets which are 64 octets in length (excluding framing bits, including FCS octets).

Parameter	Description
65-127 Octets	Total number of packets which are between 65 and 127 octets in length (excluding framing bits, including FCS octets).
128-255 Octets	Total number of packets which are between 128 and 255 octets in length (excluding framing bits, including FCS octets).
256-511 Octets	Total number of packets which are between 256 and 511 octets in length (excluding framing bits, including FCS octets).
512-1023 Octets	Total number of packets which are between 512 and 1023 octets in length (excluding framing bits, including FCS octets).
1024-1518 Octets	Total number of packets which are between 1024 and 1518 octets in length (excluding framing bits, including FCS octets).
HC Overflow Pkts	Total number of times the packet counter has overflowed.
HC Overflow Octets	Total number of times the octet counter has overflowed.
HC Overflow Pkts 64 Octets	The number of times the associated 64-octet counter has overflowed.
HC Overflow Pkts 65 - 127 Octets	The number of times the associated 65 to 127 octet counter has overflowed.
HC Overflow Pkts 128 - 255 Octets	The number of times the associated 128 to 255 octet counter has overflowed.
HC Overflow Pkts 256 - 511 Octets	The number of times the associated 256 to 511 octet counter has overflowed.
HC Overflow Pkts 512 - 1023 Octets	The number of times the associated 512 to 1023 octet counter has overflowed.
HC Overflow Pkts 1024 - 1518 Octets	The number of times the associated 1024 to 1518 octet counter has overflowed.

Example: The following shows example CLI display output for the command.

```
(Routing) # show rmon statistics interfaces 1/0/1
Port: 1/0/1
Dropped: 0
Octets: 0  Packets: 0
Broadcast: 0  Multicast: 0
CRC Align Errors: 0  Collisions: 0
Undersize Pkts: 0  Oversize Pkts: 0
Fragments: 0  Jabbers: 0
64 Octets: 0  65 - 127 Octets: 0
128 - 255 Octets: 0  256 - 511 Octets: 0
512 - 1023 Octets: 0  1024 - 1518 Octets: 0
HC Overflow Pkts: 0  HC Pkts: 0
HC Overflow Octets: 0  HC Octets: 0
HC Overflow Pkts 64 Octets: 0  HC Pkts 64 Octets: 0
HC Overflow Pkts 65 - 127 Octets: 0  HC Pkts 65 - 127 Octets: 0
HC Overflow Pkts 128 - 255 Octets: 0  HC Pkts 128 - 255 Octets: 0
HC Overflow Pkts 256 - 511 Octets: 0  HC Pkts 256 - 511 Octets: 0
HC Overflow Pkts 512 - 1023 Octets: 0  HC Pkts 512 - 1023 Octets: 0
HC Overflow Pkts 1024 - 1518 Octets: 0  HC Pkts 1024 - 1518 Octets: 0
```

show rmon hcalarms

This command displays the entries in the RMON high-capacity alarm table.

Format	show rmon {hcalarms|hcalarm *alarm index*}
Mode	Privileged EXEC

Parameter	Description
High Capacity Alarm Index	An arbitrary integer index value used to uniquely identify the high capacity alarm entry. The range is 1 to 65535.
High Capacity Alarm Variable	The object identifier of the particular variable to be sampled. Only variables that resolve to an ASN.1 primitive type of integer.
High Capacity Alarm Interval	The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. The range is 1 to 2147483647. The default is 1.
High Capacity Alarm Sample Type	The method of sampling the selected variable and calculating the value to be compared against the thresholds. Possible types are **Absolute Value** or **Delta Value**. The default is **Absolute Value**.
High Capacity Alarm Absolute Value	The absolute value (that is, the unsigned value) of the hcAlarmVariable statistic during the last sampling period. The value during the current sampling period is not made available until the period is complete. This object is a 64-bit unsigned value that is Read-Only.
High Capacity Alarm Absolute Alarm Status	This object indicates the validity and sign of the data for the high capacity alarm absolute value object (hcAlarmAbsValueobject). Possible status types are **valueNotAvailable**, **valuePositive**, or **valueNegative**. The default is **valueNotAvailable**.
High Capacity Alarm Startup Alarm	High capacity alarm startup alarm that may be sent. Possible values are **rising**, **falling**, or **rising-falling**. The default is **rising-falling**.
High Capacity Alarm Rising-Threshold Absolute Value Low	The lower 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 1.
High Capacity Alarm Rising-Threshold Absolute Value High	The upper 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 0.
High Capacity Alarm Rising-Threshold Value Status	This object indicates the sign of the data for the rising threshold, as defined by the objects hcAlarmRisingThresAbsValueLow and hcAlarmRisingThresAbsValueHigh. Possible values are **valueNotAvailable**, **valuePositive**, or **valueNegative**. The default is **valuePositive**.
High Capacity Alarm Falling-Threshold Absolute Value Low	The lower 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 1.
High Capacity Alarm Falling-Threshold Absolute Value High	The upper 32 bits of the absolute value for threshold for the sampled statistic. The range is 0 to 4294967295. The default is 0.
High Capacity Alarm Falling-Threshold Value Status	This object indicates the sign of the data for the falling threshold, as defined by the objects hcAlarmFallingThresAbsValueLow and hcAlarmFallingThresAbsValueHigh. Possible values are **valueNotAvailable**, **valuePositive**, or **valueNegative**. The default is **valuePositive**.
High Capacity Alarm Rising Event Index	The index of the eventEntry that is used when a rising threshold is crossed. The range is 1 to 65535. The default is 1.
High Capacity Alarm Falling Event Index	The index of the eventEntry that is used when a falling threshold is crossed. The range is 1 to 65535. The default is 2.
High Capacity Alarm Failed Attempts	The number of times the associated hcAlarmVariable instance was polled on behalf of the hcAlarmEntry (while in the active state) and the value was not available. This object is a 32-bit counter value that is read-only.
High Capacity Alarm Owner	The owner string associated with the alarm entry. The default is **monitorHCAlarm**.

Parameter	Description
High Capacity Alarm Storage Type	The type of non-volatile storage configured for this entry. This object is read-only. The default is **volatile**.

Example: The following shows example CLI display output for the command.

```
(Routing) #show rmon hcalarms

Index   OID               Owner
----------------------------------------------
1     alarmInterval.1        MibBrowser
2     alarmInterval.1        MibBrowser

(Routing) #show rmon hcalarm 1

Alarm 1
----------
OID: alarmInterval.1
Last Sample Value: 1
Interval: 1
Sample Type: absolute
Startup Alarm: rising-falling
Rising Threshold High: 0
Rising Threshold Low: 1
Rising Threshold Status: Positive
Falling Threshold High: 0
Falling Threshold Low: 1
Falling Threshold Status: Positive
Rising Event: 1
Falling Event: 2
Startup Alarm: Rising-Falling
Owner: MibBrowser
```

Chapter 6. Switching Commands

This chapter describes the switching commands available in the CE0128XB/CE0152XB CLI.

Port Configuration Commands

This section describes the commands you use to view and configure port settings.

interface

This command gives you access to the Interface Config mode, which allows you to enable or modify the operation of an interface (port). You can also specify a range of ports to configure at the same time by specifying the starting *unit/slot/port* and ending *unit/slot/port*, separated by a hyphen.

Format	interface {*unit/slot/port* | *unit/slot/port(startrange)-unit/slot/port(endrange)*}
Mode	Global Config

Example: The following example enters Interface Config mode for port 1/0/1:

```
(switch) #configure
(switch) (config)#interface 1/0/1
(switch) (interface 1/0/1)#
```

Example: The following example enters Interface Config mode for ports 1/0/1 through 1/0/4:

```
(switch) #configure
(switch) (config)#interface 1/0/1-1/0/4
(switch) (interface 1/0/1-1/0/4)#
```

auto-negotiate

This command enables automatic negotiation on a port or range of ports.

Note: This command has been deprecated. The Auto-negotiation enable/disable option is no longer available using `auto-negotiate`. Instead, different variants of the `speed` command (i.e., `speed` and `speed auto` are used to disable and enable auto-negotiation, respectively. However, backward compatibility will be maintained for the `auto-negotiate` command, so a configuration script that has the `auto-negotiate` command is still supported. Both, text-based as well as binary-based configuration migration will be handled to keep this command backward compatible.

Default	enabled
Format	auto-negotiate
Mode	Interface Config

no auto-negotiate

This command disables automatic negotiation on a port.

Note: Automatic sensing is disabled when automatic negotiation is disabled.

Format	no auto-negotiate
Mode	Interface Config

auto-negotiate all

This command enables automatic negotiation on all ports.

Default	enabled
Format	auto-negotiate all
Mode	Global Config

no auto-negotiate all

This command disables automatic negotiation on all ports.

Format	no auto-negotiate all
Mode	Global Config

description

Use this command to create an alpha-numeric description of an interface or range of interfaces.

Format	description *description*
Mode	Interface Config

mtu

Use the `mtu` command to set the maximum transmission unit (MTU) size, in bytes, for frames that ingress or egress the interface. You can use the `mtu` command to configure jumbo frame support for physical and port-channel (LAG) interfaces. For the standard CE0128XB/CE0152XB implementation, the MTU size is a valid integer between 1500-9198.

Note: To receive and process packets, the Ethernet MTU must include any extra bytes that Layer-2 headers might require. To configure the IP MTU size, which is the maximum size of the IP packet (IP Header + IP payload), see "ip mtu" on page 606.

Default	1500 (untagged)
Format	mtu *1500-9198*
Mode	Interface Config

no mtu

This command sets the default MTU size (in bytes) for the interface.

Format	no mtu
Mode	Interface Config

shutdown

This command disables a port or range of ports.

Note: You can use the `shutdown` command on physical and port-channel (LAG) interfaces, but not on VLAN routing interfaces.

Default	enabled
Format	shutdown
Mode	Interface Config

no shutdown

This command enables a port.

Format	no shutdown
Mode	Interface Config

shutdown all

This command disables all ports.

Note: You can use the `shutdown all` command on physical and port-channel (LAG) interfaces, but not on VLAN routing interfaces.

Default	enabled
Format	shutdown all
Mode	Global Config

no shutdown all

This command enables all ports.

Format	no shutdown all
Mode	Global Config

speed

Use this command to enable or disable auto-negotiation and set the speed that will be advertised by that port. The duplex parameter allows you to set the advertised speed for both half as well as full duplex mode.

Use the `auto` keyword to enable auto-negotiation on the port. Use the command without the `auto` keyword to ensure auto-negotiation is disabled and to set the port speed and mode according to the command values. If auto-negotiation is disabled, the speed and duplex mode must be set.

Default	Auto-negotiation is enabled.
Format	speed auto {10|100|1000 speed {10|100|10G} {half-duplex|full-duplex}

Mode	Interface Config

speed all

This command sets the speed and duplex setting for all interfaces if auto-negotiation is disabled. If auto-negotiation is enabled, an error message is returned. Use the `no auto-negotiate` command to disable.

Default	Auto-negotiation is enabled. Adv. is 10h, 10f, 100h, 100f, 1000f.
Format	speed all {100 | 10} {half-duplex | full-duplex}
Mode	Global Config

show port

This command displays port information.

Format	show port {*intf-range* | all}
Mode	Privileged EXEC

Parameter	Definition
Interface	unit/slot/port
Type	If not blank, this field indicates that this port is a special type of port. The possible values are: • **Mirror** — this port is a monitoring port. For more information, see "Port Mirroring Commands" on page 475. • **PC Mbr**— this port is a member of a port-channel (LAG). • **Probe** — this port is a probe port.
Admin Mode	The Port control administration state. The port must be enabled in order for it to be allowed into the network. May be enabled or disabled. The factory default is enabled.
Physical Mode	The desired port speed and duplex mode. If auto-negotiation support is selected, then the duplex mode and speed is set from the auto-negotiation process. Note that the maximum capability of the port (full duplex -100M) is advertised. Otherwise, this object determines the port's duplex mode and transmission rate. The factory default is Auto.
Physical Status	The port speed and duplex mode.
Link Status	The Link is up or down.
Link Trap	This object determines whether or not to send a trap when link status changes. The factory default is enabled.
LACP Mode	LACP is enabled or disabled on this port.

Example: The following command shows an example of the command output for all ports.

```
(Routing) #show port all

            Admin   Physical  Physical  Link   Link    LACP  Actor
Intf   Type  Mode     Mode     Status   Status Trap    Mode  Timeout
--------- ------ --------- ---------- ---------- ------ ------- ------ --------
0/1          Enable   Auto     100 Full  Up     Enable  Enable long
0/2          Enable   Auto     100 Full  Up     Enable  Enable long
```

```
0/3        Enable   Auto          Down   Enable  Enable long
0/4        Enable   Auto    100 Full  Up    Enable  Enable long
0/5        Enable   Auto    100 Full  Up    Enable  Enable long
0/6        Enable   Auto    100 Full  Up    Enable  Enable long
0/7        Enable   Auto    100 Full  Up    Enable  Enable long
0/8        Enable   Auto    100 Full  Up    Enable  Enable long
1/1        Enable              Down   Disable N/A    N/A
1/2        Enable              Down   Disable N/A    N/A
1/3        Enable              Down   Disable N/A    N/A
1/4        Enable              Down   Disable N/A    N/A
1/5        Enable              Down   Disable N/A    N/A
1/6        Enable              Down   Disable N/A    N/A
```

Example: The following command shows an example of the command output for a range of ports.

```
(Routing) #show port 0/1-1/6

          Admin    Physical   Physical  Link  Link    LACP   Actor
Intf    Type  Mode     Mode     Status    Status Trap   Mode  Timeout
--------- ------ --------- ---------- ---------- ------ ------- ------ --------
0/1        Enable   Auto    100 Full  Up    Enable  Enable long
0/2        Enable   Auto    100 Full  Up    Enable  Enable long
0/3        Enable   Auto          Down   Enable  Enable long
0/4        Enable   Auto    100 Full  Up    Enable  Enable long
0/5        Enable   Auto    100 Full  Up    Enable  Enable long
0/6        Enable   Auto    100 Full  Up    Enable  Enable long
0/7        Enable   Auto    100 Full  Up    Enable  Enable long
0/8        Enable   Auto    100 Full  Up    Enable  Enable long
1/1        Enable              Down   Disable N/A    N/A
1/2        Enable              Down   Disable N/A    N/A
1/3        Enable              Down   Disable N/A    N/A
1/4        Enable              Down   Disable N/A    N/A
1/5        Enable              Down   Disable N/A    N/A
1/6        Enable              Down   Disable N/A    N/A
```

show port advertise

Use this command to display the local administrative link advertisement configuration, local operational link advertisement, and the link partner advertisement for an interface. It also displays priority Resolution for speed and duplex as per 802.3 Annex 28B.3. It displays the Auto negotiation state, PHY Master/Slave Clock configuration, and Link state of the port.

If the link is down, the Clock is displayed as *No Link*, and a dash is displayed against the Oper Peer advertisement, and Priority Resolution. If Auto negotiation is disabled, then the admin Local Link advertisement, operational local link advertisement, operational peer advertisement, and Priority resolution fields are not displayed.

If this command is executed without the optional `unit/slot/port` parameter, then it displays the Auto-negotiation state and operational Local link advertisement for all the ports. Operational link advertisement will display speed only if it is supported by both local as well as link partner. If auto-negotiation is disabled, then operational local link advertisement is not displayed.

Format	show port advertise [*unit/slot/port*]
Mode	Privileged EXEC

Example: The following commands show the command output with and without the optional parameter:

```
(Switching)#show port advertise 0/1

Port: 0/1
Type: Gigabit - Level
Link State: Down
Auto Negotiation: Enabled
Clock: Auto
                    1000f 1000h 100f 100h 10f 10h
                    ----- ----- ---- ---- --- ---
Admin Local Link Advertisement no    no    yes  no   yes no
Oper Local Link Advertisement  no    no    yes  no   yes no
Oper Peer Advertisement                          no    no    yes  yes  yes yes
Priority Resolution            -     -     yes  -    -   -

(Switching)#show port advertise
Port      Type                          Neg      Operational Link Advertisement
--------- ----------------------------- ----------- ------------------------------
0/1   Gigabit - Level                Enabled  1000f, 100f, 100h, 10f, 10h
0/2   Gigabit - Level                Enabled  1000f, 100f, 100h, 10f, 10h
0/3   Gigabit - Level                Enabled  1000f, 100f, 100h, 10f, 10h
```

show port description

This command displays the interface description. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format	show port description *unit/slot/port*
Mode	Privileged EXEC

Parameter	Definition
Interface	unit/slot/port
ifIndex	The interface index number associated with the port.
Description	The alpha-numeric description of the interface created by the command. See “description” on page 339.
MAC address	The MAC address of the port. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB.
Bit Offset Val	The bit offset value.

Example: The following shows example CLI display output for the command.

```
(Switching) #show port description 0/1

Interface...........0/1
ifIndex.............1
Description.........
MAC address.........00:10:18:82:0C:10
Bit Offset Val......1
```

Spanning Tree Protocol Commands

This section describes the commands you use to configure Spanning Tree Protocol (STP). STP helps prevent network loops, duplicate messages, and network instability.

Note: Note the following:

- STP is enabled on the switch and on all ports and LAGs by default.
- If STP is disabled, the system does not forward BPDU messages.

spanning-tree

This command sets the spanning-tree operational mode to enabled.

Default	enabled
Format	spanning-tree
Mode	Global Config

no spanning-tree

This command sets the spanning-tree operational mode to disabled. While disabled, the spanning-tree configuration is retained and can be changed, but is not activated.

Format	no spanning-tree
Mode	Global Config

spanning-tree auto-edge

Use this command to allow the interface to become an edge port if it does not receive any BPDUs within a given amount of time.

Default	Enabled
Format	spanning-tree auto-edge
Mode	Interface Config

no spanning-tree auto-edge

This command resets the auto-edge status of the port to the default value.

Format	no spanning-tree auto-edge
Mode	Interface Config

spanning-tree backbonefast

Use this command to enable the detection of indirect link failures and accelerate spanning tree convergence on PVSTP configured switches.

Backbonefast accelerates finding an alternate path when an indirect link to the root port goes down.

Backbonefast can be configured even if the switch is configured for MST(RSTP) or PVST mode. It only has an effect when the switch is configured for the PVST mode.

If a backbonefast-enabled switch receives an inferior BPDU from its designated switch on a root or blocked port, it sets the maximum aging time on the interfaces on which it received the inferior BPDU if there are alternate paths to the designated switch. This allows a blocked port to immediately move to the listening state where the port can be transitioned to the forwarding state in the normal manner.

On receipt of an inferior BPDU from a designated bridge, backbonefast enabled switches send a Root Link Query (RLQ) request to all non-designated ports except the port from which it received the inferior BPDU. This check validates that the switch can receive packets from the root on ports where it expects to receive BPDUs. The port from which the original inferior BPDU was received is excluded because it has already encountered a failure. Designated ports are excluded as they do not lead to the root.

On receipt of an RLQ response, if the answer is negative, the receiving port has lost connection to the root and its BPDU is immediately aged out. If all nondesignated ports have already received a negative answer, the whole bridge has lost the root and can start the STP calculation from scratch.

If the answer confirms the switch can access the root bridge on a port, it can immediately age out the port on which it initially received the inferior BPDU.

A bridge that sends an RLQ puts its bridge ID in the PDU. This ensures that it does not flood the response on designated ports.

A bridge that receives an RLQ and has connectivity to the root forwards the query toward the root through its root port.

A bridge that receives a RLQ request and does not have connectivity to the root (switch bridge ID is different from the root bridge ID in the query) or is the root bridge immediately answers the query with its root bridge ID.

RLQ responses are flooded on designated ports.

Default	NA
Format	spanning-tree backbonefast
Mode	Global Config

no spanning-tree backbonefast

This command disables backbonefast.

Note: PVRSTP embeds support for FastBackbone and FastUplink. Even if FastUplink and FastBackbone are configured, they are effective only in PVSTP mode.

Format	no spanning-tree backbonefast
Mode	Global Config

spanning-tree bpdufilter

Use this command to enable BPDU Filter on an interface or range of interfaces.

Default	disabled
Format	spanning-tree bpdufilter
Mode	Interface Config

no spanning-tree bpdufilter

Use this command to disable BPDU Filter on the interface or range of interfaces.

Default	disabled
Format	no spanning-tree bpdufilter
Mode	Interface Config

spanning-tree bpdufilter default

Use this command to enable BPDU Filter on all the edge port interfaces.

Default	disabled
Format	spanning-tree bpdufilter default
Mode	Global Config

no spanning-tree bpdufilter default

Use this command to disable BPDU Filter on all the edge port interfaces.

Default	disabled
Format	no spanning-tree bpdufilter default
Mode	Global Config

spanning-tree bpduflood

Use this command to enable BPDU Flood on an interface or range of interfaces.

Default	disabled
Format	spanning-tree bpduflood
Mode	Interface Config

no spanning-tree bpduflood

Use this command to disable BPDU Flood on the interface or range of interfaces.

Default	disabled
Format	no spanning-tree bpduflood
Mode	Interface Config

spanning-tree bpduguard

Use this command to enable BPDU Guard on the switch.

Default	disabled
Format	spanning-tree bpduguard
Mode	Global Config

no spanning-tree bpduguard

Use this command to disable BPDU Guard on the switch.

Default	disabled
Format	no spanning-tree bpduguard
Mode	Global Config

spanning-tree bpdumigrationcheck

Use this command to force a transmission of rapid spanning tree (RSTP) and multiple spanning tree (MSTP) BPDUs. Use the *unit/slot/port* parameter to transmit a BPDU from a specified interface, or use the *all* keyword to transmit RST or MST BPDUs from all interfaces. This command forces the BPDU transmission when you execute it, so the command does not change the system configuration or have a `no` version.

Format	spanning-tree bpdumigrationcheck {*unit/slot/port* | all}
Mode	Global Config

spanning-tree configuration name

This command sets the Configuration Identifier Name for use in identifying the configuration that this switch is currently using. The *name* is a string of up to 32 characters.

Default	base MAC address in hexadecimal notation
Format	spanning-tree configuration name *name*
Mode	Global Config

no spanning-tree configuration name

This command resets the Configuration Identifier Name to its default.

Format	no spanning-tree configuration name
Mode	Global Config

spanning-tree configuration revision

This command sets the Configuration Identifier Revision Level for use in identifying the configuration that this switch is currently using. The Configuration Identifier Revision Level is a number in the range of 0 to 65535.

Default	0
Format	spanning-tree configuration revision *0-65535*
Mode	Global Config

no spanning-tree configuration revision

This command sets the Configuration Identifier Revision Level for use in identifying the configuration that this switch is currently using to the default value.

Format	no spanning-tree configuration revision
Mode	Global Config

spanning-tree cost

Use this command to configure the external path cost for port used by a MST instance. When the `auto` keyword is used, the path cost from the port to the root bridge is automatically determined by the speed of the interface. To configure the cost manually, specify a ***`cost`*** value from 1 to 200000000.

Default	auto
Format	spanning-tree cost {*cost* | auto}
Mode	Interface Config

no spanning-tree cost

This command resets the auto-edge status of the port to the default value.

Format	no spanning-tree cost
Mode	Interface Config

spanning-tree edgeport

This command specifies that an interface (or range of interfaces) is an Edge Port within the common and internal spanning tree. This allows this port to transition to Forwarding State without delay.

Format	spanning-tree edgeport
Mode	Interface Config

no spanning-tree edgeport

This command specifies that this port is not an Edge Port within the common and internal spanning tree.

Format	no spanning-tree edgeport
Mode	Interface Config

spanning-tree forward-time

This command sets the Bridge Forward Delay parameter to a new value for the common and internal spanning tree. The forward-time value is in seconds within a range of 4 to 30, with the value being greater than or equal to "(Bridge Max Age / 2) + 1".

Default	15
Format	spanning-tree forward-time *4-30*
Mode	Global Config

no spanning-tree forward-time

This command sets the Bridge Forward Delay parameter for the common and internal spanning tree to the default value.

Format	no spanning-tree forward-time
Mode	Global Config

spanning-tree guard

This command selects whether loop guard or root guard is enabled on an interface or range of interfaces. If neither is enabled, then the port operates in accordance with the multiple spanning tree protocol.

Default	none
Format	spanning-tree guard {none | root | loop}
Mode	Interface Config

no spanning-tree guard

This command disables loop guard or root guard on the interface.

Format	no spanning-tree guard
Mode	Interface Config

spanning-tree max-age

This command sets the Bridge Max Age parameter to a new value for the common and internal spanning tree. The max-age value is in seconds within a range of 6 to 40, with the value being less than or equal to *2 x (Bridge Forward Delay - 1)*.

Default	20
Format	spanning-tree max-age *6-40*
Mode	Global Config

no spanning-tree max-age

This command sets the Bridge Max Age parameter for the common and internal spanning tree to the default value.

Format	no spanning-tree max-age
Mode	Global Config

spanning-tree max-hops

This command sets the Bridge Max Hops parameter to a new value for the common and internal spanning tree. The max-hops value is a range from 6 to 40.

Default	20
Format	spanning-tree max-hops *6-40*
Mode	Global Config

no spanning-tree max-hops

This command sets the Bridge Max Hops parameter for the common and internal spanning tree to the default value.

Format	no spanning-tree max-hops
Mode	Global Config

spanning-tree mode

This command configures global spanning tree mode per VLAN spanning tree, Rapid-PVST, MST, RSTP or STP. Only one of MSTP (RSTP), PVST or RPVST can be enabled on a switch.

When PVSTP or rapid PVSTP (PVRSTP) is enabled, MSTP/RSTP/STP is operationally disabled. To reenable MSTP/RSTP/STP, disable PVSTP/PVRSTP. By default, CE0128XB/CE0152XB has MSTP enabled. In PVSTP or PVRSTP mode, BPDUs contain per-VLAN information instead of the common spanning-tree information (MST/RSTP).

PVSTP maintains independent spanning tree information about each configured VLAN. PVSTP uses IEEE 802.1Q trunking and allows a trunked VLAN to maintain blocked or forwarding state per port on a per-VLAN basis. This allows a trunk port to be forwarded on some VLANs and blocked on other VLANs.

PVRSTP is based on the IEEE 8012.1w standard. It supports fast convergence IEEE 802.1D. PVRSTP is compatible with IEEE 802.1D spanning tree. PVRSTP sends BPDUs on all ports, instead of only the root bridge sending BPDUs, and supports the discarding, learning, and forwarding states.

When the mode is changed to PVRSTP, version 0 STP BPDUs are no longer transmitted and version 2 PVRSTP BPDUs that carry per-VLAN information are transmitted on the VLANs enabled for spanning-tree. If a version 0 BPDU is seen, PVRSTP reverts to sending version 0 BPDUs.

Per VLAN Rapid Spanning Tree Protocol (PVRSTP) embeds support for PVSTP FastBackbone and FastUplink. There is no provision to enable or disable these features in PVRSTP.

Default	Disabled
Format	spanning-tree mode {mst | pvst | rapid-pvst | stp | rstp }
Mode	Global Config

no spanning-tree mode

This command globally configures the switch to the default CE0128XB/CE0152XB spanning-tree mode, MSTP.

Format	no spanning-tree mode { pvst | rapid-pvst }
Mode	Global Configuration

spanning-tree mst

This command sets the Path Cost or Port Priority for this port within the multiple spanning tree instance or in the common and internal spanning tree. If you specify an `mstid` parameter that corresponds to an existing multiple spanning tree instance, the configurations are done for that multiple spanning tree instance. If you specify 0 (defined as the default CIST ID) as the `mstid`, the configurations are done for the common and internal spanning tree instance.

If you specify the `cost` option, the command sets the path cost for this port within a multiple spanning tree instance or the common and internal spanning tree instance, depending on the `mstid` parameter. You can set the path cost as a number in the range of 1 to 200000000 or `auto`. If you select `auto` the path cost value is set based on Link Speed.

If you specify the **port-priority** option, this command sets the priority for this port within a specific multiple spanning tree instance or the common and internal spanning tree instance, depending on the `mstid` parameter. The port-priority value is a number in the range of 0 to 240 in increments of 16.

Default	• cost—auto • port-priority—128
Format	spanning-tree mst *mstid* {{cost *1-200000000* | auto} | port-priority *0-240*}
Mode	Interface Config

no spanning-tree mst

This command sets the Path Cost or Port Priority for this port within the multiple spanning tree instance, or in the common and internal spanning tree to the respective default values. If you specify an `mstid` parameter that corresponds to an existing multiple spanning tree instance, you are configuring that multiple spanning tree instance. If you specify 0 (defined as the default CIST ID) as the *mstid*, you are configuring the common and internal spanning tree instance.

If the you specify `cost`, this command sets the path cost for this port within a multiple spanning tree instance or the common and internal spanning tree instance, depending on the *mstid* parameter, to the default value, i.e., a path cost value based on the Link Speed.

If you specify `port-priority`, this command sets the priority for this port within a specific multiple spanning tree instance or the common and internal spanning tree instance, depending on the *mstid* parameter, to the default value.

Format	no spanning-tree mst *mstid* {cost | port-priority}
Mode	Interface Config

spanning-tree mst instance

This command adds a multiple spanning tree instance to the switch. The parameter *mstid* is a number within a range of 1 to 4094, that corresponds to the new instance ID to be added. The maximum number of multiple instances supported by the switch is 4.

Default	none
Format	spanning-tree mst instance *mstid*
Mode	Global Config

no spanning-tree mst instance

This command removes a multiple spanning tree instance from the switch and reallocates all VLANs allocated to the deleted instance to the common and internal spanning tree. The parameter *mstid* is a number that corresponds to the desired existing multiple spanning tree instance to be removed.

Format	no spanning-tree mst instance *mstid*
Mode	Global Config

spanning-tree mst priority

This command sets the bridge priority for a specific multiple spanning tree instance. The parameter *mstid* is a number that corresponds to the desired existing multiple spanning tree instance. The priority value is a number within a range of 0 to 4094.

If you specify 0 (defined as the default CIST ID) as the *mstid*, this command sets the Bridge Priority parameter to a new value for the common and internal spanning tree. The bridge priority value is a number within a range of 0 to 4094. The twelve least significant bits are masked according to the 802.1s specification. This causes the priority to be rounded down to the next lower valid priority.

Default	32768

Format	spanning-tree mst priority *mstid 0-4094*
Mode	Global Config

no spanning-tree mst priority

This command sets the bridge priority for a specific multiple spanning tree instance to the default value. The parameter *`mstid`* is a number that corresponds to the desired existing multiple spanning tree instance.

If 0 (defined as the default CIST ID) is passed as the *`mstid`*, this command sets the Bridge Priority parameter for the common and internal spanning tree to the default value.

Format	no spanning-tree mst priority *mstid*
Mode	Global Config

spanning-tree mst vlan

This command adds an association between a multiple spanning tree instance and one or more VLANs so that the VLAN(s) are no longer associated with the common and internal spanning tree. The parameter *`mstid`* is a multiple spanning tree instance identifier, in the range of 0 to 4094, that corresponds to the desired existing multiple spanning tree instance. The *`vlanid`* can be specified as a single VLAN, a list, or a range of values. To specify a list of VLANs, enter a list of VLAN IDs in the range 1 to 4093, each separated by a comma with no spaces in between. To specify a range of VLANs, separate the beginning and ending VLAN ID with a dash (-). Spaces and zeros are not permitted. The VLAN IDs may or may not exist in the system.

Format	spanning-tree mst vlan *mstid vlanid*
Mode	Global Config

no spanning-tree mst vlan

This command removes an association between a multiple spanning tree instance and one or more VLANs so that the VLAN(s) are again associated with the common and internal spanning tree.

Format	no spanning-tree mst vlan *mstid vlanid*
Mode	Global Config

spanning-tree port mode

This command sets the Administrative Switch Port State for this port to enabled for use by spanning tree.

Default	enabled
Format	spanning-tree port mode
Mode	Interface Config

no spanning-tree port mode

This command sets the Administrative Switch Port State for this port to disabled, disabling the port for use by spanning tree.

Format	no spanning-tree port mode
Mode	Interface Config

spanning-tree port mode all

This command sets the Administrative Switch Port State for all ports to enabled.

Default	enabled
Format	spanning-tree port mode all
Mode	Global Config

no spanning-tree port mode all

This command sets the Administrative Switch Port State for all ports to disabled.

Format	no spanning-tree port mode all
Mode	Global Config

spanning-tree port-priority

Use this command to change the priority value of the port to allow the operator to select the relative importance of the port in the forwarding process. Set this value to a lower number to prefer a port for forwarding of frames.

All LAN ports have 128 as priority value by default. PVSTP/PVRSTP puts the LAN port with the lowest LAN port number in the forwarding state and blocks other LAN ports.

The application uses the port priority value when the LAN port is configured as an edge port.

Default	enabled
Format	spanning-tree port-priority *0-240*
Mode	Interface Config

spanning-tree tcnguard

Use this command to enable TCN guard on the interface. When enabled, TCN Guard restricts the interface from propagating any topology change information received through that interface.

Default	Enabled
Format	spanning-tree tcnguard
Mode	Interface Config

no spanning-tree tcnguard

This command resets the TCN guard status of the port to the default value.

Format	no spanning-tree tcnguard
Mode	Interface Config

spanning-tree transmit

This command sets the Bridge Transmit Hold Count parameter.

Default	6
Format	spanning-tree transmit *hold-count*
Mode	Global Config

Parameter	Description
hold-count	The Bridge Tx hold-count parameter. The value in an integer between 1 and 10.

spanning-tree uplinkfast

Use this command to configure the rate at which gratuitous frames are sent (in packets per second) after switchover to an alternate port on PVSTP configured switches and enables uplinkfast on PVSTP switches. The range is 0-32000; the default is 150. This command has the effect of accelerating spanning-tree convergence after switchover to an alternate port.

Uplinkfast can be configured even if the switch is configured for MST(RSTP) mode, but it only has an effect when the switch is configured for PVST mode. Enabling FastUplink increases the priority by 3000. Path costs less than 3000 have an additional 3000 added when uplinkfast is enabled. This reduces the probability that the switch will become the root switch.

Uplinkfast immediately changes to an alternate root port on detecting a root port failure and changes the new root port directly to the forwarding state. A TCN is sent for this event.

After a switchover to an alternate port (new root port), uplinkfast multicasts a gratuitous frame on the new root port on behalf of each attached machine so that the rest of the network knows to use the secondary link to reach that machine.

PVRSTP embeds support for backbonefast and uplinkfast. There is no provision to enable or disable these features in PVRSTP configured switches.

Default	150
Format	spanning-tree uplinkfast [max-update-rate *packets*]
Mode	Global Config

no spanning-tree uplinkfast

This command disables uplinkfast on PVSTP configured switches. All switch priorities and path costs that have not been modified from their default values are set to their default values.

Format	no spanning-tree uplinkfast [max-update-rate]
Mode	Global Config

spanning-tree vlan

Use this command to enable/disable spanning tree on a VLAN.

Default	None
Format	spanning-tree vlan *vlan-list*
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.

spanning-tree vlan cost

Use this command to set the path cost for a port in a VLAN. The valid values are in the range of 1 to 200000000 or auto. If auto is selected, the path cost value is set based on the link speed.

Default	None
Format	spanning-tree vlan *vlan-id* cost {auto |*1-200000000*}
Mode	Interface Config

spanning-tree vlan forward-time

Use this command to configure the spanning tree forward delay time for a VLAN or a set of VLANs. The default is 15 seconds.

Set this value to a lower number to accelerate the transition to forwarding. The network operator should take into account the end-to-end BPDU propagation delay, the maximum frame lifetime, the maximum transmission halt delay, and the message age overestimate values specific to their network when configuring this parameter.

Default	15 seconds
Format	spanning-tree vlan *vlan-list* forward-time *4-30*
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.

Parameter	Description
forward-time	The spanning tree forward delay time. The range is 4-30 seconds.

spanning-tree vlan hello-time

Use this command to configure the spanning tree hello time for a specified VLAN or a range of VLANs. The default is 2 seconds. Set this value to a lower number to accelerate the discovery of topology changes.

Default	2 seconds
Format	spanning-tree vlan *vlan-list* hello-time *1-10*
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.
hello-time	The spanning tree forward hello time. The range is 1-10 seconds.

spanning-tree vlan max-age

Use this command to configure the spanning tree maximum age time for a set of VLANs. The default is 20 seconds.

Set this value to a lower number to accelerate the discovery of topology changes. The network operator must take into account the end-to-end BPDU propagation delay and message age overestimate for their specific topology when configuring this value.

The default setting of 20 seconds is suitable for a network of diameter 7, lost message value of 3, transit delay of 1, hello interval of 2 seconds, overestimate per bridge of 1 second, and a BPDU delay of 1 second. For a network of diameter 4, a setting of 16 seconds is appropriate if all other timers remain at their default values.

Default	20 seconds
Format	spanning-tree vlan *vlan-list* max-age *6-40*
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.
hello-time	The spanning tree forward hello time. The range is 1-10 seconds.

spanning-tree vlan root

Use this command to configure the switch to become the root bridge or standby root bridge by modifying the bridge priority from the default value of 32768 to a lower value calculated to ensure the bridge is the root (or standby) bridge.

The logic takes care of setting the bridge priority to a value lower (primary) or next lower (secondary) than the lowest bridge priority for the specified VLAN or a range of VLANs.

Default	32768
Format	spanning-tree vlan *vlan-list* root {primary|secondary}
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.

spanning-tree vlan port-priority

Use this command to change the VLAN port priority value of the VLAN port to allow the operator to select the relative importance of the VLAN port in the forwarding selection process when the port is configured as a point-to-point link type. Set this value to a lower number to prefer a port for forwarding of frames.

Default	None
Format	spanning-tree vlan *vlan-id* port-priority *priority*
Mode	Interface Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.
priority	The VLAN port priority. The range is 0-255.

spanning-tree vlan priority

Use this command to configure the bridge priority of a VLAN. The default value is 32768.

If the value configured is not among the specified values, it will be rounded off to the nearest valid value.

Default	32768
Format	spanning-tree vlan *vlan-list* priority *priority*
Mode	Global Config

Parameter	Description
vlan-list	The VLANs to which to apply this command.
priority	The VLAN bridge priority. Valid values are 0, 4096, 8192, 12288, 16384, 20480, 24576, 28672, 32768, 36864, 40960, 45056, 49152, 53248, 57344, and 61440.

show spanning-tree

This command displays spanning tree settings for the common and internal spanning tree. The following details are displayed.

Format	show spanning-tree
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Bridge Priority	Specifies the bridge priority for the Common and Internal Spanning tree (CST). The value lies between 0 and 61440. It is displayed in multiples of 4096.
Bridge Identifier	The bridge identifier for the CST. It is made up using the bridge priority and the base MAC address of the bridge.
Time Since Topology Change	Time in seconds.
Topology Change Count	Number of times changed.
Topology Change in Progress	Boolean value of the Topology Change parameter for the switch indicating if a topology change is in progress on any port assigned to the common and internal spanning tree.
Designated Root	The bridge identifier of the root bridge. It is made up from the bridge priority and the base MAC address of the bridge.
Root Path Cost	Value of the Root Path Cost parameter for the common and internal spanning tree.
Root Port Identifier	Identifier of the port to access the Designated Root for the CST
Bridge Max Age	Derived value.
Bridge Max Hops	Bridge max-hops count for the device.
Root Port Bridge Forward Delay	Derived value.
Hello Time	Configured value of the parameter for the CST.
Bridge Hold Time	Minimum time between transmission of Configuration Bridge Protocol Data Units (BPDUs).
CST Regional Root	Bridge Identifier of the CST Regional Root. It is made up using the bridge priority and the base MAC address of the bridge.
Regional Root Path Cost	Path Cost to the CST Regional Root.
Associated FIDs	List of forwarding database identifiers currently associated with this instance.
Associated VLANs	List of VLAN IDs currently associated with this instance.

Example: The following shows example CLI display output for the command.

```
(Routing) #show spanning-tree

Bridge Priority................................ 32768
Bridge Identifier.............................. 80:00:00:10:18:48:FC:07
Time Since Topology Change..................... 8 day 3 hr 22 min 37 sec
Topology Change Count.......................... 0
Topology Change in progress.................... FALSE
Designated Root................................ 80:00:00:10:18:48:FC:07
Root Path Cost................................. 0
Root Port Identifier.......................... 00:00
Bridge Max Age................................ 20
Bridge Max Hops............................... 20
Bridge Tx Hold Count.......................... 6
Bridge Forwarding Delay....................... 15
Hello Time.................................... 2
Bridge Hold Time.............................. 6
CST Regional Root............................. 80:00:00:10:18:48:FC:07
Regional Root Path Cost....................... 0

   Associated FIDs       Associated VLANs
   ---------------       ----------------

(Routing) #
```

show spanning-tree active

Use this command to display the spanning tree values on active ports for the modes (xSTP and PV(R)STP).

Format	show spanning-tree active
Mode	• Privileged EXEC • User EXEC

Example: Example 1

```
(Routing)#show spanning-tree active

Spanning Tree: Enabled (BPDU Flooding: Disabled) Portfast BPDU Filtering: Disabled
Mode: rstp
CST Regional Root:       80:00:00:01:85:48:F0:0F
Regional Root Path Cost:  0


###### MST 0 Vlan Mapped:   3
ROOT ID
         Priority      32768
         Address       00:00:EE:EE:EE:EE
         This Switch is the Root.
         Hello Time: 2s Max Age: 20s Forward Delay: 15s
Interfaces

Name     State    Prio.Nbr  Cost      Sts         Role  RestrictedPort
--------- -------- --------- --------- ------------- ----- --------------
0/49      Enabled  128.49    2000      Forwarding    Desg  No
3/1       Enabled  96.66     5000      Forwarding    Desg  No
3/2       Enabled  96.67     5000      Forwarding    Desg  No
3/10      Enabled  96.75     0         Forwarding    Desg  No
```

Example: Example 2

```
(Routing)#show spanning-tree active

Spanning-tree enabled protocol rpvst

VLAN    1
 RootID    Priority       32769
       Address       00:00:EE:EE:EE:EE
       Cost          0
       Port          This switch is the root
       Hello Time 2 Sec Max Age 20 sec Forward Delay 15 sec
 BridgeID  Priority       32769 (priority 32768 sys-id-ext 1)
```

```
          Address        00:00:EE:EE:EE:EE
          Hello Time 2 Sec Max Age 20 sec Forward Delay 15 sec
          Aging Time 300 sec

Interface State     Prio.Nbr  Cost    Status       Role
--------- --------- --------- ------- ------------- -----------
0/49      Enabled   128.49    2000    Forwarding    Designated
3/1       Enabled   128.66    5000    Forwarding    Designated
3/2       Enabled   128.67    5000    Forwarding    Designated
3/10      Enabled   128.75    0       Forwarding    Designated

VLAN    3
 RootID    Priority        32771
          Address        00:00:EE:EE:EE:EE
          Cost           0
          Port           This switch is the root
          Hello Time 2 Sec Max Age 20 sec Forward Delay 15 sec
 BridgeID  Priority        32771 (priority 32768 sys-id-ext 3)
          Address        00:00:EE:EE:EE:EE
          Hello Time 2 Sec Max Age 20 sec Forward Delay 15 sec
          Aging Time 300 sec

Interface State     Prio.Nbr  Cost    Status       Role
--------- --------- --------- ------- ------------- -----------
3/1       Enabled   128.66    5000    Forwarding    Designated
3/2       Enabled   128.67    5000    Forwarding    Designated
3/10      Enabled   128.75    0       Forwarding    Designated
```

Example: Example 3

```
(Routing)#show spanning-tree active

Spanning-tree enabled protocol rpvst

VLAN    1
 RootID    Priority        32769
          Address        00:00:EE:EE:EE:EE
          Cost           0
          Port           10(3/10   )
          Hello Time 2 Sec Max Age 20 sec Forward Delay 15 sec
 BridgeID  Priority        32769 (priority 32768 sys-id-ext 1)
          Address        00:00:EE:EE:EE:EE
          Hello Time 2 Sec Max Age 20 sec Forward Delay 15 sec
          Aging Time 300 sec

Interface State     Prio.Nbr  Cost    Status       Role
--------- --------- --------- ------- ------------- -----------
0/49      Enabled   128.49    2000    Discarding    Alternate
3/1       Enabled   128.66    5000    Forwarding    Disabled
3/2       Enabled   128.67    5000    Forwarding    Disabled
3/10      Enabled   128.75    0       Forwarding    Root

VLAN    3
 RootID    Priority        32771
          Address        00:00:EE:EE:EE:EE
          Cost           0
          Port           10(3/10   )
          Hello Time 2 Sec Max Age 20 sec Forward Delay 15 sec
 BridgeID  Priority        32771 (priority 32768 sys-id-ext 3)
          Address        00:00:EE:EE:EE:EE
          Hello Time 2 Sec Max Age 20 sec Forward Delay 15 sec
          Aging Time 300 sec

Interface State     Prio.Nbr  Cost    Status       Role
```

```
--------- --------- --------- ------- ------------- -----------
3/1      Enabled   128.66    5000    Forwarding    Disabled
3/2      Enabled   128.67    5000    Forwarding    Disabled
3/10      Enabled   128.75    0      Forwarding    Root
```

show spanning-tree backbonefast

This command displays spanning tree information for backbonefast.

Format	show spanning-tree backbonefast
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Transitions via Backbonefast	The number of backbonefast transitions.
Inferior BPDUs received (all VLANs)	The number of inferior BPDUs received on all VLANs.
RLQ request PDUs received (all VLANs)	The number of root link query (RLQ) requests PDUs received on all VLANs.
RLQ response PDUs received (all VLANs)	The number of RLQ response PDUs received on all VLANs.
RLQ request PDUs sent (all VLANs)	The number of RLQ request PDUs sent on all VLANs.
RLQ response PDUs sent (all VLANs)	The number of RLQ response PDUs sent on all VLANs.

Example: The following shows example output from the command.

```
(Routing)#show spanning-tree backbonefast

Backbonefast Statistics
-----------------------
Transitions via Backbonefast (all VLANs)         : 0
Inferior BPDUs received (all VLANs)              : 0
RLQ request PDUs received (all VLANs)            : 0
RLQ response PDUs received (all VLANs)           : 0
RLQ request PDUs sent (all VLANs)                : 0
RLQ response PDUs sent (all VLANs)               : 0
```

show spanning-tree brief

This command displays spanning tree settings for the bridge. The following information appears.

Format	show spanning-tree brief
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Bridge Priority	Configured value.
Bridge Identifier	The bridge identifier for the selected MST instance. It is made up using the bridge priority and the base MAC address of the bridge.
Bridge Max Age	Configured value.

Parameter	Definition
Bridge Max Hops	Bridge max-hops count for the device.
Bridge Hello Time	Configured value.
Bridge Forward Delay	Configured value.
Bridge Hold Time	Minimum time between transmission of Configuration Bridge Protocol Data Units (BPDUs).

Example: The following shows example CLI display output for the command.

```
(Routing) #show spanning-tree brief

Bridge Priority................................ 32768
Bridge Identifier............................. 80:00:00:10:18:48:FC:07
Bridge Max Age................................ 20
Bridge Max Hops............................... 20
Bridge Hello Time............................. 2
Bridge Forward Delay.......................... 15
Bridge Hold Time.............................. 6

(Routing) #
```

show spanning-tree interface

This command displays the settings and parameters for a specific switch port within the common and internal spanning tree. The *`unit/slot/port`* is the desired switch port. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number. The following details are displayed on execution of the command.

Format	show spanning-tree interface *unit/slot/port*|lag lag-intf-num
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Hello Time	Admin hello time for this port.
Port Mode	Enabled or disabled.
BPDU Guard Effect	Enabled or disabled.
Root Guard	Enabled or disabled.
Loop Guard	Enabled or disabled.
TCN Guard	Enable or disable the propagation of received topology change notifications and topology changes to other ports.
BPDU Filter Mode	Enabled or disabled.
BPDU Flood Mode	Enabled or disabled.
Auto Edge	To enable or disable the feature that causes a port that has not seen a BPDU for **edge delay** time, to become an edge port and transition to forwarding faster.
Port Up Time Since Counters Last Cleared	Time since port was reset, displayed in days, hours, minutes, and seconds.
STP BPDUs Transmitted	Spanning Tree Protocol Bridge Protocol Data Units sent.

Parameter	Definition
STP BPDUs Received	Spanning Tree Protocol Bridge Protocol Data Units received.
RSTP BPDUs Transmitted	Rapid Spanning Tree Protocol Bridge Protocol Data Units sent.
RSTP BPDUs Received	Rapid Spanning Tree Protocol Bridge Protocol Data Units received.
MSTP BPDUs Transmitted	Multiple Spanning Tree Protocol Bridge Protocol Data Units sent.
MSTP BPDUs Received	Multiple Spanning Tree Protocol Bridge Protocol Data Units received.

Example: The following shows example CLI display output for the command.

```
(Routing) >show spanning-tree interface 0/1

Hello Time..................................... Not Configured
Port Mode...................................... Enabled
BPDU Guard Effect.............................. Disabled
Root Guard..................................... FALSE
Loop Guard..................................... FALSE
TCN Guard...................................... FALSE
BPDU Filter Mode............................... Disabled
BPDU Flood Mode................................ Disabled
Auto Edge...................................... TRUE
Port Up Time Since Counters Last Cleared....... 8 day 3 hr 39 min 58 sec
STP BPDUs Transmitted.......................... 0
STP BPDUs Received............................. 0
RSTP BPDUs Transmitted......................... 0
RSTP BPDUs Received............................ 0
MSTP BPDUs Transmitted......................... 0
MSTP BPDUs Received............................ 0

(Routing) >
```

Example: The following shows example CLI display output for the command.

```
(Routing) >show spanning-tree interface lag 1

Hello Time..................................... Not Configured
Port Mode...................................... Enabled
BPDU Guard Effect.............................. Disabled
Root Guard..................................... FALSE
Loop Guard..................................... FALSE
TCN Guard...................................... FALSE
BPDU Filter Mode............................... Disabled
BPDU Flood Mode................................ Disabled
Auto Edge...................................... TRUE
Port Up Time Since Counters Last Cleared....... 8 day 3 hr 42 min 5 sec
STP BPDUs Transmitted.......................... 0
STP BPDUs Received............................. 0
RSTP BPDUs Transmitted......................... 0
RSTP BPDUs Received............................ 0
MSTP BPDUs Transmitted......................... 0
MSTP BPDUs Received............................ 0

(Routing) >
```

show spanning-tree mst detailed

This command displays the detailed settings for an MST instance.

Format show spanning-tree mst detailed *mstid*

Mode
- Privileged EXEC
- User EXEC

Parameter	Description
mstid	A multiple spanning tree instance identifier. The value is 0–4094.

Example: The following shows example CLI display output for the command.

```
(Routing) >show spanning-tree mst detailed 0

MST Instance ID................................ 0
MST Bridge Priority............................ 32768
MST Bridge Identifier.......................... 80:00:00:10:18:48:FC:07
Time Since Topology Change..................... 8 day 3 hr 47 min 7 sec
Topology Change Count.......................... 0
Topology Change in progress.................... FALSE
Designated Root................................ 80:00:00:10:18:48:FC:07
Root Path Cost................................. 0
Root Port Identifier........................... 00:00

    Associated FIDs        Associated VLANs
    ---------------        ----------------

(Routing) >
```

show spanning-tree mst port detailed

This command displays the detailed settings and parameters for a specific switch port within a particular multiple spanning tree instance. The parameter `mstid` is a number that corresponds to the desired existing multiple spanning tree instance. The *`unit/slot/port`* is the desired switch port. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format show spanning-tree mst port detailed *mstid unit/slot/port*|lag lag-intf-num

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
MST Instance ID	The ID of the existing multiple spanning tree (MST) instance identifier. The value is 0–4094.
Port Identifier	The port identifier for the specified port within the selected MST instance. It is made up from the port priority and the interface number of the port.
Port Priority	The priority for a particular port within the selected MST instance. The port priority is displayed in multiples of 16.
Port Forwarding State	Current spanning tree state of this port.
Port Role	Each enabled MST Bridge Port receives a Port Role for each spanning tree. The port role is one of the following values: Root Port, Designated Port, Alternate Port, Backup Port, Master Port or Disabled Port

Parameter	Definition
Auto-Calculate Port Path Cost	Indicates whether auto calculation for port path cost is enabled.
Port Path Cost	Configured value of the Internal Port Path Cost parameter.
Designated Root	The Identifier of the designated root for this port.
Root Path Cost	The path cost to get to the root bridge for this instance. The root path cost is zero if the bridge is the root bridge for that instance.
Designated Bridge	Bridge Identifier of the bridge with the Designated Port.
Designated Port Identifier	Port on the Designated Bridge that offers the lowest cost to the LAN.
Loop Inconsistent State	The current loop inconsistent state of this port in this MST instance. When in loop inconsistent state, the port has failed to receive BPDUs while configured with loop guard enabled. Loop inconsistent state maintains the port in a blocking state until a subsequent BPDU is received.
Transitions Into Loop Inconsistent State	The number of times this interface has transitioned into loop inconsistent state.
Transitions Out of Loop Inconsistent State	The number of times this interface has transitioned out of loop inconsistent state.

If you specify 0 (defined as the default CIST ID) as the `mstid`, this command displays the settings and parameters for a specific switch port within the common and internal spanning tree. The `unit/slot/port` is the desired switch port. In this case, the following are displayed.

Parameter	Definition
Port Identifier	The port identifier for this port within the CST.
Port Priority	The priority of the port within the CST.
Port Forwarding State	The forwarding state of the port within the CST.
Port Role	The role of the specified interface within the CST.
Auto-Calculate Port Path Cost	Indicates whether auto calculation for port path cost is enabled or not (disabled).
Port Path Cost	The configured path cost for the specified interface.
Auto-Calculate External Port Path Cost	Indicates whether auto calculation for external port path cost is enabled.
External Port Path Cost	The cost to get to the root bridge of the CIST across the boundary of the region. This means that if the port is a boundary port for an MSTP region, then the external path cost is used.
Designated Root	Identifier of the designated root for this port within the CST.
Root Path Cost	The root path cost to the LAN by the port.
Designated Bridge	The bridge containing the designated port.
Designated Port Identifier	Port on the Designated Bridge that offers the lowest cost to the LAN.
Topology Change Acknowledgment	Value of flag in next Configuration Bridge Protocol Data Unit (BPDU) transmission indicating if a topology change is in progress for this port.
Hello Time	The hello time in use for this port.
Edge Port	The configured value indicating if this port is an edge port.

Parameter	Definition
Edge Port Status	The derived value of the edge port status. True if operating as an edge port; false otherwise.
Point To Point MAC Status	Derived value indicating if this port is part of a point to point link.
CST Regional Root	The regional root identifier in use for this port.
CST Internal Root Path Cost	The internal root path cost to the LAN by the designated external port.
Loop Inconsistent State	The current loop inconsistent state of this port in this MST instance. When in loop inconsistent state, the port has failed to receive BPDUs while configured with loop guard enabled. Loop inconsistent state maintains the port in a blocking state until a subsequent BPDU is received.
Transitions Into Loop Inconsistent State	The number of times this interface has transitioned into loop inconsistent state.
Transitions Out of Loop Inconsistent State	The number of times this interface has transitioned out of loop inconsistent state.

Example: The following shows example CLI display output for the command in `slot/port` format.

```
(Routing)#show spanning-tree mst port detailed 0 1/0/1
Port Identifier................................ 80:01
Port Priority.................................. 128
Port Forwarding State.......................... Disabled
Port Role...................................... Disabled
Auto-calculate Port Path Cost.................. Enabled
Port Path Cost................................. 0
Auto-Calculate External Port Path Cost......... Enabled
External Port Path Cost........................ 0
Designated Root................................ 80:00:80:96:21:F1:01:00
Designated Port Cost........................... 0
Designated Bridge.............................. 80:00:80:96:21:F1:01:00
Designated Port Identifier..................... 00:00
Topology Change Acknowledge.................... False
Hello Time..................................... 2
Edge Port...................................... False
Edge Port Status............................... False
Point to Point MAC Status...................... False
CST Regional Root.............................. 80:00:80:96:21:F1:01:00
CST Internal Root Path Cost.................... 0
Loop Inconsistent State........................ False
Transitions Into Loop Inconsistent State....... 0
Transitions Out Of Loop Inconsistent State..... 0
```

Example: The following shows example CLI display output for the command using a LAG interface number.

```
(Routing)#show spanning-tree mst port detailed 0 lag 1
Port Identifier................................ 81:A2
Port Priority.................................. 128
Port Forwarding State.......................... Disabled
Port Role...................................... Disabled
Auto-calculate Port Path Cost.................. Enabled
Port Path Cost................................. 0
Auto-Calculate External Port Path Cost......... Enabled
External Port Path Cost........................ 0
Designated Root................................ 80:00:80:96:21:F1:01:00
Designated Port Cost........................... 0
Designated Bridge.............................. 80:00:80:96:21:F1:01:00
Designated Port Identifier..................... 00:00
Topology Change Acknowledge.................... False
Hello Time..................................... 2
Edge Port...................................... False
Edge Port Status............................... False
Point to Point MAC Status...................... TRUE
CST Regional Root.............................. 80:00:80:96:21:F1:01:00
CST Internal Root Path Cost.................... 0
Loop Inconsistent State........................ False
Transitions Into Loop Inconsistent State....... 0
Transitions Out Of Loop Inconsistent State..... 0
```

show spanning-tree mst port summary

This command displays the settings of one or all ports within the specified multiple spanning tree instance. The parameter *`mstid`* indicates a particular MST instance. The parameter `{`*`unit/slot/port`*`|all}` indicates the desired switch port or all ports. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

If you specify 0 (defined as the default CIST ID) as the *`mstid`*, the status summary displays for one or all ports within the common and internal spanning tree.

Format	show spanning-tree mst port summary *mstid* {*unit/slot/port* |lag lag-intf-num| all}
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
MST Instance ID	The MST instance associated with this port.
Interface	*unit/slot/port*
STP Mode	Indicates whether spanning tree is enabled or disabled on the port.
Type	Currently not used.
STP State	The forwarding state of the port in the specified spanning tree instance.
Port Role	The role of the specified port within the spanning tree.
Desc	Indicates whether the port is in loop inconsistent state or not. This field is blank if the loop guard feature is not available.

Example: The following shows example CLI display output for the command in `slot/port` format.

```
(Routing) >show spanning-tree mst port summary 0 0/1

MST Instance ID............................... CST

          STP            STP          Port
Interface  Mode  Type        State          Role       Desc
--------- -------- ------- ---------------- ---------- ----------
0/1       Enabled          Disabled         Disabled
```

Example: The following shows example CLI display output for the command using a LAG interface number.

```
(Routing) >show spanning-tree mst port summary 0 lag 1
```

```
MST Instance ID................................ CST

          STP              STP         Port
Interface   Mode  Type        State          Role      Desc
--------- -------- ------- ----------------- ---------- ----------
3/1       Enabled         Disabled         Disabled
```

show spanning-tree mst port summary active

This command displays settings for the ports within the specified multiple spanning tree instance that are active links.

Format show spanning-tree mst port summary *mstid* active

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
MST Instance ID	The ID of the existing MST instance.
Interface	*unit/slot/port*
STP Mode	Indicates whether spanning tree is enabled or disabled on the port.
Type	Currently not used.
STP State	The forwarding state of the port in the specified spanning tree instance.
Port Role	The role of the specified port within the spanning tree.
Desc	Indicates whether the port is in loop inconsistent state or not. This field is blank if the loop guard feature is not available.

Example: The following shows example CLI display output for the command.

```
(Routing) >show spanning-tree mst port summary 0 active

          STP              STP         Port
Interface   Mode  Type        State          Role      Desc
--------- -------- ------- ----------------- ---------- ---------
```

show spanning-tree mst summary

This command displays summary information about all multiple spanning tree instances in the switch. On execution, the following details are displayed.

Format show spanning-tree mst summary

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
MST Instance ID List	List of multiple spanning trees IDs currently configured.
For each MSTID: • Associated FIDs • Associated VLANs	• List of forwarding database identifiers associated with this instance. • List of VLAN IDs associated with this instance.

show spanning-tree summary

This command displays spanning tree settings and parameters for the switch. The following details are displayed on execution of the command.

Format	show spanning-tree summary
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Spanning Tree Adminmode	Enabled or disabled.
Spanning Tree Version	Version of 802.1 currently supported (IEEE 802.1s, IEEE 802.1w, or IEEE 802.1d) based upon the Force Protocol Version parameter.
BPDU Guard Mode	Enabled or disabled.
BPDU Filter Mode	Enabled or disabled.
Configuration Name	Identifier used to identify the configuration currently being used.
Configuration Revision Level	Identifier used to identify the configuration currently being used.
Configuration Digest Key	A generated Key used in the exchange of the BPDUs.
Configuration Format Selector	Specifies the version of the configuration format being used in the exchange of BPDUs. The default value is zero.
MST Instances	List of all multiple spanning tree instances configured on the switch.

Example: The following shows example CLI display output for the command.

```
(Routing) >show spanning-tree summary

Spanning Tree Adminmode........... Enabled
Spanning Tree Version............. IEEE 802.1s
BPDU Guard Mode................... Disabled
BPDU Filter Mode.................. Disabled
Configuration Name................ ****
Configuration Revision Level...... ****
Configuration Digest Key.......... ****
Configuration Format Selector..... 0
No MST instances to display.
```

show spanning-tree uplinkfast

This command displays spanning tree information for uplinkfast.

Format	show spanning-tree uplinkfast
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Uplinkfast transitions (all VLANs)	The number of uplinkfast transitions on all VLANs.

Parameter	Definition
Proxy multicast addresses transmitted (all VLANs)	The number of proxy multicast addresses transmitted on all VLANs.

Example: The following shows example output from the command.

```
(Routing) #show spanning-tree uplinkfast

Uplinkfast is enabled.
BPDU update rate : 150 packets/sec

Uplinkfast Statistics
---------------------
Uplinkfast transitions (all VLANs)................ 0
Proxy multicast addresses transmitted (all VLANs).. 0
```

show spanning-tree vlan

This command displays spanning tree information per VLAN and also lists out the port roles and states along with port cost. The *vlan-list* parameter is a list of VLANs or VLAN-ranges separated by commas and with no embedded blank spaces. VLAN ranges are of the form “X-Y” where X and Y are valid VLAN identifiers and X< Y. The `vlanid` corresponds to an existing VLAN ID.

Format	show spanning-tree vlan {*vlanid* | *vlan-list*}
Mode	• Privileged EXEC • User EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) show spanning-tree vlan 1

VLAN    1
        Spanning-tree enabled protocol rpvst
        RootID   Priority      32769
         Address        00:0C:29:D3:80:EA
         Cost          0
         Port          This switch is the root
         Hello Time 2 Sec Max Age 15 sec Forward Delay 15 sec
 BridgeID  Priority       32769 (priority 32768 sys-id-ext 1)
         Address        00:0C:29:D3:80:EA
         Hello Time 2 Sec Max Age 15 sec Forward Delay 15 sec
         Aging Time 300
Interface  Role       Sts          Cost        Prio.Nbr
---------  ---------- ------------- ---------    --------
1/0/1     Designated  Forwarding     3000       128.1
1/0/2     Designated  Forwarding     3000       128.2
1/0/3     Disabled    Disabled      3000       128.3
1/0/4     Designated  Forwarding     3000       128.4
1/0/5     Designated  Forwarding     3000       128.5
1/0/6     Designated  Forwarding     3000       128.6
1/0/7     Designated  Forwarding     3000       128.7
1/0/8     Designated  Forwarding     3000       128.8
0/1/1     Disabled    Disabled      3000       128.1026
0/1/2     Disabled    Disabled      3000       128.1027
0/1/3     Disabled    Disabled      3000       128.1028
0/1/4     Disabled    Disabled      3000       128.1029
0/1/5     Disabled    Disabled      3000       128.1030
0/1/6     Disabled    Disabled      3000       128.1031
```

Loop Protection Commands

This section describes the commands used to configure loop protection. Loop protection detects physical and logical loops between Ethernet ports on a device. Loop protection must be enabled globally before it can be enabled at the interface level.

keepalive (Global Config)

This command enables loop protection for the system.

Default	Disabled
Format	keepalive
Mode	Global Config

no keepalive

This command disables loop protection for the system. This command also sets the transmit interval and retry count to the default value.

Format	no keepalive
Mode	Global Config

keepalive (Interface Config)

This command enables keepalive on a particular interface.

Default	Disabled
Format	keepalive
Mode	Interface Config

no keepalive

This command disables keepalive on a particular interface.

Format	keepalive
Mode	Interface Config

keepalive action

This command configures the action to be taken on a port when a loop is detected.

Default	Disabled
Format	keepalive action {log | disable | both}
Mode	Interface Configuration

Parameter	Description
log	Only logs the message. The log mode only logs the message to buffer logs without bringing the port down. This option also generates an SNMP trap message that is sent to the trap receiver based on the trap configuration.
disable	Shuts down the port. This is the default.
both	Logs and disables the port. This option also generates an SNMP trap message that is sent to the trap receiver based on the trap configuration.

no keepalive action

This command returns the command to the default action of disabling a port when a loop is detected.

Format	no keepalive action {log|disable|both}
Mode	Interface Configuration

keepalive tag

This command configures the VLAN to be used when generating the VLAN tag of the loop protection PDUs. The TPID used is based on the TPID type configured on that port.

Default	None
Format	keepalive tag { dot1q | dot1ad } *vlan-id*
Mode	Interface Configuration

Parameter	Description
dot1q	Uses a TPID of 0x8100
dot1ad	Uses a TPID of 0x88A8
vlan-id	The ID of the VLAN to use when generating the VLAN

no keepalive tag

This command removes the VLAN-based loop protection and resets the port to port-based loop protection only.

Format	no keepalive tag
Mode	Global Configuration

keepalive retry

This command configures the time in seconds between transmission of keep-alive packets. Retry is an optional parameter that configures the count of keepalive packets received by the switch after which the interface will be error disabled.

Default	5
Format	keepalive *val [retry]*

Mode	Global Configuration

Parameter	Description
val	The time in seconds between transmission of keep-alive packets.
retry	The count of keepalive packets missed by the switch after which the switch will be error disabled.

show keepalive

This command displays the global keepalive configuration.

Default	None
Format	show keepalive
Mode	Privileged EXEC

Example:

```
(Routing) #show  keepalive
Keepalive..................................... Disabled
Transmit interval.............................. 5
Max PDU Receive............................ 1
```

show keepalive statistics

This command displays the keep-alive statistics for each port or a specific port. Use the `port-num` parameter to display statistics for a specific interface or range of interfaces.

Statistics are displayed only for the ports on which keep-alive is enabled at the interface level.

Default	None
Format	show keepalive statistics {*port-num* | all }
Mode	Privileged EXEC

Parameter	Definition
port-num	The port number for which to show statistics.
all	Show statistics for all ports.

Example:

```
(Routing) #show  keepalive statistics all

      Keep    Loop       Loop    Time Since   Rx          Port
Port  Alive   Detected   Count   Last Loop    Action      Status
------ --------- ----------- -------- ------------- ------------- --------
0/1   Yes     Yes        1       85           shut-down   D-Disable
0/3   Yes     No                              log-shutdown Enable
```

clear keepalive

This command clears keepalive statistics associated with ports (for example, number of transmitted packets, received packets, and loop packets).

Default	None
Format	clear keepalive
Mode	Privileged EXEC

VLAN Commands

This section describes the commands you use to configure VLAN settings.

vlan database

This command gives you access to the VLAN Database mode, which allows you to configure VLAN characteristics

.

Format	vlan database
Mode	Privileged EXEC

network mgmt_vlan

This command configures the Management VLAN ID.

Default	1
Format	network mgmt_vlan *1-4093*
Mode	Privileged EXEC

no network mgmt_vlan

This command sets the Management VLAN ID to the default.

Format	no network mgmt_vlan
Mode	Privileged EXEC

vlan

This command creates a new VLAN and assigns it an ID. The ID is a valid VLAN identification number (ID 1 is reserved for the default VLAN). VLAN range is 2-4093.

Format	vlan *2-4093*
Mode	VLAN Database

no vlan

This command deletes an existing VLAN. The ID is a valid VLAN identification number (ID 1 is reserved for the default VLAN). The VLAN range is 2-4093.

Format	no vlan *2-4093*
Mode	VLAN Database

vlan acceptframe

This command sets the frame acceptance mode on an interface or range of interfaces. For VLAN Only mode, untagged frames or priority frames received on this interface are discarded. For Admit All mode, untagged frames or priority frames received on this interface are accepted and assigned the value of the interface VLAN ID for this port. For admituntaggedonly mode, only untagged frames are accepted on this interface; tagged frames are discarded. With any option, VLAN tagged frames are forwarded in accordance with the IEEE 802.1Q VLAN Specification.

Default	all
Format	vlan acceptframe {admituntaggedonly | vlanonly | all}
Mode	Interface Config

no vlan acceptframe

This command resets the frame acceptance mode for the interface or range of interfaces to the default value.

Format	no vlan acceptframe
Mode	Interface Config

vlan ingressfilter

This command enables ingress filtering on an interface or range of interfaces. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Default	disabled
Format	vlan ingressfilter
Mode	Interface Config

no vlan ingressfilter

This command disables ingress filtering. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Format	no vlan ingressfilter
Mode	Interface Config

vlan internal allocation

Use this command to configure which VLAN IDs to use for port-based routing interfaces. When a port-based routing interface is created, an unused VLAN ID is assigned internally.

Format vlan internal allocation {base vlan-id | policy ascending | policy descending}

Mode Global Config

Parameter	Description
base *vlan-id*	The first VLAN ID to be assigned to a port-based routing interface.
policy ascending	VLAN IDs assigned to port-based routing interfaces start at the base and increase in value
policy descending	VLAN IDs assigned to port-based routing interfaces start at the base and decrease in value

vlan makestatic

This command changes a dynamically created VLAN (created by GVRP registration) to a static VLAN (one that is permanently configured and defined). The ID is a valid VLAN identification number. VLAN range is 2-4093.

Format vlan makestatic *2-4093*

Mode VLAN Database

vlan name

This command changes the name of a VLAN. The name is an alphanumeric string of up to 32 characters, and the ID is a valid VLAN identification number. ID range is 1-4093.

Default
- VLAN ID 1 - default
- other VLANS - blank string

Format vlan name *1-4093 name*

Mode VLAN Database

no vlan name

This command sets the name of a VLAN to a blank string.

Format no vlan name *1-4093*

Mode VLAN Database

vlan participation

This command configures the degree of participation for a specific interface or range of interfaces in a VLAN. The ID is a valid VLAN identification number, and the interface is a valid interface number.

Format vlan participation {exclude | include | auto} *1-4093*

Mode Interface Config

Participation options are:

Options	Definition
include	The interface is always a member of this VLAN. This is equivalent to registration fixed.
exclude	The interface is never a member of this VLAN. This is equivalent to registration forbidden.
auto	The interface is dynamically registered in this VLAN by GVRP and will not participate in this VLAN unless a join request is received on this interface. This is equivalent to registration normal.

vlan participation all

This command configures the degree of participation for all interfaces in a VLAN. The ID is a valid VLAN identification number.

Format	vlan participation all {exclude | include | auto} *1-4093*
Mode	Global Config

You can use the following participation options:

Participation Options	Definition
include	The interface is always a member of this VLAN. This is equivalent to registration fixed.
exclude	The interface is never a member of this VLAN. This is equivalent to registration forbidden.
auto	The interface is dynamically registered in this VLAN by GVRP. The interface will not participate in this VLAN unless a join request is received on this interface. This is equivalent to registration normal.

vlan port acceptframe all

This command sets the frame acceptance mode for all interfaces.

Default	all
Format	vlan port acceptframe all {vlanonly | admituntaggedonly |all}
Mode	Global Config

The modes are defined as follows:

Mode	Definition
VLAN Only mode	Untagged frames or priority frames received on this interface are discarded.
Admit Untagged Only mode	VLAN-tagged and priority tagged frames received on this interface are discarded.
Admit All mode	Untagged frames or priority frames received on this interface are accepted and assigned the value of the interface VLAN ID for this port.

With either option, VLAN tagged frames are forwarded in accordance with the IEEE 802.1Q VLAN Specification.

no vlan port acceptframe all

This command sets the frame acceptance mode for all interfaces to Admit All. For Admit All mode, untagged frames or priority frames received on this interface are accepted and assigned the value of the interface VLAN ID for this port. With either option, VLAN tagged frames are forwarded in accordance with the IEEE 802.1Q VLAN Specification.

Format	no vlan port acceptframe all
Mode	Global Config

vlan port ingressfilter all

This command enables ingress filtering for all ports. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Default	disabled
Format	vlan port ingressfilter all
Mode	Global Config

no vlan port ingressfilter all

This command disables ingress filtering for all ports. If ingress filtering is disabled, frames received with VLAN IDs that do not match the VLAN membership of the receiving interface are admitted and forwarded to ports that are members of that VLAN.

Format	no vlan port ingressfilter all
Mode	Global Config

vlan port pvid all

This command changes the VLAN ID for all interface.

Default	1
Format	vlan port pvid all *1-4093*
Mode	Global Config

no vlan port pvid all

This command sets the VLAN ID for all interfaces to 1.

Format	no vlan port pvid all
Mode	Global Config

vlan port tagging all

This command configures the tagging behavior for all interfaces in a VLAN to enabled. If tagging is enabled, traffic is transmitted as tagged frames. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format	vlan port tagging all *1-4093*
Mode	Global Config

no vlan port tagging all

This command configures the tagging behavior for all interfaces in a VLAN to disabled. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format	no vlan port tagging all
Mode	Global Config

vlan protocol group

This command adds protocol-based VLAN groups to the system. The `groupid` is a unique number from 1–128 that is used to identify the group in subsequent commands.

Format	vlan protocol group *groupid*
Mode	Global Config

vlan protocol group name

This command assigns a name to a protocol-based VLAN groups. The *groupname* variable can be a character string of 0 to 16 characters.

Format	vlan protocol group name *groupid groupname*
Mode	Global Config

no vlan protocol group name

This command removes the name from the group identified by `groupid`.

Format	no vlan protocol group name *groupid*
Mode	Global Config

vlan protocol group add protocol

This command adds the `protocol` to the protocol-based VLAN identified by `groupid`. A group may have more than one protocol associated with it. Each interface and protocol combination can only be associated with one group. If adding a protocol to a group causes any conflicts with interfaces currently associated with the group, this command fails and the protocol is not added to the group. The possible values for *protocol* are The possible values for *protocol-list* includes the keywords `ip, arp,` and `ipx` and hexadecimal or decimal values ranging from 0x0600 (1536) to 0xFFFF (65535). The protocol list can accept up to 16 protocols separated by a comma.

Default	none
Format	vlan protocol group add protocol *groupid ethertype protocol-list*
Mode	Global Config

no vlan protocol group add protocol

This command removes the protocols specified in the *`protocol-list`* from this protocol-based VLAN group that is identified by this *`groupid`*.

Format	no vlan protocol group add protocol *groupid ethertype protocol-list*
Mode	Global Config

protocol group

This command attaches a *`vlanid`* to the protocol-based VLAN identified by *`groupid`*.   A group may only be associated with one VLAN at a time, however the VLAN association can be changed.

Default	none
Format	protocol group *groupid vlanid*
Mode	VLAN Database

no protocol group

This command removes the *`vlanid`* from this protocol-based VLAN group that is identified by this *`groupid`*.

Format	no protocol group *groupid vlanid*
Mode	VLAN Database

protocol vlan group

This command adds a physical interface or a range of interfaces to the protocol-based VLAN identified by *`groupid`*. You can associate multiple interfaces with a group, but you can only associate each interface and protocol combination with one group. If adding an interface to a group causes any conflicts with protocols currently associated with the group, this command fails and the interface(s) are not added to the group.

Default	none
Format	protocol vlan group *groupid*
Mode	Interface Config

no protocol vlan group

This command removes the interface from this protocol-based VLAN group that is identified by this `groupid`.

Format	no protocol vlan group *groupid*
Mode	Interface Config

protocol vlan group all

This command adds all physical interfaces to the protocol-based VLAN identified by `groupid`. You can associate multiple interfaces with a group, but you can only associate each interface and protocol combination with one group. If adding an interface to a group causes any conflicts with protocols currently associated with the group, this command will fail and the interface(s) will not be added to the group.

Default	none
Format	protocol vlan group all *groupid*
Mode	Global Config

no protocol vlan group all

This command removes all interfaces from this protocol-based VLAN group that is identified by this `groupid`.

Format	no protocol vlan group all *groupid*
Mode	Global Config

show port protocol

This command displays the Protocol-Based VLAN information for either the entire system, or for the indicated group.

Format	show port protocol {*groupid* | all}
Mode	Privileged EXEC

Parameter	Definition
Group Name	The group name of an entry in the Protocol-based VLAN table.
Group ID	The group identifier of the protocol group.
VLAN	The VLAN associated with this Protocol Group.
Protocol(s)	The type of protocol(s) for this group.
Interface(s)	Lists the *`unit/slot/port`* interface(s) that are associated with this Protocol Group.

vlan pvid

This command changes the VLAN ID on an interface or range of interfaces.

Default	1
Format	vlan pvid *1-4093*
Mode	Interface Config Interface Range Config

no vlan pvid

This command sets the VLAN ID on an interface or range of interfaces to 1.

Format	no vlan pvid
Mode	Interface Config

vlan tagging

This command configures the tagging behavior for a specific interface or range of interfaces in a VLAN to enabled. If tagging is enabled, traffic is transmitted as tagged frames. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format	vlan tagging *1-4093*
Mode	• Interface Config

no vlan tagging

This command configures the tagging behavior for a specific interface or range of interfaces in a VLAN to disabled. If tagging is disabled, traffic is transmitted as untagged frames. The ID is a valid VLAN identification number.

Format	no vlan tagging *1-4093*
Mode	• Interface Config

vlan association subnet

This command associates a VLAN to a specific IP-subnet.

Format	vlan association subnet *ipaddr netmask vlanid*
Mode	VLAN Database

no vlan association subnet

This command removes association of a specific IP-subnet to a VLAN.

Format	no vlan association subnet *ipaddr netmask*
Mode	VLAN Database

vlan association mac

This command associates a MAC address to a VLAN.

Format	vlan association mac *macaddr vlanid*
Mode	VLAN Database

no vlan association mac

This command removes the association of a MAC address to a VLAN.

Format	no vlan association mac *macaddr*
Mode	VLAN Database

remote-span

This command identifies the VLAN as the RSPAN VLAN. To enter VLAN Config mode, use the `vlan vlan-id` from Global Config mode.

Default	None
Format	remote-span
Mode	VLAN Config

no remote-span

This command clears RSPAN information for the VLAN.

Format	no remote-span
Mode	VLAN Config

show vlan

This command displays information about the configured private VLANs, including primary and secondary VLAN IDs, type (community, isolated, or primary) and the ports which belong to a private VLAN.

Format	show vlan {*vlanid*|private-vlan [*type*]}
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Primary	Primary VLAN identifier. The range of the VLAN ID is 1 to 4093.
Secondary	Secondary VLAN identifier.
Type	Secondary VLAN type (community, isolated, or primary).
Ports	Ports which are associated with a private VLAN.
VLAN ID	The VLAN identifier (VID) associated with each VLAN. The range of the VLAN ID is 1 to 4093.
VLAN Name	A string associated with this VLAN as a convenience. It can be up to 32 alphanumeric characters long, including blanks. The default is blank. VLAN ID 1 always has a name of **Default**. This field is optional.

Parameter	Definition
VLAN Type	Type of VLAN, which can be Default (VLAN ID = 1) or static (one that is configured and permanently defined), or Dynamic. A dynamic VLAN can be created by GVRP registration or during the 802.1X authentication process (DOT1X) if a RADIUS-assigned VLAN does not exist on the switch.
Interface	unit/slot/port. It is possible to set the parameters for all ports by using the selectors on the top line.
Current	The degree of participation of this port in this VLAN. The permissible values are: • **Include** - This port is always a member of this VLAN. This is equivalent to registration fixed in the IEEE 802.1Q standard. • **Exclude** - This port is never a member of this VLAN. This is equivalent to registration forbidden in the IEEE 802.1Q standard. • **Autodetect** - To allow the port to be dynamically registered in this VLAN via GVRP. The port will not participate in this VLAN unless a join request is received on this port. This is equivalent to registration normal in the IEEE 802.1Q standard.
Configured	The configured degree of participation of this port in this VLAN. The permissible values are: • **Include** - This port is always a member of this VLAN. This is equivalent to registration fixed in the IEEE 802.1Q standard. • **Exclude** - This port is never a member of this VLAN. This is equivalent to registration forbidden in the IEEE 802.1Q standard. • **Autodetect** - To allow the port to be dynamically registered in this VLAN via GVRP. The port will not participate in this VLAN unless a join request is received on this port. This is equivalent to registration normal in the IEEE 802.1Q standard.
Tagging	The tagging behavior for this port in this VLAN. • **Tagged** - Transmit traffic for this VLAN as tagged frames. • **Untagged** - Transmit traffic for this VLAN as untagged frames.

show vlan internal usage

This command displays information about the VLAN ID allocation on the switch.

Format	show vlan internal usage
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Base VLAN ID	Identifies the base VLAN ID for Internal allocation of VLANs to the routing interface.
Allocation policy	Identifies whether the system allocates VLAN IDs in ascending or descending order.

show vlan brief

This command displays a list of all configured VLANs.

Format	show vlan brief
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
VLAN ID	There is a VLAN Identifier (vlanid) associated with each VLAN. The range of the VLAN ID is 1 to 4093.
VLAN Name	A string associated with this VLAN as a convenience. It can be up to 32 alphanumeric characters long, including blanks. The default is blank. VLAN ID 1 always has a name of “Default.” This field is optional.
VLAN Type	Type of VLAN, which can be Default (VLAN ID = 1) or static (one that is configured and permanently defined), or a Dynamic (one that is created by GVRP registration).

show vlan port

This command displays VLAN port information.

Format	show vlan port {*unit/slot/port* | all}
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	`unit/slot/port` It is possible to set the parameters for all ports by using the selectors on the top line.
Port VLAN ID Configured	The VLAN ID that this port will assign to untagged frames or priority tagged frames received on this port. The value must be for an existing VLAN. The factory default is 1.
Port VLAN ID Current	The current VLAN ID that this port assigns to untagged frames or priority tagged frames received on this port. The factory default is 1.
Acceptable Frame Types	The types of frames that may be received on this port. The options are 'VLAN only' and 'Admit All'. When set to 'VLAN only', untagged frames or priority tagged frames received on this port are discarded. When set to 'Admit All', untagged frames or priority tagged frames received on this port are accepted and assigned the value of the Port VLAN ID for this port. With either option, VLAN tagged frames are forwarded in accordance to the 802.1Q VLAN specification.
Ingress Filtering Configured	May be enabled or disabled. When enabled, the frame is discarded if this port is not a member of the VLAN with which this frame is associated. In a tagged frame, the VLAN is identified by the VLAN ID in the tag. In an untagged frame, the VLAN is the Port VLAN ID specified for the port that received this frame. When disabled, all frames are forwarded in accordance with the 802.1Q VLAN bridge specification. The factory default is disabled.
Ingress Filtering Current	Shows the current ingress filtering configuration.
GVRP	May be enabled or disabled.
Default Priority	The 802.1p priority assigned to tagged packets arriving on the port.
Protected Port	Specifies if this is a protected port. If False, it is not a protected port; If true, it is.
Switchport mode	The current switchport mode for the port.
Operating parameters	The operating parameters for the port, including the VLAN, name, egress rule, and type.
Static configuration	The static configuration for the port, including the VLAN, name, and egress rule.

Parameter	Definition
Forbidden VLANs	The forbidden VLAN configuration for the port, including the VLAN and name.

show vlan association subnet

This command displays the VLAN associated with a specific configured IP-Address and net mask. If no IP address and net mask are specified, the VLAN associations of all the configured IP-subnets are displayed.

Format	show vlan association subnet [*ipaddr netmask*]
Mode	Privileged EXEC

Parameter	Definition
IP Address	The IP address assigned to each interface.
Net Mask	The subnet mask.
VLAN ID	There is a VLAN Identifier (VID) associated with each VLAN.

show vlan association mac

This command displays the VLAN associated with a specific configured MAC address. If no MAC address is specified, the VLAN associations of all the configured MAC addresses are displayed.

Format	show vlan association mac *[macaddr]*
Mode	Privileged EXEC

Parameter	Definition
Mac Address	A MAC address for which the switch has forwarding and or filtering information. The format is 6 or 8 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB. In an IVL system the MAC address will be displayed as 8 bytes.
VLAN ID	There is a VLAN Identifier (VID) associated with each VLAN.

Double VLAN Commands

This section describes the commands you use to configure double VLAN (DVLAN). Double VLAN tagging is a way to pass VLAN traffic from one customer domain to another through a Metro Core in a simple and cost effective manner. The additional tag on the traffic helps differentiate between customers in the MAN while preserving the VLAN identification of the individual customers when they enter their own IEEE 802.1Q domain.

dvlan-tunnel ethertype (Interface Config)

Note: This command is not available on all platforms.

This command configures the ethertype for the specified interface. The two-byte hex ethertype is used as the first 16 bits of the DVLAN tag. The ethertype may have the values of *802.1Q*, *vman*, or *custom*. If the ethertype has an optional value of *custom*, then it is a custom tunnel value, and ethertype must be set to a value in the range of 1 to 65535.

Default	802.1Q
Format	dvlan-tunnel ethertype {802.1Q | vman | custom *1-65535*}
Mode	Global Config

Parameter	Description
802.1Q	Configure the ethertype as 0x8100.
custom	Configure the value of the custom tag in the range from 1to 65535.
vman	Represents the commonly used value of 0x88A8.

no dvlan-tunnel ethertype (Interface Config)

Note: This command is not available on all platforms.

This command removes the ethertype value for the interface.

Format	no dvlan-tunnel ethertype
Mode	Global Config

dvlan-tunnel ethertype primary-tpid

Use this command to create a new TPID and associate it with the next available TPID register. If no TPID registers are empty, the system returns an error to the user. Specifying the optional keyword [primary–tpid] forces the TPID value to be configured as the default TPID at index 0.

Format	dvlan-tunnel ethertype {802.1Q | vman | custom *1–65535*} [primary-tpid]
Mode	Global Config

Parameter	Description
802.1Q	Configure the ethertype as 0x8100.

Parameter	Description
custom	Configure the value of the custom tag in the range from 1 to 65535.
vman	Represents the commonly used value of 0x88A8.

no dvlan-tunnel ethertype primary–tpid

Use the `no` form of the command to reset the TPID register to 0. (At initialization, all TPID registers will be set to their default values.)

Format	no dvlan-tunnel ethertype {802.1Q | vman | custom *1–65535*} [primary-tpid]
Mode	Global Config

mode dot1q-tunnel

This command is used to enable Double VLAN Tunneling on the specified interface.

Default	disabled
Format	mode dot1q-tunnel
Mode	Interface Config

no mode dot1q-tunnel

This command is used to disable Double VLAN Tunneling on the specified interface. By default, Double VLAN Tunneling is disabled.

Format	no mode dot1q-tunnel
Mode	Interface Config

mode dvlan-tunnel

Use this command to enable Double VLAN Tunneling on the specified interface.

Note: When you use the `mode dvlan-tunnel` command on an interface, it becomes a service provider port. Ports that do not have double VLAN tunneling enabled are customer ports.

Default	disabled
Format	mode dvlan-tunnel
Mode	Interface Config

no mode dvlan-tunnel

This command is used to disable Double VLAN Tunneling on the specified interface. By default, Double VLAN Tunneling is disabled.

Format	no mode dvlan-tunnel
Mode	Interface Config

show dot1q-tunnel

Use this command without the optional parameters to display all interfaces enabled for Double VLAN Tunneling. Use the optional parameters to display detailed information about Double VLAN Tunneling for the specified interface or all interfaces.

Format	show dot1q-tunnel [interface {*unit/slot/port* | all}]
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	*unit/slot/port*
Mode	The administrative mode through which Double VLAN Tunneling can be enabled or disabled. The default value for this field is disabled.
EtherType	A 2-byte hex EtherType to be used as the first 16 bits of the DVLAN tunnel. There are three different EtherType tags. The first is 802.1Q, which represents the commonly used value of 0x8100. The second is vMAN, which represents the commonly used value of 0x88A8. If EtherType is not one of these two values, then it is a custom tunnel value, representing any value in the range of 1 to 65535.

show dvlan-tunnel

Use this command without the optional parameters to display all interfaces enabled for Double VLAN Tunneling. Use the optional parameters to display detailed information about Double VLAN Tunneling for the specified interface or all interfaces.

Format	show dvlan-tunnel [interface {*unit/slot/port*|all|lag *lag-intf-num*}]
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	*unit/slot/port*
LAG	Instead of `unit/slot/port, lag lag-intf-num can be used as an alternate way to specify the LAG interface. lag lag-intf-num can also be used to specify the LAG interface where lag-intf-num is the LAG port number.`
Mode	The administrative mode through which Double VLAN Tunneling can be enabled or disabled. The default value for this field is disabled.
EtherType	A 2-byte hex EtherType to be used as the first 16 bits of the DVLAN tunnel. There are three different EtherType tags. The first is 802.1Q, which represents the commonly used value of 0x8100. The second is vMAN, which represents the commonly used value of 0x88A8. If EtherType is not one of these two values, then it is a custom tunnel value, representing any value in the range of 1 to 65535.

Example: The following shows examples of the CLI display output for the commands.

```
(Routing) #show dvlan-tunnel
```

```
TPIDs Configured.............................. 0x88a8
Default TPID.................................. 0x88a8
Interfaces Enabled for DVLAN Tunneling......... None

(Routing) #

(switch)#show dvlan-tunnel interface 1/0/1

Interface Mode    EtherType
--------- ------- ------------
1/0/1     Disable 0x88a8
```

Private VLAN Commands

This section describes the commands you use for private VLANs. Private VLANs provides Layer 2 isolation between ports that share the same broadcast domain. In other words, it allows a VLAN broadcast domain to be partitioned into smaller point-to-multipoint subdomains. The ports participating in a private VLAN can be located anywhere in the Layer 2 network.

switchport private-vlan

This command defines a private-VLAN association for an isolated or community port or a mapping for a promiscuous port.

Format switchport private-vlan {host-association primary-vlan-id secondary-vlan-id | mapping primary-vlan-id {add | remove} secondary-vlan-list | mapping trunk primary-vlan-id {secondary-vlan-list|addsecondary-vlan-list|removesecondary-vlan-list}|trunk{nativevlan vlan-id | allowed vlan vlan-list}} | association trunk primary-vlan-id secondary-vlan-id}

Mode Interface Config

Parameter	Description
host-association	Defines the VLAN association for community or host ports.
mapping	Defines the private VLAN mapping for promiscuous ports.
mapping trunk	Maps the port to a primary VLAN and selected secondary VLANs.
primary-vlan-id	Primary VLAN ID of a private VLAN.
secondary-vlan-id	Secondary (isolated or community) VLAN ID of a private VLAN.
add	Associates the secondary VLAN with the primary one.
remove	Deletes the secondary VLANs from the primary VLAN association.
secondary-vlan-list	A list of secondary VLANs to be mapped to a primary VLAN.
trunk native vlan	Defines the VLAN association for untagged packets. If not configured, untagged packets are dropped.
trunk allowed vlan	Specifies the list of allowed normal VLANs on the trunk port.
association trunk	Associates a primary VLAN with a secondary (isolated only) VLAN. Multiple private VLAN pairs can be configured using this command.

no switchport private-vlan

This command removes the private-VLAN association or mapping from the port.

Format noswitchportprivate-vlan{host-association|mapping|mappingtrunk{primary-vlan-id} |trunk allowed vlan-list | trunk native vlan vlan-id} association trunk primary-vlan-id secondary-vlan-id}

Mode Interface Config

switchport mode private-vlan

This command configures a port as a promiscuous or host private VLAN port. Note that the properties of each mode can be configured even when the switch is not in that mode. However, they will only be applicable once the switch is in that particular mode.

Default	general
Format	switchport mode private-vlan {host | promiscuous | trunk promiscuous | trunk secondary}
Mode	Interface Config

Parameter	Description
host	Configures an interface as a private VLAN host port. It can be either isolated or community port depending on the secondary VLAN it is associated with.
promiscuous	Configures an interface as a private VLAN promiscuous port. The promiscuous ports are members of the primary VLAN.
trunk promiscuous	Configures an interface as a private VLAN promiscuous trunk port. These ports can carry traffic of several primary VLANs and normal VLANs. An endpoint connected to a promiscuous trunk port is allowed to communicate with all the endpoints within the private VLAN and also with other ports participating in normal VLANs. These ports carry the traffic of multiple primary VLANs towards the upstream router and regular VLANs. Promiscuous trunk ports are used when it is required to reduce the number of links connected to upstream devices while still being able to manage all the endpoints in a private VLAN — in addition to carrying traffic of normal VLANs. These ports are typically used where the switches are connected to upstream devices that do not understand private VLANs.
trunk secondary	Configures an interface as a private VLAN isolated trunk port. These ports can carry traffic of several secondary VLANs and normal VLANs.

no switchport mode private-vlan

This command removes the private-VLAN association or mapping from the port.

Format	no switchport mode private-vlan
Mode	Interface Config

private-vlan

This command configures the private VLANs and configures the association between the primary private VLAN and secondary VLANs.

Format	private-vlan{association[add|remove]secondary-vlan-list|community|isolated|primary}
Mode	VLAN Config

Parameter	Description
association	Associates the primary and secondary VLAN.
secondary-vlan-list	A list of secondary VLANs to be mapped to a primary VLAN.
community	Designates a VLAN as a community VLAN.
isolated	Designates a VLAN as the isolated VLAN.
primary	Designates a VLAN as the primary VLAN.

no private-vlan

This command restores normal VLAN configuration.

Format	no private-vlan {association}
Mode	VLAN Config

show interface ethernet switchport

This command displays the private VLAN mapping information for the switch interfaces.

Format	show interface ethernet *interface-id* switchport
Mode	Privileged EXEC

Parameter	Description
interface-id	The *unit/slot/port* of the switch.

The command displays the following information. Note that the fields that display depend on the configured mode on the port.

Parameter	Definition
Port	The port number for which data is displayed.
VLAN Switchport Mode	The private VLAN mode of the interface, which is one of the following: • General – The interface is in general mode and is not a member of a private VLAN. • Private VLAN Promiscuous – The interface belongs to a primary VLAN and can communicate with all interfaces in the private VLAN, including other promiscuous ports, community ports, and isolated ports. • Private VLAN Promiscuous Trunk – The interface belongs to a primary VLAN and can communicate with all interfaces in the private VLAN, including other promiscuous trunk ports, community ports, and isolated ports. • Private VLAN Host – The interface belongs to a secondary VLAN and, depending upon the type of secondary VLAN, can either communicate with other ports in the same community (if the secondary VLAN is a community VLAN) and with the promiscuous ports or is able to communicate only with the promiscuous ports (if the secondary VLAN is an isolated VLAN). • Private VLAN Isolated Trunk – The interface belongs to an isolated VLAN and can communicate with promiscuous, promiscuous trunk, and trunk ports.
Private VLAN Host Association	The VLAN association for the private-VLAN host ports.
Private VLAN Mapping	The VLAN mapping for the private-VLAN promiscuous ports.
Private VLAN trunk native VLAN	Displays the native VLAN for the promiscuous trunk ports. When the port is configured to operate in Promiscuous Trunk mode, the native VLAN defines VLAN association for untagged packets. If not configured, untagged packets are dropped.

Parameter	Definition
Private VLAN trunk normal VLANs	The list of normal VLANs for the promiscuous trunk ports.
Private-VLAN trunk mappings	The mappings of all the primary VLANs and their associated secondary VLANs of promiscuous trunk ports.
Private-vlan trunk associations	The associations of all the primary VLANs and their associated isolated VLANs of isolated trunk ports.
Operational Private VLANS	The operational private VLANs on this interface.

Switch Ports

This section describes the commands used for switch port mode.

switchport mode

Use this command to configure the mode of a switch port as access, trunk or general.

In Trunk mode, the port becomes a member of all VLANs on switch unless specified in the allowed list in the `switchport trunk allowed vlan` command. The PVID of the port is set to the Native VLAN as specified in the `switchport trunk native vlan` command. It means that trunk ports accept both tagged and untagged packets, where untagged packets are processed on the native VLAN and tagged packets are processed on the VLAN ID contained in the packet. MAC learning is performed on both tagged and untagged packets. Tagged packets received with a VLAN ID of which the port is not a member are discarded and MAC learning is not performed. The Trunk ports always transmit packets untagged on native VLAN.

In Access mode, the port becomes a member of only one VLAN. The port sends and receives untagged traffic. It can also receive tagged traffic.The ingress filtering is enabled on port. It means that when the VLAN ID of received packet is not identical to Access VLAN ID, the packet is discarded.

In General mode, the user can perform custom configuration of VLAN membership, PVID, tagging, ingress filtering etc. This is legacy CE0128XB/CE0152XB behavior of switch port configuration. Legacy CE0128XB/CE0152XB CLI commands are used to configure port in general mode.

Default	General mode
Format	switchport mode {access | trunk | general}
Mode	Interface Config

no switchport mode

This command resets the switch port mode to its default value.

Format	no switchport mode
Mode	Interface Config

switchport trunk allowed vlan

Use this command to configure the list of allowed VLANs that can receive and send traffic on this interface in tagged format when in trunking mode. The default is all.

The VLANs list can be modified using the add or remove options or replaced with another list using the vlan-list, all, or except options. If all is chosen, all VLANs are added to the list of allowed vlan. The except option provides an exclusion list.

Trunk ports accept tagged packets, where tagged packets are processed on the VLAN ID contained in the packet, if this VLAN is in the allowed VLAN list. Tagged packets received with a VLAN ID to which the port is not a member are discarded and MAC learning is not performed. If a VLAN is added to the system after a port is set to the Trunk mode and it is in the allowed VLAN list, this VLAN is assigned to this port automatically.

Default	All
Format	switchport trunk allowed vlan {*vlan-list* | all | {add *vlan-list*} | {remove *vlan-list*} | {except *vlan-list* }}
Mode	Interface Config

Parameter	Description
all	Specifies all VLANs from 1 to 4093. This keyword is not allowed on commands that do not permit all VLANs in the list to be set at the same time.
add	Adds the defined list of VLANs to those currently set instead of replacing the list.
remove	Removes the defined list of VLANs from those currently set instead of replacing the list. Valid IDs are from 1 to 4093; extended-range VLAN IDs of the form X-Y or X,Y,Z are valid in this command.
except	Lists the VLANs that should be calculated by inverting the defined list of VLANs. (VLANs are added except the ones specified.)
vlan-list	Either a single VLAN number from 1 to 4093 or a continuous range of VLANs described by two VLAN numbers, the lesser one first, separated by a hyphen.

no switchport trunk allowed vlan

This command resets the list of allowed VLANs on the trunk port to its default value.

Format	no switchport trunk allowed vlan
Mode	Interface Config

switchport trunk native vlan

Use this command to configure the Trunk port Native VLAN (PVID) parameter. Any ingress untagged packets on the port are tagged with the value of Native VLAN. Native VLAN must be in the allowed VLAN list for tagging of received untagged packets. Otherwise, untagged packets are discarded. Packets marked with Native VLAN are transmitted untagged from Trunk port. The default is 1.

Default	1 (Default VLAN)
Format	switchport trunk native vlan *vlan-id*
Mode	Interface Config

no switchport trunk native vlan

Use this command to reset the switch port trunk mode native VLAN to its default value.

Format	no switchport trunk native vlan
Mode	Interface Config

switchport access vlan

Use this command to configure the VLAN on the Access port. Only one VLAN can be assigned to the Access port. Access ports are members of VLAN 1 by default. Access ports may be assigned to a VLAN other than VLAN 1. Removing the Access VLAN on the switch makes the Access port a member of VLAN 1. Configuring an Access port to be a member of a VLAN that does not exist results in an error and does not change the configuration.

Default	1 (Default VLAN)
Format	switchport access vlan *vlan-id*
Mode	Interface Config

no switchport access vlan

This command resets the switch port access mode VALN to its default value.

Format	no switchport access vlan
Mode	Interface Config

show interfaces switchport

Use this command to display the switchport status for all interfaces or a specified interface. The output contains information about configured switchport mode, VLAN membership, PVID/Native VLAN, acceptable frame type, and other options per switchport modes.

Format	show interfaces switchport *unit/slot/port*
Mode	Privileged EXEC

Example:

```
(Switching) # show interfaces switchport 1/0/20
Port: 1/0/20
Switchport Mode: Access Mode
Access Mode VLAN: 1 (default)
General Mode PVID: 1 (default)
General Mode Ingress Filtering: Enabled
General Mode Acceptable Frame Type: Admit All
General Mode Dynamically Added VLANs:
General Mode Untagged VLANs: 1
General Mode Tagged VLANs:
General Mode Forbidden VLANs:
Trunking Mode Native VLAN: 1 (default)
Trunking Mode Native VLAN Tagging: Disabled
Trunking Mode VLANs Enabled: All
Protected: False

(Routing) #show interfaces switchport

Port: 1/0/1
VLAN Membership Mode: General
Access Mode VLAN: 1 (default)
General Mode PVID: 1 (default)
General Mode Ingress Filtering: Disabled
General Mode Acceptable Frame Type: Admit all
General Mode Dynamically Added VLANs:
General Mode Untagged VLANs: 1
General Mode Tagged VLANs:
General Mode Forbidden VLANs:
Trunking Mode Native VLAN: 1 (default)
Trunking Mode Native VLAN tagging: Disable
Trunking Mode VLANs Enabled: All
Protected Port: False
```

show interfaces switchport

Use this command to display the switchport configuration for a selected mode per interface. If the interface is not specified, the configuration for all interfaces is displayed.

Format	show interfaces switchport {access | trunk | general} [*unit/slot/port*]
Mode	Privileged EXEC

Example:

```
Switching) # show interfaces switchport access 1/0/1
Intf      PVID
--------- ----
1/0/1     1

(Switching) # show interfaces switchport trunk 1/0/6

Intf      PVID  Allowed Vlans List
--------- ----- -------------------
1/0/6     1     All

(Switching) # show interfaces switchport general 1/0/5

Intf      PVID  Ingress    Acceptable  Untagged  Tagged     Forbidden  Dynamic
                Filtering  Frame Type  Vlans     Vlans      Vlans      Vlans
--------- ----- ---------- ----------  --------- ---------  ---------  ---------
1/0/5     1     Enabled    Admit All   7         10-50,55   9,100-200  88,96

(Switching) # show interfaces switchport general
Intf      PVID  Ingress    Acceptable  Untagged  Tagged     Forbidden  Dynamic
                Filtering  Frame Type  Vlans     Vlans      Vlans      Vlans
--------- ----- ---------- ----------  --------- ---------  ---------  ---------
1/0/1     1     Enabled    Admit All   1,4-7     30-40,55   3,100-200  88,96
1/0/2     1     Disabled   Admit All   1         30-40,55   none       none
..
```

Voice VLAN Commands

This section describes the commands you use for Voice VLAN. Voice VLAN enables switch ports to carry voice traffic with defined priority so as to enable separation of voice and data traffic coming onto the port. The benefits of using Voice VLAN is to ensure that the sound quality of an IP phone could be safeguarded from deteriorating when the data traffic on the port is high.

Also the inherent isolation provided by VLANs ensures that inter-VLAN traffic is under management control and that network- attached clients cannot initiate a direct attack on voice components. QoS-based on IEEE 802.1P class of service (CoS) uses classification and scheduling to sent network traffic from the switch in a predictable manner. The system uses the source MAC of the traffic traveling through the port to identify the IP phone data flow.

voice vlan (Global Config)

Use this command to enable the Voice VLAN capability on the switch.

Default	disabled
Format	voice vlan
Mode	Global Config

no voice vlan (Global Config)

Use this command to disable the Voice VLAN capability on the switch.

Format	no voice vlan
Mode	Global Config

voice vlan (Interface Config)

Use this command to enable the Voice VLAN capability on the interface or range of interfaces.

Default	disabled
Format	voice vlan {vlanid *id* | dot1p *priority* | none | untagged}
Mode	Interface Config

You can configure Voice VLAN in one of four different ways:

Parameter	Description
vlan-id	Configure the IP phone to forward all voice traffic through the specified VLAN. Valid VLAN ID's are from 1 to 4093 (the max supported by the platform).
dot1p	Configure the IP phone to use 802.1p priority tagging for voice traffic and to use the default native VLAN (VLAN 0) to carry all traffic. Valid `priority` range is 0 to 7.
none	Allow the IP phone to use its own configuration to send untagged voice traffic.

Parameter	Description
untagged	Configure the phone to send untagged voice traffic.

no voice vlan (Interface Config)

Use this command to disable the Voice VLAN capability on the interface.

Format	no voice vlan
Mode	Interface Config

voice vlan data priority

Use this command to either trust or untrust the data traffic arriving on the Voice VLAN interface or range of interfaces being configured.

Default	trust
Format	voice vlan data priority {untrust | trust}
Mode	Interface Config

show voice vlan

Format	show voice vlan [interface {*unit/slot/port* | all}]
Mode	Privileged EXEC

When the `interface` parameter is not specified, only the global mode of the Voice VLAN is displayed.

Parameter	Definition
Administrative Mode	The Global Voice VLAN mode.

When the `interface` is specified:

Parameter	Definition
Voice VLAN Mode	The admin mode of the Voice VLAN on the interface.
Voice VLAN ID	The Voice VLAN ID
Voice VLAN Priority	The do1p priority for the Voice VLAN on the port.
Voice VLAN Untagged	The tagging option for the Voice VLAN traffic.
Voice VLAN CoS Override	The Override option for the voice traffic arriving on the port.
Voice VLAN Status	The operational status of Voice VLAN on the port.

Provisioning (IEEE 802.1p) Commands

This section describes the commands you use to configure provisioning (IEEE 802.1p,) which allows you to prioritize ports.

vlan port priority all

This command configures the port priority assigned for untagged packets for all ports presently plugged into the device. The range for the priority is 0-7. Any subsequent per port configuration will override this configuration setting.

Format	vlan port priority all *priority*
Mode	Global Config

vlan priority

This command configures the default 802.1p port priority assigned for untagged packets for a specific interface. The range for the priority is 0–7.

Default	0
Format	vlan priority *priority*
Mode	Interface Config

Asymmetric Flow Control

When in asymmetric flow control mode, the switch responds to PAUSE frames received from a peer by stopping packet transmission, but the switch does not initiate MAC control PAUSE frames.

When you configure the switch in asymmetric flow control (or no flow control mode), the device is placed in egress drop mode. Egress drop mode maximizes the throughput of the system at the expense of packet loss in a heavily congested system, and this mode avoids head-of-line blocking.

flowcontrol {symmetric|asymmetric}

Note: The `flowcontrol {symmetric|asymmetric}` command is available if the platform supports the asymmetric flow control feature.

Use this command to enable or disable the symmetric or asymmetric flow control on the switch. Asymmetric here means that `Tx Pause` can never be enabled. Only `Rx Pause` can be enabled.

Default	Flow control is disabled.
Format	flowcontrol {symmetric|asymmetric}
Mode	Global Config

no flowcontrol {symmetric|asymmetric}

Use the `no` form of this command to disable symmetric or asymmetric flow control.

Format	no flowcontrol {symmetric|asymmetric}
Mode	Global Config

show flowcontrol

Use this command to display the IEEE 802.3 Annex 31B flow control settings and status for a specific interface or all interfaces. The command also displays 802.3 Tx and Rx pause counts. Priority Flow Control frames counts are not displayed. If the port is enabled for priority flow control, operational flow control status is displayed as `Inactive`. Operational flow control status for stacking ports is always displayed as `N/A`.

Format	show flowcontrol [*unit/slot/port*]
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switching)#show flowcontrol

Admin Flow Control: Symmetric

Port   Flow Control   RxPause   TxPause
       Oper
------ ------------   --------  ---------
0/1    Active         310       611
```

```
0/2     Inactive        0           0
```

Example: The following shows example CLI display output for the command.

```
(Switching)#show flowcontrol interface 0/1

Admin Flow Control: Symmetric

Port       Flow Control  RxPause      TxPause
           Oper
---------  -------      --------     -------
0/1        Active        310          611
```

Protected Ports Commands

This section describes commands you use to configure and view protected ports on a switch. Protected ports do not forward traffic to each other, even if they are on the same VLAN. However, protected ports can forward traffic to all unprotected ports in their group. Unprotected ports can forward traffic to both protected and unprotected ports. Ports are unprotected by default.

If an interface is configured as a protected port, and you add that interface to a Port Channel or Link Aggregation Group (LAG), the protected port status becomes operationally disabled on the interface, and the interface follows the configuration of the LAG port. However, the protected port configuration for the interface remains unchanged. Once the interface is no longer a member of a LAG, the current configuration for that interface automatically becomes effective.

switchport protected (Global Config)

Use this command to create a protected port group. The *groupid* parameter identifies the set of protected ports. Use the name *name* pair to assign a name to the protected port group. The name can be up to 32 alphanumeric characters long, including blanks. The default is blank.

Note: Port protection occurs within a single switch. Protected port configuration does not affect traffic between ports on two different switches. No traffic forwarding is possible between two protected ports.

Default	unprotected
Format	switchport protected *groupid* name *name*
Mode	Global Config

no switchport protected (Global Config)

Use this command to remove a protected port group. The *groupid* parameter identifies the set of protected ports. The name keyword specifies the name to remove from the group.

Format	no switchport protected *groupid* name
Mode	Global Config

switchport protected (Interface Config)

Use this command to add an interface to a protected port group. The *groupid* parameter identifies the set of protected ports to which this interface is assigned. You can only configure an interface as protected in one group.

Note: Port protection occurs within a single switch. Protected port configuration does not affect traffic between ports on two different switches. No traffic forwarding is possible between two protected ports.

Default	unprotected
Format	switchport protected *groupid*
Mode	Interface Config

no switchport protected (Interface Config)

Use this command to configure a port as unprotected. The `groupid` parameter identifies the set of protected ports to which this interface is assigned.

Format	no switchport protected *groupid*
Mode	Interface Config

show switchport protected

This command displays the status of all the interfaces, including protected and unprotected interfaces.

Format	show switchport protected *groupid*
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Group ID	The number that identifies the protected port group.
Name	An optional name of the protected port group. The name can be up to 32 alphanumeric characters long, including blanks. The default is blank.
List of Physical Ports	List of ports, which are configured as protected for the group identified with *groupid*. If no port is configured as protected for this group, this field is blank.

show interfaces switchport

This command displays the status of the interface (protected/unprotected) under the groupid.

Format	show interfaces switchport *unit/slot/port groupid*
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Name	A string associated with this group as a convenience. It can be up to 32 alphanumeric characters long, including blanks. The default is blank. This field is optional.
Protected	Indicates whether the interface is protected or not. It shows TRUE or FALSE. If the group is a multiple groups then it shows TRUE in Group *`groupid.`*

GARP Commands

This section describes the commands you use to configure Generic Attribute Registration Protocol (GARP) and view GARP status. The commands in this section affect both GARP VLAN Registration Protocol (GVRP) and GARP Multicast Registration Protocol (GMRP). GARP is a protocol that allows client stations to register with the switch for membership in VLANS (by using GVMP) or multicast groups (by using GVMP).

set garp timer join

This command sets the GVRP join time per GARP for one interface, a range of interfaces, or all interfaces. Join time is the interval between the transmission of GARP Protocol Data Units (PDUs) registering (or re-registering) membership for a VLAN or multicast group. This command has an effect only when GVRP is enabled. The time is from 10 to 100 (centiseconds). The value 20 centiseconds is 0.2 seconds.

Default	20
Format	set garp timer join *10-100*
Mode	• Interface Config • Global Config

no set garp timer join

This command sets the GVRP join time to the default and only has an effect when GVRP is enabled.

Format	no set garp timer join
Mode	• Interface Config • Global Config

set garp timer leave

This command sets the GVRP leave time for one interface, a range of interfaces, or all interfaces or all ports and only has an effect when GVRP is enabled. Leave time is the time to wait after receiving an unregister request for a VLAN or a multicast group before deleting the VLAN entry. This can be considered a buffer time for another station to assert registration for the same attribute in order to maintain uninterrupted service. The leave time is 20 to 600 (centiseconds). The value 60 centiseconds is 0.6 seconds. The leave time must be greater than or equal to three times the join time.

Default	60
Format	set garp timer leave *20-600*
Mode	• Interface Config • Global Config

no set garp timer leave

This command sets the GVRP leave time on all ports or a single port to the default and only has an effect when GVRP is enabled.

Format	no set garp timer leave
Mode	• Interface Config • Global Config

set garp timer leaveall

This command sets how frequently Leave All PDUs are generated. A Leave All PDU indicates that all registrations will be unregistered. Participants would need to rejoin in order to maintain registration. The value applies per port and per GARP participation. The time may range from 200 to 6000 (centiseconds). The value 1000 centiseconds is 10 seconds. You can use this command on all ports (Global Config mode), or on a single port or a range of ports (Interface Config mode) and it only has an effect only when GVRP is enabled. The leave all time must be greater than the leave time.

Default	1000
Format	set garp timer leaveall *200-6000*
Mode	• Interface Config • Global Config

no set garp timer leaveall

This command sets how frequently Leave All PDUs are generated the default and only has an effect when GVRP is enabled.

Format	no set garp timer leaveall
Mode	• Interface Config • Global Config

show garp

This command displays GARP information.

Format	show garp
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
GMRP Admin Mode	The administrative mode of GARP Multicast Registration Protocol (GMRP) for the system.
GVRP Admin Mode	The administrative mode of GARP VLAN Registration Protocol (GVRP) for the system.

GVRP Commands

This section describes the commands you use to configure and view GARP VLAN Registration Protocol (GVRP) information. GVRP-enabled switches exchange VLAN configuration information, which allows GVRP to provide dynamic VLAN creation on trunk ports and automatic VLAN pruning.

Note: If GVRP is disabled, the system does not forward GVRP messages.

set gvrp adminmode

This command enables GVRP on the system.

Default	disabled
Format	set gvrp adminmode
Mode	Privileged EXEC

no set gvrp adminmode

This command disables GVRP.

Format	no set gvrp adminmode
Mode	Privileged EXEC

set gvrp interfacemode

This command enables GVRP on a single port (Interface Config mode), a range of ports (Interface Range mode), or all ports (Global Config mode).

Default	disabled
Format	set gvrp interfacemode
Mode	• Interface Config • Interface Range • Global Config

no set gvrp interfacemode

This command disables GVRP on a single port (Interface Config mode) or all ports (Global Config mode). If GVRP is disabled, Join Time, Leave Time and Leave All Time have no effect.

Format	no set gvrp interfacemode
Mode	• Interface Config • Global Config

show gvrp configuration

This command displays Generic Attributes Registration Protocol (GARP) information for one or all interfaces.

Format	show gvrp configuration {*unit/slot/port* | all}
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	*unit/slot/port*
Join Timer	The interval between the transmission of GARP PDUs registering (or re-registering) membership for an attribute. Current attributes are a VLAN or multicast group. There is an instance of this timer on a per-Port, per-GARP participant basis. Permissible values are 10 to 100 centiseconds (0.1 to 1.0 seconds). The factory default is 20 centiseconds (0.2 seconds). The finest granularity of specification is one centisecond (0.01 seconds).
Leave Timer	The period of time to wait after receiving an unregister request for an attribute before deleting the attribute. Current attributes are a VLAN or multicast group. This may be considered a buffer time for another station to assert registration for the same attribute in order to maintain uninterrupted service. There is an instance of this timer on a per-Port, per-GARP participant basis. Permissible values are 20 to 600 centiseconds (0.2 to 6.0 seconds). The factory default is 60 centiseconds (0.6 seconds).
LeaveAll Timer	This Leave All Time controls how frequently LeaveAll PDUs are generated. A LeaveAll PDU indicates that all registrations will shortly be deregistered. Participants will need to rejoin in order to maintain registration. There is an instance of this timer on a per-Port, per-GARP participant basis. The Leave All Period Timer is set to a random value in the range of LeaveAllTime to 1.5*LeaveAllTime. Permissible values are 200 to 6000 centiseconds (2 to 60 seconds). The factory default is 1000 centiseconds (10 seconds).
Port GMRP Mode	The GMRP administrative mode for the port, which is enabled or disabled (default). If this parameter is disabled, Join Time, Leave Time and Leave All Time have no effect.

GMRP Commands

This section describes the commands you use to configure and view GARP Multicast Registration Protocol (GMRP) information. Like IGMP snooping, GMRP helps control the flooding of multicast packets.GMRP-enabled switches dynamically register and de-register group membership information with the MAC networking devices attached to the same segment. GMRP also allows group membership information to propagate across all networking devices in the bridged LAN that support Extended Filtering Services.

Note: If GMRP is disabled, the system does not forward GMRP messages.

set gmrp adminmode

This command enables GARP Multicast Registration Protocol (GMRP) on the system.

Default	disabled
Format	set gmrp adminmode
Mode	Privileged EXEC

no set gmrp adminmode

This command disables GARP Multicast Registration Protocol (GMRP) on the system.

Format	no set gmrp adminmode
Mode	Privileged EXEC

set gmrp interfacemode

This command enables GARP Multicast Registration Protocol on a single interface (Interface Config mode), a range of interfaces, or all interfaces (Global Config mode). If an interface which has GARP enabled is enabled for routing or is enlisted as a member of a port-channel (LAG), GARP functionality is disabled on that interface. GARP functionality is subsequently re-enabled if routing is disabled and port-channel (LAG) membership is removed from an interface that has GARP enabled.

Default	disabled
Format	set gmrp interfacemode
Mode	• Interface Config • Global Config

no set gmrp interfacemode

This command disables GARP Multicast Registration Protocol on a single interface or all interfaces. If an interface which has GARP enabled is enabled for routing or is enlisted as a member of a port-channel (LAG), GARP functionality is disabled.

GARP functionality is subsequently re-enabled if routing is disabled and port-channel (LAG) membership is removed from an interface that has GARP enabled.

Format	no set gmrp interfacemode
Mode	• Interface Config • Global Config

show gmrp configuration

This command displays Generic Attributes Registration Protocol (GARP) information for one or all interfaces.

Format	show gmrp configuration {*unit/slot/port* | all}
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	The `unit/slot/port` of the interface that this row in the table describes.
Join Timer	The interval between the transmission of GARP PDUs registering (or reregistering) membership for an attribute. Current attributes are a VLAN or multicast group. There is an instance of this timer on a per-port, per-GARP participant basis. Permissible values are 10 to 100 centiseconds (0.1 to 1.0 seconds). The factory default is 20 centiseconds (0.2 seconds). The finest granularity of specification is 1 centisecond (0.01 seconds).
Leave Timer	The period of time to wait after receiving an unregister request for an attribute before deleting the attribute. Current attributes are a VLAN or multicast group. This may be considered a buffer time for another station to assert registration for the same attribute in order to maintain uninterrupted service. There is an instance of this timer on a per-Port, per-GARP participant basis. Permissible values are 20 to 600 centiseconds (0.2 to 6.0 seconds). The factory default is 60 centiseconds (0.6 seconds).
LeaveAll Timer	This Leave All Time controls how frequently LeaveAll PDUs are generated. A LeaveAll PDU indicates that all registrations will shortly be deregistered. Participants will need to rejoin in order to maintain registration. There is an instance of this timer on a per-Port, per-GARP participant basis. The Leave All Period Timer is set to a random value in the range of LeaveAllTime to 1.5*LeaveAllTime. Permissible values are 200 to 6000 centiseconds (2 to 60 seconds). The factory default is 1000 centiseconds (10 seconds).
Port GMRP Mode	The GMRP administrative mode for the port. It may be enabled or disabled. If this parameter is disabled, Join Time, Leave Time and Leave All Time have no effect.

show mac-address-table gmrp

This command displays the GMRP entries in the Multicast Forwarding Database (MFDB) table.

Format	show mac-address-table gmrp
Mode	Privileged EXEC

Parameter	Definition
VLAN ID	The VLAN in which the MAC Address is learned.
MAC Address	A unicast MAC address for which the switch has forwarding and or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 80:96:21:67:89:AB.
Type	The type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

Port-Based Network Access Control Commands

This section describes the commands you use to configure port-based network access control (IEEE 802.1X and Authentication Manager). Port-based network access control allows you to permit access to network services only to and devices that are authorized and authenticated.

The IEEE 802.1X version has been upgraded from the 2004 standard to the 2010 standard. The authenticator and supplicant PACP state machines now comply with the 2010 standard.

Due to this migration, several IEEE 802.1X (dot1x) commands have been deprecated. For information about the deprecated commands, see "Deprecated IEEE 802.1X Commands" on page 440

aaa authentication dot1x default

Use this command to configure the authentication method for port-based access to the switch. The possible methods are as follows:

- ias. Uses the internal authentication server users database for authentication. This method can be used in conjunction with any one of the existing methods like `local`, `radius`, etc.
- local. Uses the local username database for authentication.
- none. Uses no authentication.
- radius. Uses the list of all RADIUS servers for authentication.

Format	aaa authentication dot1x default {[ias | local | none | radius]}
Mode	Global Config

Example: The following is an example of the command.

```
(Routing) #configure
(Routing) (Config)#aaa authentication dot1x default local
```

clear dot1x statistics

This command resets the 802.1X statistics for the specified port or for all ports.

Format	clear dot1x statistics {*unit/slot/port* | all}
Mode	Privileged EXEC

clear radius statistics

This command is used to clear all RADIUS statistics.

Format	clear radius statistics
Mode	Privileged EXEC

dot1x eapolflood

Use this command to enable EAPOL flood support on the switch.

Default	disabled
Format	dot1x eapolflood
Mode	Global Config

no dot1x eapolflood

This command disables EAPOL flooding on the switch.

Format	no dot1x eapolflood
Mode	Global Config

authentication dynamic-vlan enable

Use this command to enable the switch to create VLANs dynamically when a RADIUS-assigned VLAN does not exist in the switch.

Default	Disabled
Format	authentication dynamic-vlan enable
Mode	Global Config

no authentication dynamic-vlan enable

Use this command to prevent the switch from creating VLANs when a RADIUS-assigned VLAN does not exist in the switch.

Format	no authentication dynamic-vlan enable
Mode	Global Config

authentication event no-response action authorize vlan

This command configures the specified VLAN as the guest VLAN on an interface or a range of interfaces. The range is 1 to the maximum VLAN ID supported by the platform. By default, the guest VLAN is 0, which means it is invalid and is not operational.

Default	disabled
Format	authentication event no-response action authorize vlan *vlan-id*
Mode	Interface Config

no authentication event no-response action authorize vlan

This command disables Guest VLAN on the interface.

Default	disabled
Format	no authentication event no-response action authorize vlan

Mode	Interface Config

authentication event fail action authorize vlan

Use this command to configure the unauthenticated VLAN associated with the specified interface or range of interfaces. This VLAN is used when the AAA server fails to recognize the client credentials and rejects the authentication attempt. The unauthenticated VLAN ID can be a valid VLAN ID from 0-Maximum supported VLAN ID (4093 for CE0128XB/CE0152XB). By default, the unauthenticated VLAN is 0, i.e. invalid and not operational.

Default	0
Format	authentication event fail action authorize vlan *vlan id*
Mode	Interface Config

no authentication event fail action authorize vlan

This command resets the unauthenticated VLAN associated with the port to its default value.

Format	no authentication event fail action authorize vlan
Mode	Interface Config

authentication event fail retry

Use this command to configure the number of times authentication may be reattempted by the client before a port moves to the authentication fail VLAN. The reattempts range is 1 to 5.

Default	3
Format	authentication event fail retry *max-attempts*
Mode	Interface Config

no authentication event fail retry

Use this command to disable the authentication reattempts by the client.

Format	no authentication event fail retry
Mode	Interface Config

clear authentication sessions

This command clears information for all authentication manager sessions. All the authenticated clients are re-intialized and forced to authenticate again.

Format	clear authentication sessions
Mode	Privileged EXEC

dot1x max-reauth-req

This command sets the maximum number of times (attempts), the authenticator state machine on this port will retransmit EAPOL EAP Request-Identity frames before timing out the supplicant. The `count` value range is 1 to 20.

Default	2
Format	dot1x max-reauth-req *count*
Mode	Interface Config

no dot1x max-reauth-req

This command resets maximum number of retries allowed per port to its default value.

Format	no dot1x max-reauth-req
Mode	Interface Config

dot1x max-req

This command sets the maximum number of times the authenticator state machine on this port will retransmit EAPOL EAP Request frames (excluding Request-Identity frames) before restarting the authentication process. The count value ranges from 1 to 10.

Default	2
Format	dot1x max-req *count*
Mode	Interface Config

no dot1x max-req

This command resets maximum number of retries allowed per port to its default value.

Format	no dot1x max-req
Mode	Interface Config

authentication max-users

Use this command to set the maximum number of clients supported on an interface or range of interfaces when multi-authentication host mode is enabled on the port. The maximum users supported per port is dependent on the product. The `count` value is in the range 1 - 48.

Default	48
Format	authentication max-users *count*
Mode	Interface Config

no authentication max-users

This command resets the maximum number of clients allowed per port to its default value.

Format	no authentication max-users
Mode	Interface Config

authentication periodic

This command enables periodic reauthentication of the supplicant for the specified interface or range of interfaces.

Default	Disabled
Format	authentication periodic
Mode	Interface Config

no authentication periodic

This command resets the periodic reauthenticate to the default.

Format	no authentication periodic
Mode	Interface Config

authentication port-control

This command sets the authentication mode to be used on the specified interface or range of interfaces. The configuration on the interface takes precedence over the global configuration of this parameter.

Use the `force-unauthorized` parameter to specify that the authenticator PAE unconditionally sets the controlled port to unauthorized. Use the `force-authorized` parameter to specify that the authenticator PAE unconditionally sets the controlled port to authorized. Use the `auto` parameter to specify that the authenticator PAE sets the controlled port mode to reflect the outcome of the authentication exchanges between the supplicant, authenticator and the authentication server.

Default	auto
Format	authentication port-control {force-unauthorized | force-authorized | auto }
Mode	Interface Config

no authentication port-control

This command sets the authentication-enabled port control mode on the specified port to the default value.

Format	no authentication port-control
Mode	Interface Config

authentication port-control all

This command configures the global authentication port-control mode. The interface port-control mode takes precedence over the global port-control mode.

Select `force-unauthorized` to specify that the authenticator PAE unconditionally sets the controlled port to unauthorized. Select `force-authorized` to specify that the authenticator PAE unconditionally sets the controlled port to authorized. Select `auto` to specify that the authenticator PAE sets the controlled port mode to reflect the outcome of the authentication exchanges between the supplicant, authenticator and the authentication server.

Default	auto
Format	authentication port-control all {force-unauthorized | force-authorized | auto }
Mode	Global Config

no authentication port-control all

This command sets the authentication mode on all ports to the default value.

Format	no authentication port-control all
Mode	Global Config

authentication host-mode

This command configures the host mode of a port. The configuration on the interface mode takes precedence over the global configuration of this parameter.

Default	multi-host
Format	authentication host-mode { multi-auth | multi-domain | multi-host | single-host | multi-domain-multi-host }
Mode	Interface Config

no authentication host-mode

This command sets the host mode for the port to the default value.

Format	no authentication host-mode
Mode	Interface Config

authentication host-mode all

This command configures the global authentication host mode. The interface host mode takes precedence over the global host mode.

Default	multi-host
Format	authentication host-mode all { multi-auth | multi-domain | multi-host | single-host | multi-domain-multi-host }
Mode	Global Config

no authentication host-mode

This command sets the host mode to the default value.

Format	no authentication host-mode all
Mode	Global Config

mab

This command is used to enable MAC Authentication Bypass (MAB) on an interface. MAB is a supplemental authentication mechanism that allows 802.1X unaware clients — such as printers, fax machines, and some IP phones — to authenticate to the network using the client MAC address as an identifier. However MAB can also be used to authenticate 802.1X aware clients.

This command also provides options to specify the type of authentication to be used, which can be either EAP-MD5, PAP, or CHAP. If enabled, EAP-MD5 is used by default.

Default	Status: Disabled If enabled, the default authentication type is EAP-MD5.
Format	mab [auth-type {pap | eap-md5 | chap}]
Mode	Interface Config

no mab

This command disables MAC authentication bypass (MAB) on an interface and resets the authentication type to the default value.

Format	no mab
Mode	Interface Config

dot1x system-auth-control

Use this command to enable the dot1x authentication support on the switch and to set the CE0128XB/CE0152XB implementation of the IEEE 802.1X feature (dot1x) to version 1. By default, the current dot1x implementation version is 0.

While disabled, the dot1x configuration is retained and can be changed, but is not activated.

Default	disabled
Format	dot1x system-auth-control
Mode	Global Config

no dot1x system-auth-control

This command is used to disable the dot1x authentication support on the switch.

Format	no dot1x system-auth-control

Mode	Global Config

authentication monitor

Use this command to enable the authentication monitor mode on the switch. The purpose of Monitor mode is to help troubleshoot port-based authentication configuration issues without disrupting network access for hosts connected to the switch. In Monitor mode, a host is granted network access to an authentication-enabled port even if it fails the authentication process. The results of the process are logged for diagnostic purposes.

Default	disabled
Format	authentication monitor
Mode	Global Config

no authentication monitor

This command disables the authentication monitor mode on the switch.

Format	no authentication monitor
Mode	Global Config

dot1x software version

This command configures the version of IEEE 802.1X software implemented on the switch. This command configures the CE0128XB/CE0152XB implementation, and not the protocol version of 802.1X. The value of the current software version is 1, and the value of the legacy software version is 0.

This command cannot be run from the CLI. The software version is set to 1 whenever the `dot1x system-auth-control` command is executed.

Default	0
Format	dot1x software version { 0 | 1 }
Mode	N/A

dot1x timeout

This command sets the value, in seconds, of the timer used by the authenticator or supplicant state machines on an interface or range of interfaces. Depending on the token used and the value (in seconds) passed, various timeout configurable parameters are set. The following tokens are supported:

Tokens	Definition
quiet-period	The value, in seconds, of the timer used by the authenticator state machine on this port to define periods of time in which it will not attempt to acquire a supplicant. This is the period for which the authenticator state machine stays in the HELD state.

Tokens	Definition
tx-period	The value, in seconds, of the timer used by the authenticator state machine on this port to determine when to send an EAPOL EAP Request/Identity frame to the supplicant.
server-timeout	The value, in seconds, of the timer used by the authenticator state machine on this port to timeout the authentication server.
supp-timeout	The value, in seconds, of the timer used by the authenticator state machine on this port to timeout the supplicant.
auth-period	The value, in seconds, of the timer used by the supplicant state machine on this port to timeout an authenticator when waiting for a response to packets other than EAPOL-Start.
start-period	The value, in seconds, of the timer used by the supplicant state machine on this port to determine the interval between two successive EAPOL-Start frames when they are being retransmitted.
held-period	The value, in seconds, of the timer used by the supplicant state machine on this port to determine the length of time it will wait before trying to send the authentication credentials again after a failed attempt. This is the period for which the supplicant state machine stays in the HELD state.

Default
- quiet-period: 60 seconds
- tx-period: 30 seconds
- supp-timeout: 30 seconds
- server-timeout: 30 seconds
- auth-period: 30 seconds
- start-period: 30 seconds
- held-period: 60 seconds

Format dot1xtimeout{quiet-period*seconds*|tx-period*seconds*|supp-timeout*seconds*|server-timeout *seconds* | auth-period *seconds* | start-period *seconds* | held-period *seconds*}

Mode Interface Config

no dot1x timeout

This command sets the value, in seconds, of the timer used by the authenticator state machine on this port to the default values. Depending on the token used, the corresponding default values are set.

Format no dot1x timeout {quiet-period *seconds* | tx-period *seconds* | supp-timeout *seconds* | server-timeout *seconds* | auth-period *seconds* | start-period *seconds* | held-period *seconds*}

Mode Interface Config

dot1x user

This command adds the specified user to the list of users with access to the specified port or all ports. The `user` parameter must be a configured user.

Format dot1x user *user* {*unit/slot/port* | all}

Mode Global Config

no dot1x user

This command removes the user from the list of users with access to the specified port or all ports.

Format	no dot1x user *user* {*unit/slot/port* | all}
Mode	Global Config

authentication event server dead action

This command configures the actions to take when all the authentication servers are dead. The command also configures the critical VLAN ID. If the VLAN ID is not specified, the port PVID is used as the critical VLAN ID.

The `reinitialize` action triggers reauthentication for all authenticated clients on the port. Supplicants on the voice VLAN, unauthenticated VLAN (authentication failed clients), and guest VLAN are not disturbed. During reauthentication if all the servers are still dead, the supplicant is authorized and placed in the critical VLAN without contacting the RADIUS server for authentication.

The `authorize` action authorizes the authenticated supplicants and assigns them to the critical VLAN. Supplicants on the RADIUS assigned VLAN, voice VLAN, unauthenticated VLAN, and guest VLAN are not disturbed. Supplicants authorized on the port PVID are reauthorized on the critical VLAN.

Default	Action: None VLAN: Port PVID
Format	authentication event server dead action [{reinitialize | authorize}][vlan *vlan-id*]]
Mode	Interface Config

no authentication event server dead action

This command configures the dead server action to none.

Format	no authentication server dead action
Mode	Interface Config

authentication event server dead action authorize voice

This command enables authorization of voice devices on the critical voice VLAN when all the authentication servers are dead. The configured voice VLAN of the port, on which the voice device is connected, is used as the critical voice VLAN ID.

The connected device is identified as a voice device by the vendor-specific RADIUS attribute “device-traffic-class=voice”, which is sent in the RADIUS Access-Accept message. This means that the device should have been identified and authenticated once by reachable RADIUS servers before they went dead. The critical voice VLAN feature is activated under the following conditions:

- This command is configured.
- The RADIUS servers have stopped responding (i.e. are dead).

- A reauthentication of identified and authenticated voice devices occurs.

When this command is not configured, the voice device is not authorized when all RADIUS servers are dead.

Default	Action: None
Format	authentication event server dead action authorize voice
Mode	Interface Config

no authentication event server dead action authorize voice

This command configures the dead server action for voice devices to none.

Format	no authentication server dead action authorize voice
Mode	Interface Config

authentication event server alive action

This command configures the actions to take when one authentication server comes back alive after all were dead. The `reinitialize` action triggers the reauthentication of supplicants authenticated on the critical VLAN.

Default	Action: None
Format	authentication event server alive action [reinitialize]
Mode	Interface Config

no authentication event server alive action

This command configures the alive server action to none.

Format	no authentication server alive action
Mode	Interface Config

authentication violation

This command is used to configure the action to be taken when a security violation occurs on a port. The authentication violation can occur when a device tries to connect to a port where maximum number of devices has been exceeded.

Default	Restrict
Format	authentication violation { protect | restrict | shutdown }
Mode	Interface Config

no authentication violation

This command resets the authentication violation mode allowed per port to its default mode.

Format	no authentication violation

Mode Interface Config

mab request format attribute 1

This command sets configuration parameters that are used to format attribute1 for MAB requests to the RADIUS server. RADIUS attribute 1 is the username, which is often the client MAC address.

Default The group size is 2
The separator is :
The case is uppercase.

Format mab request format attribute 1 groupsize {1 | 2 | 4 | 12} separator {- | : | .} [lowercase | uppercase]

Mode Global Config

groupsize	The number of characters included in a group. In the following example, the group size is 2: 00:10:18:99:F2:B3 In the following example, the group size is 4: 0010:1899:F2B3
separator	The character that separates the group. In the following example, the separator is - (hyphen): 00-10-18-99-F2-B3 In the following example, the separator is : (colon): 00:10:18:99:F2:B3
lowercase | uppercase	The case of any letters in the username. In the following example, the case is lowercase: 00:10:18:99:f2:b3 In the following example, the case is uppercase: 00:10:18:99:F2:B3

no mab request format attribute 1

This command attribute1 formats for MAB requests to the RADIUS server to the default values.

Format no mab request format attribute 1

Mode Global Config

authentication critical recovery max-reauth

This command configures the number of supplicants that are reauthenticated per second. This configuration is for the entire system across all the supplicants on all ports. This is used to control the system and network load when the number of supplicants to be reauthenticated is large. These reauthentications can be triggered due to the configured dead or alive server reinitialize actions.

The range for *number-of-clients* is 1 to 50 clients.

Default	10 clients
Format	authentication critical recovery max-reauth *number-of-clients*
Mode	Global Config

no authentication critical recovery max-reauth

This command resets the number of supplicants that are reauthenticated per second to the default value.

Format	no authentication critical recovery max-reauth
Mode	Global Config

authentication enable

This command globally enables the Authentication Manager. Interface configuration takes effect only if the Authentication Manager is enabled with this command.

Default	disabled
Format	*authentication enable*
Mode	Global Config

no authentication enable

This command disables the Authentication Manager.

Format	*no authentication enable*
Mode	Global Config

authentication order

This command sets the order of authentication methods used on a port. The available authentication methods are Dot1x, MAB, and captive portal. Ordering sets the order of methods that the switch attempts when trying to authenticate a new device connected to a port. If one method is unsuccessful or timed out, the next method is attempted.

Each method can only be entered once. Ordering is only possible between 802.1x and MAB. Captive portal can be configured either as a stand-alone method or as the last method in the order.

Format	authentication order {dot1x [mab [captive-portal] | captive-portal] | mab [dot1x [captive-portal] | captive-portal] | captive-portal}
Mode	Interface Config

no authentication order

This command returns the port to the default authentication order.

Format	*no authentication order*
Mode	Interface Config

authentication priority

This command sets the priority for the authentication methods used on a port. The available authentication methods are Dot1x, MAB, and captive portal. The authentication priority decides if a previously authenticated client is reauthenticated with a higher-priority method when the same is received. Captive portal is always the last method in the list.

Default	authentication order dot1x mab captive portal
Format	authentication priority {dot1x [mab [captive portal] | captive portal] | mab [dot1x [captive portal] | captive portal] | captive portal}
Mode	Interface Config

no authentication priority

This command returns the port to the default order of priority for the authentication methods.

Format	*no authentication priority*
Mode	Interface Config

authentication timer restart

This command sets the time, in seconds, after which reauthentication starts. (The default time is 300 seconds.) The timer restarts the authentication only after all the authentication methods fail. At the expiration of this timer, authentication is re-initiated for the port.

Format	*authentication timer restart <300-65535>*
Mode	Interface Config

no authentication timer restart

This command sets the reauthentication value to the default value of 3600 seconds.

Format	*no authentication timer restart*
Mode	Interface Config

authentication timer reauthenticate

This command configures the period of time after which the Authenticator attempts to reauthenticate a supplicant on the port. You can specify the timeout value, in seconds, or use the `server` parameter to get the reauthentication timeout value from the server (for example, RADIUS). The `server` option specifies that the server-supplied session timeout and session termination-action are used by the Authenticator to reauthenticate a supplicant on the port. The server option is enabled by default. The reauthenticate `seconds` value range is 1 to 65535.

For reauthentication to happen after the configured or server-provided timeout, the `authentication periodic` command should have periodic reauthentication enabled (see “authentication periodic” on page 419).

Default	server
Format	*authentication timer reauthenticate {seconds | server}*
Mode	Interface Config

no authentication timer reauthenticate

This command sets the reauthentication value to the default value.

Format	*no authentication timer reauthenticate*
Mode	Interface Config

clear authentication statistics

Use this command to clear the authentication statistics on an interface.

Format	*clear authentication statistics {unit/slot/port] | all}*
Mode	Privileged EXEC

clear authentication authentication-history

Use this command to clear the authentication history log for an interface.

Format	*clear authentication authentication-history {unit/slot/port | all}*
Mode	Privileged EXEC

802.1X Supplicant Commands

CE0128XB/CE0152XB supports 802.1X (“dot1x”) supplicant functionality on point-to-point ports. The administrator can configure the user name and password used in authentication and capabilities of the supplicant port.

dot1x pae

This command sets the port’s dot1x role. The port can serve as a supplicant, an authenticator, or none.

Default	authenticator
Format	dot1x pae {supplicant | authenticator | none}
Mode	Interface Config

dot1x supplicant port-control

This command sets the ports authorization state (Authorized or Unauthorized) either manually or by setting the port to auto-authorize upon startup. By default all the ports are authenticators. If the port's attribute needs to be moved from <authenticator to supplicant> or <supplicant to authenticator>, use this command.

Default	auto
Format	dot1x supplicant port-control {auto | force-authorized | force_unauthorized}
Mode	Interface Config

Parameter	Description
auto	The port is in the Unauthorized state until it presents its user name and password credentials to an authenticator. If the authenticator authorizes the port, then it is placed in the Authorized state.
force-authorized	Sets the authorization state of the port to Authorized, bypassing the authentication process.
force-unauthorized	Sets the authorization state of the port to Unauthorized, bypassing the authentication process.

no dot1x supplicant port-control

This command sets the port-control mode to the default, auto.

Default	auto
Format	no dot1x supplicant port-control
Mode	Interface Config

dot1x max-start

This command configures the number of attempts that the supplicant makes (EAP start frames sent) to find the authenticator before the supplicant assumes that there is no authenticator.

Default	3
Format	dot1x max-start <*1-10*>
Mode	Interface Config

no dot1x max-start

This command sets the max-start value to the default.

Format	no dot1x max-start
Mode	Interface Config

dot1x supplicant user

Use this command to configure the user credentials to be used by the supplicant state machine for authentication.

Default	None
Format	dot1x supplicant user {user}
Mode	Interface Config

dot1x supplicant user

Use this command to configure the user credentials to the default.

Format	no dot1x supplicant user
Mode	Interface Config

Authentication Show Commands

show authentication

This command displays the authentication manager global information and the number of authenticated clients.

Format	show authentication
Mode	Privileged EXEC

Parameter	Definition
Authentication Manager Status	The admin status of the Authentication Manager on the switch. This is a global configuration.
Dynamic VLAN Creation Mode	Indicates whether the switch can dynamically create a RADIUS-assigned VLAN if it does not currently exist on the switch.
VLAN Assignment Mode	Indicates whether assignment of an authorized port to a RADIUS-assigned VLAN is allowed (enabled) or not (disabled).
Authentication Monitor Mode	Indicates whether the Monitor mode on the switch is enabled or disabled.
Critical Recovery Max ReAuth	Indicates the number of supplicants that are reauthenticated per second.
Number of Authenticated clients	The total number of clients authenticated on the switch except the ones in Monitor Mode.
Number of clients in Monitor Mode	The number clients authorized by Monitor mode on the switch.

Example:

```
(dhcp-10-130-86-142) #show authentication

Authentication Manager Status.................. Disabled
Dynamic Vlan Creation Mode..................... Disabled
VLAN Assignment Mode........................... Disabled
Authentication Monitor Mode.................... Disabled
Critical Recovery Max ReAuth................... 10

Number of Authenticated clients................ 2
Number of clients in Monitor mode............. 0
```

show authentication authentication-history

Use this command to display information about the authentication history for a specified interface.

Format	show authentication authentication-history *unit/slot/port*
Mode	Privileged EXEC

Parameter	Definition
Timestamp	The time of the authentication.
Interface	The interface.
MAC-Address	The MAC address for the interface.
Auth Status	The authentication and status for the interface.
Method	The authentication method for the interface.

Example: The following information is shown for the interface.

```
(switch) #show authentication authentication-history 1/0/2

Timestamp           Interface  MAC-Address       Auth Status   Method
--------------------  ---------  -----------------  ------------  ------
May 07 2018 13:02:41  1/0/2      58:05:94:1C:00:00  Unauthorized  802.1X
May 07 2018 13:01:33  1/0/2      58:05:94:1C:00:00  Unauthorized  802.1X
```

show authentication clients

Use this command to display Authentication Manager information for the clients authenticated on an interface.

Format	show authentication clients {all | interface *unit/slot/port* }
Mode	Privileged EXEC

Parameter	Definition
Interface	The interface for which authentication configuration information is being displayed.
Mac Address	The MAC address of the client.
User Name	The user name associated with the client.
VLAN Assigned Reason	This can take one of the following values: • Default VLAN: The client has been authenticated on the port default VLAN and the authentication server is not RADIUS. • RADIUS: RADIUS is used for authenticating the client. • Voice VLAN: The client is identified as a Voice device. • Critical VLAN: The client has been authenticated on the Critical VLAN. • Unauthenticated VLAN: The client has been authenticated on the Unauthenticated VLAN. • Guest VLAN: The client has been authenticated on the Guest VLAN. • Monitor Mode: The client has been authenticated by Monitor mode.

Parameter	Definition
Host Mode	The authentication host mode configured on the interface. The possible values are multi-auth, multi-domain, multi-host, single-host and multi-domain-multi-host.
Method	The method used to authenticate the client on the interface. The possible values are 802.1x. MAB, Captive Portal and None.
Control Mode	The configured control mode for this port. Possible values are force-unauthorized, auto and unauthorized.
Session Time	The amount of time the client session has been active.
Session Timeout	This value indicates the time for which the given session is valid. The time period in seconds is returned by the RADIUS server on authentication of the port.
Session Termination Action	This value indicates the action to be taken once the session timeout expires. Possible values are Default and Radius-Request. If the value is Default, the session is terminated and client details are cleared. If the value is Radius-Request, then a reauthentication of the client is performed.
Filter ID	Identifies the Filter ID returned by the RADIUS server when the client was authenticated. This is a configured DiffServ policy name on the switch.
DACL	Identifies the Downloadable ACL returned by the RADIUS server when the client was authenticated.
Acct Session ID	The Accounting Session Id associated with the client session.

Example:

```
(switch) #show authentication clients interface 1/0/2

Mac Address.................................. 58:05:94:1C:00:00
User Name..................................... testixia
VLAN Assigned Reason.......................... Voice VLAN (100)
Host Mode .................................... multi-auth
Method........................................ 802.1X
Control Mode.................................. auto
Session time ... .............................. 0
Session timeout .............................. 0
Session Termination Action.................... Default
Filter-Id .................................... None
DACL.......................................... None
Session Termination Action.................... Default
Acct SessionId:............................... testixia:200000003
```

show authentication interface

Use this command to display authentication method information either for all interfaces or a specified port.

Format	show authentication interface {all | *unit/slot/port* }
Mode	Privileged EXEC

The following information is displayed for each interface.

Parameter	Definition
Authentication Manager Status	The admin status of Authentication on the switch. This is a global configuration.

Parameter	Definition
Interface	The interface for which authentication configuration information is being displayed.
Port Control Mode	The configured control mode for this port. Possible values are force-unauthorized | auto | unauthorized.
Host Mode	The authentication host mode configured on the interface.
Authentication Restart timer	The time, in seconds, after which reauthentication starts.
Configured method order	The order of authentication methods used on the interface.
Enabled method order	The order of authentication methods used on the interface.
Configured method priority	The priority for the authentication methods used on the interface.
Enabled method priority	The priority for the authentication methods used on the interface.
Reauthentication Period	The period after which all clients on the interface will be reauthenticated.
Reauthentication Enabled	Indicates whether reauthentication is enabled on the interface.
Maximum Users	The maximum number of clients that can be authenticated on the interface if the interface is configured as multi-auth host mode.
Guest VLAN ID	The VLAN id to be used to authorize clients that time out or fail authentication due to invalid credentials. This is applicable only for 802.1x unaware clients.
Unauthenticated VLAN ID	The VLAN id to be used to authorize clients that that time out or fail authentication due to invalid credentials. This is applicable only for 802.1x clients.
Critical VLAN ID	The VLAN id to be used to authorize clients that that time out due to unreachable RADIUS servers.
Authentication Violation Mode	The action to be taken when a security violation occurs on a port.
Authentication Server Dead action	The action to be undertaken for data clients when all RADIUS servers are found dead.
Authentication Server Dead action for Voice	The action to be undertaken for voice clients when all RADIUS servers are found dead.
Authentication Server Alive action	The action to be undertaken for data clients when a RADIUS server comes back alive after all were found dead.

Example: The following example displays the output for the command.

```
(switch) #show  authentication interface 1/0/1

Authentication Manager Status................. Enabled

Interface..................................... 1/0/1
Authentication Restart timer.................. 300
Configured method order........................ mab undefined undefined
Enabled method order.......................... mab undefined undefined
Configured method priority..................... dot1x mab captive-portal
Enabled method priority........................ dot1x mab undefined
Reauthentication Period (secs)................ 3600
Reauthentication Enabled....................... False
Maximum Users................................. 48
Guest VLAN ID..... ........................... 0
Unauthenticated VLAN ID....................... 0
Critical Vlan Id.............................. 0
```

```
Authentication Violation Mode.................. Restrict
Authentication Server Dead action.............. None
Authentication Server Dead action for Voice.... None
Authentication Server Alive action............. None
```

show authentication methods

Use this command to display information about the authentication methods.

Format	show authentication methods
Mode	Privileged EXEC

Parameter	Definition
Authentication Login List	The authentication login listname.
Method 1	The first method in the specified authentication login list, if any.
Method 2	The second method in the specified authentication login list, if any.
Method 3	The third method in the specified authentication login list, if any.

Example: The following example displays the authentication configuration.

```
(switch)#show authentication methods

Login Authentication Method Lists
---------------------------------
defaultList        :  local
networkList        :  local

Enable Authentication Method Lists
----------------------------------
enableList         :  enable   none
enableNetList      :  enable   deny

Line     Login Method List    Enable Method List
-------  -----------------    ------------------
Console  defaultList          enableList
Telnet   networkList          enableNetList
SSH      networkList          enableNetList

HTTPS      :local
HTTP       :local
DOT1X      :
```

show authentication statistics

Use this command to display the authentication statistics for an interface.

Format	show authentication statistics unit/slot/port
Mode	Privileged EXEC

The following information is displayed for each interface.

Parameter	Definition
Port	The port for which information is being displayed.

Parameter	Definition
802.1X attempts	The number of Dot1x authentication attempts for the port.
802.1X failed attempts	The number of failed Dot1x authentication attempts for the port.
MAB attempts	The number of MAB (MAC authentication bypass) authentication attempts for the port.
MAB failed attempts	The number of failed MAB authentication attempts for the port.
Captive-portal attempts	The number of captive portal (Web authorization) authentication attempts for the port.
Captive-portal failed attempts	The number of failed captive portal authentication attempts for the port.

Example:

```
(Routing) #show authentication statistics 1/0/1

Port........................................... 1/0/1
802.1X attempts................................ 0
802.1X failed attempts......................... 0
Mab attempts................................... 0
Mab failed attempts............................ 0
Captive-portal attempts........................ 0
Captive-Portal failed attempts................. 0
```

show dot1x

This command is used to show a summary of the global dot1x configuration, summary information of the dot1x configuration for a specified port or all ports, the detailed dot1x configuration for a specified port and the dot1x statistics for a specified port - depending on the tokens used.

Format	show dot1x [{supplicant *summary* {*unit/slot/port* | all} | detail *unit/slot/port* | statistics *unit/slot/port*]
Mode	Privileged EXEC

If you do not use the optional parameters `unit/slot/port`, the command displays the global configuration.

Parameter	Definition
Administrative Mode	Indicates whether 8021X is enabled or disabled.
EAPOL Flood Mode	Indicates whether the EAPOL flood support is enabled on the switch.
Software Version	The version of the dot1X implementation running on the switch.

Example:

```
(switch) #show dot1x

Administrative Mode............... Enabled
EAPOL Flood Mode.................. Disabled
Software Version.................. 1
```

If you use the optional parameter ***`supplicant summary {unit/slot/port | all}`***, the dot1x supplicant authorization for the specified port or all ports are displayed.

Note: MAC-based dot1x authentication support is platform-dependent.

Parameter	Definition
Port	The interface whose configuration is displayed.
Port Status	Indicates whether the port is authorized or unauthorized. Possible values are authorized | unauthorized.

Example: The following shows example CLI display output for the command `show dot1x supplicant summary 1/0/1.`

```
Operating
Interface                                    Port Status
---------                                    ------------
0/1                                          Authorized
```

If the port is configured as an Authenticator, the optional parameter `detail unit/slot/port` displays the detailed dot1x configuration for the specified port.

Parameter	Definition
Port	The interface whose configuration is displayed.
Protocol Version	The protocol version associated with this port. The only possible value is 1,corresponding to the first version of the dot1x specification.
PAE Capabilities	The port access entity (PAE) functionality of this port. Possible values are Authenticator or Supplicant.
Quiet Period	The timer used by the authenticator state machine on this port to define periods of time in which it will not attempt to acquire a supplicant. The value is expressed in seconds and will be in the range 0 and 65535. This is the period for which the authenticator state machine stays in the HELD state.
Transmit Period	The timer used by the authenticator state machine on the specified port to determine when to send an EAPOL EAP Request/Identity frame to the supplicant. The value is expressed in seconds and will be in the range of 1 and 65535.
Supplicant Timeout	The timer used by the authenticator state machine on this port to timeout the supplicant. The value is expressed in seconds and will be in the range of 1 and 65535.
Server Timeout	The timer used by the authenticator on this port to timeout the authentication server. The value is expressed in seconds and will be in the range of 1 and 65535.
Maximum Request-Identities	The maximum number of times (attempts), the authenticator state machine on this port will retransmit an EAPOL EAP Request-Identity frames before timing out the supplicant.
Maximum Requests	The maximum number of times the authenticator state machine on this port will retransmit an EAPOL EAP Request/Identity before restarting the authentication process.
Key Transmission Enabled	Indicates if the key is transmitted to the supplicant for the specified port. Possible values are True or False.

Example: The following shows example CLI display output for the command.

```
(switch) #show dot1x detail 1/0/3
Port.......................................... 1/0/3
Protocol Version.............................. 1
PAE Capabilities.............................. Authenticator
Quiet Period (secs)........................... 60
Transmit Period (secs)........................ 30
Supplicant Timeout (secs)..................... 30
```

```
Server Timeout (secs).......................... 30
Maximum Request-Identities..................... 2
Maximum Requests............................... 2
Key Transmission Enabled....................... False
```

If the port is configured as a Supplicant, the `show dot1x detail unit/slot/port` command will display the following dot1x parameters

Parameter	Definition
Port	The interface whose statistics are displayed.
Protocol Version	The protocol version associated with this port. The only possible value is 1,corresponding to the first version of the dot1x specification.
PAE Capabilities	The port access entity (PAE) functionality of this port. Possible values are Authenticator or Supplicant.
Control Mode	The configured control mode for this port. Possible values are force-unauthorized | auto | unauthorized.
Supplicant PACP State	Current state of the authenticator PACP state machine. Possible values are Initialize, Logoff, Held, Unauthenticated, Authenticating and Authenticated.
Maximum Start Messages	The maximum number of EAP Start messages that the supplicant will send before moving to Unauthenticated State.
Start period	The timer period between each EAP Start message the supplicant sends when it does not hear from the authenticator.
Held period	The time period the supplicant waits before it restarts authentication after an EAP failure.
Authentication period	The time period the supplicant waits before it declares EAP timeout after it sends an EAP message (except EAP Start).

Example: The following shows example CLI display output for the command.

```
(switch) (Config)#show dot1x detail 1/0/24

Port.......................................... 1/0/24
Protocol Version.............................. 1
PAE Capabilities.............................. Supplicant
Control Mode.................................. auto
Supplicant PAE State.......................... Authenticated

Maximum Start Messages........................ 3
Start Period (secs)........................... 30
Held Period (secs)............................ 60
Authentication Period (secs).................. 30
```

If you use the optional parameter `statistics` *`unit/slot/port`*, the following dot1x statistics for the specified port appear.

Parameter	Definition
Port	The interface whose statistics are displayed.
PAE Capabilities	The port access entity (PAE) functionality of this port. Possible values are Authenticator or Supplicant.
EAPOL Frames Received	The number of valid EAPOL frames of any type that have been received by this authenticator.
EAPOL Frames Transmitted	The number of EAPOL frames of any type that have been transmitted by this authenticator.

Parameter	Definition
EAPOL Start Frames Received	The number of EAPOL start frames that have been received by this authenticator.
EAPOL Logoff Frames Received	The number of EAPOL logoff frames that have been received by this authenticator.
Last EAPOL Frame Version	The protocol version number carried in the most recently received EAPOL frame.
Last EAPOL Frame Source	The source MAC address carried in the most recently received EAPOL frame.
EAP Response/Id Frames Received	The number of EAP response/identity frames that have been received by this authenticator.
EAP Response Frames Received	The number of valid EAP response frames (other than resp/id frames) that have been received by this authenticator.
EAP Request/Id Frames Transmitted	The number of EAP request/identity frames that have been transmitted by this authenticator.
EAP Request Frames Transmitted	The number of EAP request frames (other than request/identity frames) that have been transmitted by this authenticator.
Invalid EAPOL Frames Received	The number of EAPOL frames that have been received by this authenticator in which the frame type is not recognized.
EAP Length Error Frames Received	The number of EAPOL frames that have been received by this authenticator in which the frame type is not recognized.

Example: The following shows example CLI display output for the command.

```
(switch) #show dot1x statistics 0/1
Port.......................................... 0/1
EAPOL Frames Received.......................... 0
EAPOL Frames Transmitted....................... 0
EAPOL Start Frames Transmitted................. 3
EAPOL Logoff Frames Received................... 0
EAP Resp/Id frames transmitted................. 0
EAP Response frames transmitted................ 0
EAP Req/Id frames transmitted.................. 0
EAP Req frames transmitted..................... 0
Invalid EAPOL frames received.................. 0
EAP length error frames received............... 0
Last EAPOL Frame Version....................... 0
Last EAPOL Frame Source........................ 00:00:00:00:02:01
```

show dot1x users

This command displays 802.1X port security user information for locally configured users.

Format	show dot1x users *unit/slot/port*
Mode	Privileged EXEC

Parameter	Definition
Users	Users configured locally to have access to the specified port.

Example:

```
#show dot1x users 1/0/1
```

```
Users
-----------------
admin
guest
test4
```

show mab

This command shows a summary of the global MAB configuration and summary information about the MAB configuration for all ports. This command also provides the detailed MAB sessions for a specified port.

Format	show mab [interface *unit/slot/port*]
Mode	Privileged EXEC

Parameter	Definition
MAB Request Fmt Attr1 Groupsize	Displays the group size to be used by the switch for formatting RADIUS attribute 1 in MAB requests.
MAB Request Fmt Attr1 Separator	Displays the separator to be used by the switch for formatting RADIUS attribute 1 in MAB requests.
MAB Request Fmt Attr1 Case	Displays the case (uppercase or lowercase) to be used by the switch for formatting RADIUS attribute 1 in MAB requests.
Interface	Identifies the port.
Admin Mode	Indicates whether authentication control on the switch is enabled or disabled.
Auth-type	The type of authentication used for a MAB-enabled port, which can be either EAP-MD5, PAP, or CHAP.

Example:

```
(switch) #show mab

MAB Request Fmt Attr1 Groupsize... 2
MAB Request Fmt Attr1 Separator... legacy(:)
MAB Request Fmt Attr1 Case........ uppercase

Interface    Admin Mode                              Auth-type
---------    -----------    ---------
1/0/1        Disabled                                N/A
1/0/2        Enabled                                 eap-md5
1/0/3        Disabled                                N/A
1/0/4        Disabled                                N/A
```

Example:

```
(switch) #show mab interface 1/0/2

Interface    Admin Mode    Auth-type
---------    -----------   ---------
1/0/2        Enabled       eap-md5
```

Deprecated IEEE 802.1X Commands

The following table lists the CLI commands that are deprecated and replaced as a result of the move from the IEEE 802.1X 2004 standard to the 2010 standard.

Table 10. *Deprecated IEEE 802.1X Commands*

Deprecated Command	Replaced By
dot1x initialize	clear authentication sessions
dot1x re-authenticate	
dot1x critical recovery max-reauth	authentication critical recovery max-reauth
dot1x system-auth-control monitor	authentication monitor
dot1x port-control all	authentication port-control all
dot1x dynamic-vlan enable	authentication dynamic-vlan enable
dot1x guest-vlan	authentication event no-response action authorize vlan
dot1x unauthenticated-vlan	authentication event fail action authorize vlan
dot1x mac-auth-bypass	mab
dot1x max-users	authentication max-users
dot1x re-authentication	authentication periodic
dot1x timer reauth-period	authentication timer reauthenticate
dot1x supplicant timeout start-period	dot1x timer start-period
dot1x supplicant timeout auth-period	dot1x timer auth-period
dot1x supplicant timeout held-period	dot1x timer held-period
dot1x supplicant max-start	dot1x max-start
dot1x port-control mac-based	authentication enable authentication port-control auto authentication host-mode multi-auth
dot1x port-control auto	authentication enable authentication port-control auto authentication host-mode multi-domain-multi-host
dot1x port-control force-authorized	authentication enable authentication port-control force-authorized authentication host-mode multi-host
dot1x port-control force-unauthorized	authentication enable authentication port-control force-unauthorized authentication host-mode multi-host
clear dot1x authentication-history	clear authentication authentication-history
show dot1x authentication-history	show authentication authentication-history
show dot1x clients	show authentication clients

Storm-Control Commands

This section describes commands you use to configure storm-control and view storm-control configuration information. A traffic storm is a condition that occurs when incoming packets flood the LAN, which creates performance degradation in the network. The Storm-Control feature protects against this condition.

CE0128XB/CE0152XB provides broadcast, multicast, and unicast story recovery for individual interfaces. Unicast Storm-Control protects against traffic whose MAC addresses are not known by the system. For broadcast, multicast, and unicast storm-control, if the rate of traffic ingressing on an interface increases beyond the configured threshold for that type, the traffic is dropped.

To configure storm-control, you will enable the feature for all interfaces or for individual interfaces, and you will set the threshold (storm-control level) beyond which the broadcast, multicast, or unicast traffic will be dropped. The Storm-Control feature allows you to limit the rate of specific types of packets through the switch on a per-port, per-type, basis.

Configuring a storm-control level also enables that form of storm-control. Disabling a storm-control level (using the `no` version of the command) sets the storm-control level back to the default value and disables that form of storm-control. Using the `no` version of the storm-control command (not stating a “level”) disables that form of storm-control but maintains the configured “level” (to be active the next time that form of storm-control is enabled.)

Note: The actual rate of ingress traffic required to activate storm-control is based on the size of incoming packets and the hard-coded average packet size of 512 bytes - used to calculate a packet-per-second (pps) rate - as the forwarding-plane requires pps versus an absolute rate kilobits per second (Kb/s). For example, if the configured limit is 10%, this is converted to ~25000 pps, and this pps limit is set in forwarding plane (hardware). You get the approximate desired output when 512-byte packets are used.

storm-control broadcast

Use this command to enable broadcast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If the mode is enabled, broadcast storm recovery is active and, if the rate of L2 broadcast traffic ingressing on an interface increases beyond the configured threshold, the traffic will be dropped. Therefore, the rate of broadcast traffic will be limited to the configured threshold.

Default	disabled
Format	storm-control broadcast
Mode	• Global Config • Interface Config

no storm-control broadcast

Use this command to disable broadcast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format	no storm-control broadcast
Mode	• Global Config • Interface Config

storm-control broadcast action

This command configures the broadcast storm recovery action to either `shutdown` or `trap` for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If configured to `shutdown`, the interface that receives the broadcast packets at a rate above the threshold is diagnostically disabled. If set to `trap`, the interface sends trap messages approximately every 30 seconds until broadcast storm control recovers.

Default	None
Format	storm-control broadcast action {shutdown | trap}
Mode	• Global Config • Interface Config

no storm-control broadcast action

This command configures the broadcast storm recovery action option to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format	no storm-control broadcast action
Mode	• Global Config • Interface Config

storm-control broadcast level

Use this command to configure the broadcast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) as a percentage of link speed and enable broadcast storm recovery. If the mode is enabled, broadcast storm recovery is active, and if the rate of L2 broadcast traffic ingressing on an interface increases beyond the configured threshold, the traffic is dropped. Therefore, the rate of broadcast traffic is limited to the configured threshold.

Default	5
Format	storm-control broadcast level *0-100*
Mode	• Global Config • Interface Config

no storm-control broadcast level

This command sets the broadcast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables broadcast storm recovery.

Format	no storm-control broadcast level
Mode	• Global Config • Interface Config

storm-control broadcast rate

Use this command to configure the broadcast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) in packets per second. If the mode is enabled, broadcast storm recovery is active, and if the rate of L2 broadcast traffic ingressing on an interface increases beyond the configured threshold, the traffic is dropped. Therefore, the rate of broadcast traffic is limited to the configured threshold.

Default	0
Format	storm-control broadcast rate *0-33554431*
Mode	• Global Config • Interface Config

no storm-control broadcast rate

This command sets the broadcast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables broadcast storm recovery.

Format	no storm-control broadcast rate
Mode	• Global Config • Interface Config

storm-control multicast

This command enables multicast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If the mode is enabled, multicast storm recovery is active, and if the rate of L2 multicast traffic ingressing on an interface increases beyond the configured threshold, the traffic will be dropped. Therefore, the rate of multicast traffic will be limited to the configured threshold.

Default	disabled
Format	storm-control multicast
Mode	• Global Config • Interface Config

no storm-control multicast

This command disables multicast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format	no storm-control multicast

Mode	• Global Config • Interface Config

storm-control multicast action

This command configures the multicast storm recovery action to either `shutdown` or `trap` for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If configured to `shutdown`, the interface that receives multicast packets at a rate above the threshold is diagnostically disabled. The option `trap` sends trap messages approximately every 30 seconds until multicast storm control recovers.

Default	None
Format	storm-control multicast action {shutdown | trap}
Mode	• Global Config • Interface Config

no storm-control multicast action

This command returns the multicast storm recovery action option to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format	no storm-control multicast action
Mode	• Global Config • Interface Config

storm-control multicast level

This command configures the multicast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) as a percentage of link speed and enables multicast storm recovery mode. If the mode is enabled, multicast storm recovery is active, and if the rate of L2 multicast traffic ingressing on an interface increases beyond the configured threshold, the traffic will be dropped. Therefore, the rate of multicast traffic will be limited to the configured threshold.

Default	5
Format	storm-control multicast level *0-100*
Mode	• Global Config • Interface Config

no storm-control multicast level

This command sets the multicast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables multicast storm recovery.

Format	no storm-control multicast level *0-100*

Mode	• Global Config • Interface Config

storm-control multicast rate

Use this command to configure the multicast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) in packets per second. If the mode is enabled, multicast storm recovery is active, and if the rate of L2 broadcast traffic ingressing on an interface increases beyond the configured threshold, the traffic is dropped. Therefore, the rate of multicast traffic is limited to the configured threshold.

Default	0
Format	storm-control multicast rate *0-33554431*
Mode	• Global Config • Interface Config

no storm-control multicast rate

This command sets the multicast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables multicast storm recovery.

Format	no storm-control multicast rate
Mode	• Global Config • Interface Config

storm-control unicast

This command enables unicast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If the mode is enabled, unicast storm recovery is active, and if the rate of unknown L2 unicast (destination lookup failure) traffic ingressing on an interface increases beyond the configured threshold, the traffic will be dropped. Therefore, the rate of unknown unicast traffic will be limited to the configured threshold.

Default	disabled
Format	storm-control unicast
Mode	• Global Config • Interface Config

no storm-control unicast

This command disables unicast storm recovery mode for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format	no storm-control unicast
Mode	• Global Config • Interface Config

storm-control unicast action

This command configures the unicast storm recovery action to either `shutdown` or `trap` for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode). If configured to `shutdown`, the interface that receives unicast packets at a rate above the threshold is diagnostically disabled. The option `trap` sends trap messages approximately every 30 seconds until unicast storm control recovers.

Default	None
Format	storm-control unicast action {shutdown | trap}
Mode	• Global Config • Interface Config

no storm-control unicast action

This command returns the unicast storm recovery action option to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode).

Format	no storm-control unicast action
Mode	• Global Config • Interface Config

storm-control unicast level

This command configures the unicast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) as a percentage of link speed, and enables unicast storm recovery. If the mode is enabled, unicast storm recovery is active, and if the rate of unknown L2 unicast (destination lookup failure) traffic ingressing on an interface increases beyond the configured threshold, the traffic will be dropped. Therefore, the rate of unknown unicast traffic will be limited to the configured threshold.This command also enables unicast storm recovery mode for an interface.

Default	5
Format	storm-control unicast level *0-100*
Mode	• Global Config • Interface Config

no storm-control unicast level

This command sets the unicast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables unicast storm recovery.

Format	no storm-control unicast level
Mode	• Global Config • Interface Config

storm-control unicast rate

Use this command to configure the unicast storm recovery threshold for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) in packets per second. If the mode is enabled, unicast storm recovery is active, and if the rate of L2 broadcast traffic ingressing on an interface increases beyond the configured threshold, the traffic is dropped. Therefore, the rate of unicast traffic is limited to the configured threshold.

Default	0
Format	storm-control unicast rate *0-33554431*
Mode	• Global Config • Interface Config

no storm-control unicast rate

This command sets the unicast storm recovery threshold to the default value for all interfaces (Global Config mode) or one or more interfaces (Interface Config mode) and disables unicast storm recovery.

Format	no storm-control unicast rate
Mode	• Global Config • Interface Config

show storm-control

This command displays switch configuration information. If you do not use any of the optional parameters, this command displays global storm control configuration parameters:

- `Broadcast Storm Recovery Mode` may be enabled or disabled. The factory default is disabled.
- `802.3x Flow Control Mode` may be enabled or disabled. The factory default is disabled.

Use the `all` keyword to display the per-port configuration parameters for all interfaces, or specify the `unit/slot/port` to display information about a specific interface.

Format	show storm-control [all | *unit/slot/port*]
Mode	Privileged EXEC

Parameter	Definition
Bcast Mode	Shows whether the broadcast storm control mode is enabled or disabled. The factory default is disabled.
Bcast Level	The broadcast storm control level.
Mcast Mode	Shows whether the multicast storm control mode is enabled or disabled.
Mcast Level	The multicast storm control level.
Ucast Mode	Shows whether the Unknown Unicast or DLF (Destination Lookup Failure) storm control mode is enabled or disabled.

Parameter	Definition
Ucast Level	The Unknown Unicast or DLF (Destination Lookup Failure) storm control level.

Example: The following shows example CLI display output for the command.

```
(Routing) #show storm-control

Broadcast Storm Control Mode.................. Disable
Broadcast Storm Control Level................. 5 percent
Broadcast Storm Control Action................ None
Multicast Storm Control Mode.................. Disable
Multicast Storm Control Level................. 5 percent
Multicast Storm Control Action................ None
Unicast Storm Control Mode.................... Disable
Unicast Storm Control Level................... 5 percent
Unicast Storm Control Action.................. None
```

Example: The following shows example CLI display output for the command.

```
(Routing) #show storm-control 1/0/1

     Bcast   Bcast   Bcast     Mcast   Mcast   Mcast     Ucast   Ucast   Ucast
 Intf  Mode    Level   Action    Mode    Level   Action    Mode    Level   Action
------ ------- -------- ---------- ------- -------- ---------- ------- -------- ----------
1/0/1  Disable 5%      None      Disable 5%      None      Disable 5%      None
```

Example: The following shows an example of part of the CLI display output for the command.

```
(Routing) #show storm-control all

    Bcast   Bcast    Bcast    Mcast   Mcast    Mcast    Ucast   Ucast    Ucast
Intf Mode    Level    Action    Mode    Level    Action    Mode    Level    Action
------ -------   --------   ---------- -------    --------    ----------  -------    -------- ----------
1/0/1  Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/2  Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/3  Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/4  Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/5  Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/6  Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/7  Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/8  Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/9  Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/10 Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/11 Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/12 Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/13 Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/14 Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/15 Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/16 Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/17 Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/18 Enable  50       Trap      Disable 5%      None      Disable 5%      None
1/0/19 Enable  50       Trap      Disable 5%      None      Disable 5%      None
```

Link Dependency Commands

The following commands configure link dependency. Link dependency allows the link status of specified ports to be dependent on the link status of other ports. Consequently, if a port that is depended on by other ports loses link, the dependent ports are administratively disabled or administratively enabled so that the dependent ports links are brought down or up respectively.

no link state track

This command clears link-dependency options for the selected group identifier.

Format	no link state track *group-id*
Mode	Global Config

link state group

Use this command to indicate if the downstream interfaces of the group should mirror or invert the status of the upstream interfaces. The default configuration for a group is down (that is, the downstream interfaces will mirror the upstream link status by going down when all upstream interfaces are down). The action up option causes the downstream interfaces to be up when no upstream interfaces are down.

Default	Down
Format	link state group *group-id* action {up | down}
Mode	Global Config

no link state group

Use this command to restore the link state to down for the group.

Format	no link state group *group-id* action
Mode	Global Config

link state group downstream

Use this command to add interfaces to the downstream interface list. Adding an interface to a downstream list brings the interface down until an upstream interface is added to the group. The link status then follows the interface specified in the upstream command. To avoid bringing down interfaces, enter the upstream command prior to entering the downstream command.

Format	link state group *group-id* downstream
Mode	Interface Config

no link state group downstream

Use this command to remove the selected interface from the downstream list.

Format no link state group *group-id* downstream

Mode Interface Config

link state group upstream

Use this command to add interfaces to the upstream interface list. Note that an interface that is defined as an upstream interface cannot also be defined as a downstream interface in the same link state group or as a downstream interface in a different link state group, if either configuration creates a circular dependency between groups.

Format link state group *group-id* upstream

Mode Interface Config

no link state group upstream

Use this command to remove the selected interfaces from upstream list.

Format no link state group *group-id* upstream

Mode Interface Config

show link state group

Use this command to display information for all configured link-dependency groups or a specified link-dependency group.

Format show link state group *group-id*

Mode Privileged EXEC

Example: This example displays information for all configured link-dependency groups.

```
(Switching)#show link-state group

GroupId Downstream Interfaces      Upstream Interfaces  Link Action Group State
------- -------------------------- -------------------- ----------- -----------
1       2/0/3-2/0/7,2/0/12-2/0/17  2/0/12-2/0/32,0/3/5  Link Up     Up
4       2/0/18,2/0/27              2/0/22-2/0/33,0/3/1  Link Up     Down
```

Example: This example displays information for a specified link-dependency groups

```
(Switching)#show link state group 1

GroupId Downstream Interfaces      Upstream Interfaces  Link Action Group State
------- -------------------------- -------------------- ----------- -----------
1       2/0/3-2/0/7,2/0/12-2/0/17  2/0/12-2/0/32,0/3/5  Link Up     Up
```

show link state group detail

Use this command to display detailed information about the state of upstream and downstream interfaces for a selected link-dependency group. Group Transitions is a count of the number of times the downstream interface has gone into its “action” state as a result of the upstream interfaces link state.

Format	show link state group *group-id* detail
Mode	Privileged EXEC

```
(Switching) # show link state group 1 detail
GroupId:     1
Link Action: Up
Group State: Up

Downstream Interface State:
Link Up:     2/0/3
Link Down:   2/0/4-2/0/7,2/0/12-2/0/17

Upstream Interface State:
Link Up:     -
Link Down:  2/0/12-2/0/32,0/3/5

Group Transitions: 0
Last Transition Time: 00:52:35 (UTC+0:00) Jan 1 1970
```

MVR Commands

This section lists the Multicast VLAN Registration (MVR) commands.

mvr

Use this command to enable MVR. This is disabled by default.

Default	Disabled
Format	mvr
Mode	Interface Config; Global Config

no mvr

Use this command to disable MVR.

Format	no mvr
Mode	Interface Config; Global Config

mvr group

Use this command to add an MVR membership group.

Format	mvr group
Mode	Global Config

no mvr group

Use this command to disable an MVR membership group.

Format	no mvr group
Mode	Global Config

mvr immediate

Use this command to enable MVR Immediate Leave mode. If the interface is configured as source port, MVR Immediate Leave mode cannot be enabled. MVR Immediate Leave mode disabled by default.

Default	Disabled
Format	mvr immediate
Mode	Interface Config

no mvr immediate

Use this command to disable MVR Immediate Leave mode.

Format	mvrm immediate

Mode	Interface Config

mvr mode

Use this command to change the MVR mode type. Compatible is the default mode type.

Format	mvr mode [compatible | dynamic]
Mode	Global Config

no mvr mode

Use this command to set the MVR mode type to the default value of compatible.

Format	no mvr mode
Mode	Global Config

mvr querytime

Use this command to set the MVR query response time in units of tenths of a second. The query time is the maximum time to wait for an IGMP membership report on a receiver port before removing the port from the multicast group. The query time only applies to receiver ports and is specified in tenths of a second. The default is 5.

Format	mvr querytime *1-100*
Mode	Global Config

no mvr querytime

Use this command to set the MVR query response time to the default value.

Format	no mvr querytime
Mode	Global Config

mvr type

Use this command to set the MVR port type. The default is none.

Format	mvr type [receiver | source]
Mode	Interface Config

no mvr type

Use this command to reset the MVR port type to None.

Format	no mvr type
Mode	Interface Config

mvr vlan

Use this command to set the MVR multicast VLAN.

Default	1
Format	mvr vlan *1-4093*
Mode	Global Config

no mvr vlan

Use this command to set the MVR multicast VLAN to the default value.

Format	no mvr vlan
Mode	Global Config

mvr vlan group

Use this command to make a port participate in a specific MVR group. The default value is None.

Format	mvr vlan *mvlan* group *A.B.C.D.*
Mode	Interface Config

no mvr vlan group

Use this command to remove port participation in the specific MVR group.

Format	no mvr vlan *mvlan* group *A.B.C.D.*
Mode	Interface Config

show mvr

Use this command to display global MVR settings.

Format	show mvr
Mode	Privileged EXEC

Example:

```
(Switching) #  show mvr
MVR Disabled.

(Switching) #  show mvr
MVR Running....................... TRUE
MVR multicast VLAN................ 1
MVR Max Multicast Groups.......... 256
MVR Current multicast groups...... 0
MVR Global query response time.... 5 (tenths of sec)
MVR Mode.......................... compatible
```

show mvr members

Use this command to display the allocated MVR membership groups.

Format	show mvr members [*A.B.C.D.*]
Mode	Privileged EXEC

Example:

```
(Switching) # show mvr members
MVR Disabled

(Switching) # show mvr members

MVR Group IP     Status          Members
---------------  ---------------  --------------------------------
224.1.1.1        INACTIVE         1/0/1, 1/0/2, 1/0/3

(Switching) # show mvr members 224.1.1.1

MVR Group IP     Status          Members
---------------  ---------------  --------------------------------
224.1.1.1        INACTIVE         1/0/1, 1/0/2, 1/0/3
```

show mvr interface

Use this command to display the configuration of MVR-enabled interfaces.

Format	show mvr interface [*interface-id* [members [vlan *vlan-id*]]]
Mode	Privileged EXEC

Example:

```
(Switching) # show mvr interface
Port      Type          Status           Immediate Leave
----------- --------------- ------------------- ---------------
1/0/9     RECEIVER      ACTIVE/inVLAN     DISABLED

(Switching) # show mvr interface 0/4

Type: NONE   Status: INACTIVE/InVLAN  Immediate Leave: DISABLED

show mvr interface 1/0/23 members
235.0.0.1 STATIC  ACTIVE

(Switching) # show mvr interface 1/0/23 members vlan 12
235.0.0.1 STATIC  ACTIVE
235.1.1.1 STATIC  ACTIVE
```

show mvr traffic

Use this command to display global MVR statistics.

Format	show mvr traffic
Mode	Privileged EXEC

Example:

```
(Switching) # show mvr traffic

IGMP Query Received............... 0
IGMP Report V1 Received........... 0
IGMP Report V2 Received........... 0
IGMP Leave Received............... 0
IGMP Query Transmitted............ 0
IGMP Report V1 Transmitted........ 0
IGMP Report V2 Transmitted........ 0
IGMP Leave Transmitted............ 0
IGMP Packet Receive Failures...... 0
IGMP Packet Transmit Failures..... 0
```

debug mvr trace

Use this command to enable MVR debug tracing. The default value is disabled.

Format	debug mvr trace
Mode	Privileged EXEC

no debug mvr trace

Use this command to disable MVR debug tracing.

Format	no debug mvr trace
Mode	Privileged EXEC

debug mvr packet

Use this command to enable MVR receive/transmit packets debug tracing. If it is executed without specifying the arguments, both receive and transmit packets debugging is enabled. The default is enabled.

Format	debug mvr packet [receive | transmit]
Mode	Privileged EXEC

no debug mvr packet

Use this command to disable MVR receive/transmit packet debug tracing.

Format	no debug mvr packet [receive | transmit]
Mode	Privileged EXEC

Port-Channel/LAG (802.3ad) Commands

This section describes the commands you use to configure port-channels, which is defined in the 802.3ad specification, and that are also known as link aggregation groups (LAGs). Link aggregation allows you to combine multiple full-duplex Ethernet links into a single logical link. Network devices treat the aggregation as if it were a single link, which increases fault tolerance and provides load sharing. The LAG feature initially load shares traffic based upon the source and destination MAC address. Assign the port-channel (LAG) VLAN membership after you create a port-channel. If you do not assign VLAN membership, the port-channel might become a member of the management VLAN which can result in learning and switching issues.

A port-channel (LAG) interface can be either static or dynamic, but not both. All members of a port channel must participate in the same protocols.) A static port-channel interface does not require a partner system to be able to aggregate its member ports.

Note: If you configure the maximum number of dynamic port-channels (LAGs) that your platform supports, additional port-channels that you configure are automatically static.

port-channel

This command configures a new port-channel (LAG) and generates a logical `unit/slot/port` number for the port-channel. The `name` field is a character string which allows the dash "-" character as well as alphanumeric characters. Use the `show port channel` command to display the `unit/slot/port` number for the logical interface. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Note: Before you include a port in a port-channel, set the port physical mode. For more information, see "speed" on page 340.

Format	port-channel *name*
Mode	Global Config

addport

This command adds one port to the port-channel (LAG). The first interface is a logical *`unit/slot/port`* number of a configured port-channel. You can add a range of ports by specifying the port range when you enter Interface Config mode (for example: `interface 1/0/1-1/0/4`. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Note: Before adding a port to a port-channel, set the physical mode of the port. For more information, see "speed" on page 340.

Format	addport *logical unit/slot/port*
Mode	Interface Config

deleteport (Interface Config)

This command deletes a port or a range of ports from the port-channel (LAG). The interface is a logical `unit/slot/port` number of a configured port-channel (or range of port-channels). Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format	deleteport *logical unit/slot/port*
Mode	Interface Config

deleteport (Global Config)

This command deletes all configured ports from the port-channel (LAG). The interface is a logical `unit/slot/port` number of a configured port-channel. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format	deleteport {*logical unit/slot/port* | all}
Mode	Global Config

lacp admin key

Use this command to configure the administrative value of the key for the port-channel. The value range of *key* is 0 to 65535.

Default	0x8000
Format	lacp admin key *key*
Mode	Interface Config

Note: This command is applicable only to port-channel interfaces.

This command can be used to configure a single interface or a range of interfaces.

no lacp admin key

Use this command to configure the default administrative value of the key for the port-channel.

Format	no lacp admin key
Mode	Interface Config

lacp collector max-delay

Use this command to configure the port-channel collector max delay. This command can be used to configure a single interface or a range of interfaces.The valid range of `delay` is 0-65535.

Default	0x8000
Format	lacp collector max delay *delay*
Mode	Interface Config

Note: This command is applicable only to port-channel interfaces.

no lacp collector max delay

Use this command to configure the default port-channel collector max delay.

Format	no lacp collector max delay
Mode	Interface Config

lacp actor admin key

Use this command to configure the administrative value of the LACP actor admin key on an interface or range of interfaces. The valid range for *key* is 0-65535.

Default	Internal Interface Number of this Physical Port
Format	lacp actor admin key *key*
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp actor admin key

Use this command to configure the default administrative value of the key.

Format	no lacp actor admin key
Mode	Interface Config

lacp actor admin state individual

Use this command to set LACP actor admin state to individual.

Format	lacp actor admin state individual
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp actor admin state individual

Use this command to set the LACP actor admin state to aggregation.

Format	no lacp actor admin state individual
Mode	Interface Config

lacp actor admin state longtimeout

Use this command to set LACP actor admin state to longtimeout.

Format	lacp actor admin state longtimeout
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp actor admin state longtimeout

Use this command to set the LACP actor admin state to short timeout.

Format	no lacp actor admin state longtimeout
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

lacp actor admin state passive

Use this command to set the LACP actor admin state to passive.

Format	lacp actor admin state passive
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp actor admin state passive

Use this command to set the LACP actor admin state to active.

Format	no lacp actor admin state passive
Mode	Interface Config

lacp actor admin state

Use this command to configure the administrative value of actor state as transmitted by the Actor in LACPDUs. This command can be used to configure a single interfaces or a range of interfaces.

Default	0x07
Format	lacp actor admin state {individual|longtimeout|passive}
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp actor admin state

Use this command the configure the default administrative values of actor state as transmitted by the Actor in LACPDUs.

Note: Both the `no portlacptimeout` and the `no lacp actor admin state` commands set the values back to default, regardless of the command used to configure the ports. Consequently, both commands will display in `show running-config`.

Format	no lacp actor admin state {individual|longtimeout|passive}
Mode	Interface Config

lacp actor port priority

Use this command to configure the priority value assigned to the Aggregation Port for an interface or range of interfaces. The valid range for ***`priority`*** is 0 to 65535.

Default	0x80
Format	lacp actor port priority *0-65535*
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp actor port priority

Use this command to configure the default priority value assigned to the Aggregation Port.

Format	no lacp actor port priority
Mode	Interface Config

lacp partner admin key

Use this command to configure the administrative value of the Key for the protocol partner. This command can be used to configure a single interface or a range of interfaces. The valid range for ***`key`*** is 0 to 65535.

Default	0x0
Format	lacp partner admin key *key*
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp partner admin key

Use this command to set the administrative value of the Key for the protocol partner to the default.

Format	no lacp partner admin key
Mode	Interface Config

lacp partner admin state individual

Use this command to set LACP partner admin state to individual.

Format	lacp partner admin state individual
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp partner admin state individual

Use this command to set the LACP partner admin state to aggregation.

Format	no lacp partner admin state individual
Mode	Interface Config

lacp partner admin state longtimeout

Use this command to set LACP partner admin state to longtimeout.

Format	lacp partner admin state longtimeout
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp partner admin state longtimeout

Use this command to set the LACP partner admin state to short timeout.

Format	no lacp partner admin state longtimeout
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

lacp partner admin state passive

Use this command to set the LACP partner admin state to passive.

Format	lacp partner admin state passive
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp partner admin state passive

Use this command to set the LACP partner admin state to active.

Format	no lacp partner admin state passive
Mode	Interface Config

lacp partner port id

Use this command to configure the LACP partner port id. This command can be used to configure a single interface or a range of interfaces. The valid range for `port-id` is 0 to 65535.

Default	0x80
Format	lacp partner port-id *port-id*
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp partner port id

Use this command to set the LACP partner port id to the default.

Format	no lacp partner port-id
Mode	Interface Config

lacp partner port priority

Use this command to configure the LACP partner port priority. This command can be used to configure a single interface or a range of interfaces. The valid range for `priority` is 0 to 65535.

Default	0x0
Format	lacp partner port priority *priority*
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp partner port priority

Use this command to configure the default LACP partner port priority.

Format	no lacp partner port priority
Mode	Interface Config

lacp partner system-id

Use this command to configure the 6-octet MAC Address value representing the administrative value of the Aggregation Port's protocol Partner's System ID. This command can be used to configure a single interface or a range of interfaces. The valid range of `system-id` is 00:00:00:00:00:00 - FF:FF:FF:FF:FF.

Default	00:00:00:00:00:00
Format	lacp partner system-id *system-id*
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp partner system-id

Use this command to configure the default value representing the administrative value of the Aggregation Port's protocol Partner's System ID.

Format	no lacp partner system-id
Mode	Interface Config

lacp partner system priority

Use this command to configure the administrative value of the priority associated with the Partner's System ID. This command can be used to configure a single interface or a range of interfaces. The valid range for `priority` is 0 to 65535.

Default	0x0
Format	lacp partner system priority *0-65535*
Mode	Interface Config

Note: This command is applicable only to physical interfaces.

no lacp partner system priority

Use this command to configure the default administrative value of priority associated with the Partner's System ID.

Format	no lacp partner system priority
Mode	Interface Config

interface lag

Use this command to enter Interface configuration mode for the specified LAG.

Format	interface lag lag-interface-number
Mode	Global Config

port-channel static

This command enables the static mode on a port-channel (LAG) interface or range of interfaces. By default the static mode for a new port-channel is enabled, which means the port-channel is static. If the maximum number of allowable dynamic port-channels are already present in the system, the static mode for a new port-channel is enabled, which means the port-channel is static. You can only use this command on port-channel interfaces.

Default	enabled
Format	port-channel static
Mode	Interface Config

no port-channel static

This command sets the static mode on a particular port-channel (LAG) interface to the default value. This command will be executed only for interfaces of type port-channel (LAG).

Format	no port-channel static
Mode	Interface Config

port lacpmode

This command enables Link Aggregation Control Protocol (LACP) on a port or range of ports.

Default	enabled
Format	port lacpmode
Mode	Interface Config

no port lacpmode

This command disables Link Aggregation Control Protocol (LACP) on a port.

Format	no port lacpmode
Mode	Interface Config

port lacpmode enable all

This command enables Link Aggregation Control Protocol (LACP) on all ports.

Format	port lacpmode enable all
Mode	Global Config

no port lacpmode enable all

This command disables Link Aggregation Control Protocol (LACP) on all ports.

Format	no port lacpmode enable all
Mode	Global Config

port lacptimeout (Interface Config)

This command sets the timeout on a physical interface or range of interfaces of a particular device type (actor or partner) to either long or short timeout.

Default	long
Format	port lacptimeout {actor | partner} {long | short}
Mode	Interface Config

no port lacptimeout

This command sets the timeout back to its default value on a physical interface of a particular device type (actor or partner).

Format	no port lacptimeout {actor | partner}
Mode	Interface Config

Note: Both the `no portlacptimeout` and the `no lacp actor admin state` commands set the values back to default, regardless of the command used to configure the ports. Consequently, both commands will display in `show running-config`.

port lacptimeout (Global Config)

This command sets the timeout for all interfaces of a particular device type (actor or partner) to either long or short timeout.

Default	long
Format	port lacptimeout {actor | partner} {long | short}
Mode	Global Config

no port lacptimeout

This command sets the timeout for all physical interfaces of a particular device type (actor or partner) back to their default values.

Format	no port lacptimeout {actor | partner}
Mode	Global Config

Note: Both the `no portlacptimeout` and the `no lacp actor admin state` commands set the values back to default, regardless of the command used to configure the ports. Consequently, both commands will display in `show running-config`.

port-channel adminmode

This command enables all configured port-channels with the same administrative mode setting.

Format	port-channel adminmode all
Mode	Global Config

no port-channel adminmode

This command disables all configured port-channels with the same administrative mode setting.

Format	no port-channel adminmode all
Mode	Global Config

port-channel linktrap

This command enables link trap notifications for the port-channel (LAG). The interface is a logical *unit/slot/port* for a configured port-channel. The option `all` sets every configured port-channel with the same administrative mode setting. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Default	enabled
Format	port-channel linktrap {*logical unit/slot/port* | all}
Mode	Global Config

no port-channel linktrap

This command disables link trap notifications for the port-channel (LAG). The interface is a logical slot and port for a configured port-channel. The option `all` sets every configured port-channel with the same administrative mode setting.

Format	no port-channel linktrap {*logical unit/slot/port* | all}
Mode	Global Config

port-channel load-balance

This command selects the load-balancing option used on a port-channel (LAG). Traffic is balanced on a port-channel (LAG) by selecting one of the links in the channel over which to transmit specific packets. The link is selected by creating a binary pattern from selected fields in a packet, and associating that pattern with a particular link.

Load-balancing is not supported on every device. The range of options for load-balancing may vary per device.

This command can be configured for a single interface, a range of interfaces, or all interfaces. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Default	3
Format	port-channel load-balance {1 | 2 | 3 | 4 | 5 | 6} {*unit/slot/port* | all}
Mode	Interface Config Global Config

Parameter	Definition
1	Source MAC, VLAN, EtherType, and incoming port associated with the packet
2	Destination MAC, VLAN, EtherType, and incoming port associated with the packet
3	Source/Destination MAC, VLAN, EtherType, and incoming port associated with the packet

Parameter	Definition
4	Source IP and Source TCP/UDP fields of the packet
5	Destination IP and Destination TCP/UDP Port fields of the packet
6	Source/Destination IP and source/destination TCP/UDP Port fields of the packet
unit/slot/port| all	Global Config Mode only: The interface is a logical unit/slot/port number of a configured port-channel. `All` applies the command to all currently configured port-channels.

no port-channel load-balance

This command reverts to the default load balancing configuration.

Format no port-channel load-balance {*unit/slot/port* | all}

Mode Interface Config
Global Config

Parameter	Definition
unit/slot/port| all	Global Config Mode only: The interface is a logical *unit/slot/port* number of a configured port-channel. `All` applies the command to all currently configured port-channels.

port-channel local-preference

This command enables the local-preference mode on a port-channel (LAG) interface or range of interfaces. By default, the local-preference mode for a port-channel is disabled. This command can be used only on port-channel interfaces.

Default disable

Format port-channel local-preference

Mode Interface Config

no port-channel local-preference

This command disables the local-preference mode on a port-channel.

Format no port-channel local-preference

Mode Interface Config

port-channel min-links

This command configures the port-channel’s minimum links for lag interfaces.

Default 1

Format port-channel min-links *1-8*

Mode Interface Config

port-channel name

This command defines a name for the port-channel (LAG). The interface is a logical *`unit/slot/port`* for a configured port-channel, and *`name`* is an alphanumeric string up to 15 characters. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format	port-channel name {*logical unit/slot/port*} *name*
Mode	Global Config

port-channel system priority

Use this command to configure port-channel system priority. The valid range of *priority* is 0-65535.

Default	0x8000
Format	port-channel system priority *priority*
Mode	Global Config

no port-channel system priority

Use this command to configure the default port-channel system priority value.

Format	no port-channel system priority
Mode	Global Config

show lacp actor

Use this command to display LACP actor attributes. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format	show lacp actor {*unit/slot/port* | all}
Mode	Global Config

The following output parameters are displayed.

Parameter	Description
System Priority	The administrative value of the Key.
Actor Admin Key	The administrative value of the Key.
Port Priority	The priority value assigned to the Aggregation Port.
Admin State	The administrative values of the actor state as transmitted by the Actor in LACPDUs.

show lacp partner

Use this command to display LACP partner attributes. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format	show lacp actor {*unit/slot/port*|all}
Mode	Privileged EXEC

The following output parameters are displayed.

Parameter	Description
System Priority	The administrative value of priority associated with the Partner's System ID.
System-ID	Represents the administrative value of the Aggregation Port's protocol Partner's System ID.
Admin Key	The administrative value of the Key for the protocol Partner.
Port Priority	The administrative value of the Key for protocol Partner.
Port-ID	The administrative value of the port number for the protocol Partner.
Admin State	The administrative values of the actor state for the protocol Partner.

show port-channel brief

This command displays the static capability of all port-channel (LAG) interfaces on the device as well as a summary of individual port-channel interfaces. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format	show port-channel brief
Mode	User EXEC

For each port-channel the following information is displayed:

Parameter	Definition
Logical Interface	The *unit/slot/port* of the logical interface.
Port-channel Name	The name of port-channel (LAG) interface.
Link-State	Shows whether the link is up or down.
Trap Flag	Shows whether trap flags are enabled or disabled.
Type	Shows whether the port-channel is statically or dynamically maintained.
Mbr Ports	The members of this port-channel.
Active Ports	The ports that are actively participating in the port-channel.

show port-channel

This command displays an overview of all port-channels (LAGs) on the switch. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format	show port-channel
Mode	Privileged EXEC

Parameter	Definition
Logical Interface	The valid unit/slot/port number.
Port-Channel Name	The name of this port-channel (LAG). You may enter any string of up to 15 alphanumeric characters.
Link State	Indicates whether the Link is up or down.
Admin Mode	May be enabled or disabled. The factory default is enabled.
Type	The status designating whether a particular port-channel (LAG) is statically or dynamically maintained. • `Static` - The port-channel is statically maintained. • `Dynamic` - The port-channel is dynamically maintained.
Load Balance Option	The load balance option associated with this LAG. See "port-channel load-balance" on page 468.
Local Preference Mode	Indicates whether the local preference mode is `enabled` or `disabled`.
Mbr Ports	A listing of the ports that are members of this port-channel (LAG), in *`unit/slot/port`* notation. There can be a maximum of eight ports assigned to a given port-channel (LAG).
Device Timeout	For each port, lists the timeout (`long` or `short`) for Device Type (`actor` or `partner`).
Port Speed	Speed of the port-channel port.
Active Ports	This field lists ports that are actively participating in the port-channel (LAG).

Example: The following shows example CLI display output for the command.

```
(Switch) #show port-channel 0/3/1


Local Interface................................ 0/3/1
Channel Name................................... ch1
Link State..................................... Up
Admin Mode..................................... Enabled
Type........................................... Static
Load Balance Option............................ 3
(Src/Dest MAC, VLAN, EType, incoming port)
Local Preference Mode.......................... Enabled

Mbr   Device/       Port      Port
Ports Timeout       Speed     Active
------ ------------- --------- -------
1/0/1  actor/long    Auto      True
       partner/long
1/0/2  actor/long    Auto      True
       partner/long
```

```
1/0/3  actor/long    Auto      False
       partner/long
1/0/4  actor/long    Auto      False
       partner/long
```

show port-channel system priority

Use this command to display the port-channel system priority.

Format	show port-channel system priority
Mode	Privileged EXEC

show port-channel counters

Use this command to display port-channel counters for the specified port.

Format	show port-channel *unit/slot/port* counters
Mode	Privileged EXEC

Parameter	Definition
Local Interface	The valid slot/port number.
Channel Name	The name of this port-channel (LAG).
Link State	Indicates whether the Link is up or down.
Admin Mode	May be enabled or disabled. The factory default is enabled.
Port Channel Flap Count	The number of times the port-channel was inactive.
Mbr Ports	The slot/port for the port member.
Mbr Flap Counters	The number of times a port member is inactive, either because the link is down, or the admin state is disabled.

Example: The following shows example CLI display output for the command.

```
(Switch) #show port-channel 3/1 counters


Local Interface................................ 3/1
Channel Name................................... ch1
Link State..................................... Down
Admin Mode..................................... Enabled
Port Channel Flap Count........................ 0

Mbr    Mbr Flap
Ports  Counters
------ ---------
0/1    0
0/2    0
0/3    1
0/4    0
0/5    0
0/6    0
0/7    0
0/8    0
```

clear port-channel counters

Use this command to clear and reset specified port-channel and member flap counters for the specified interface.

Format	clear port-channel {lag-intf-num | unit/slot/port} counters
Mode	Privileged EXEC

clear port-channel all counters

Use this command to clear and reset all port-channel and member flap counters for the specified interface.

Format	clear port-channel all counters
Mode	Privileged EXEC

Port Mirroring Commands

Port mirroring, which is also known as port monitoring, selects network traffic that you can analyze with a network analyzer, such as a SwitchProbe device or other Remote Monitoring (RMON) probe.

monitor session source

This command configures the source interface for a selected monitor session. Use the `source interface` *`unit/slot/port`* parameter to specify the interface to monitor. Use `rx` to monitor only ingress packets, or use *`tx`* to monitor only egress packets. If you do not specify an `{rx | tx}` option, the destination port monitors both ingress and egress packets.

A VLAN can be configured as the source to a session (all member ports of that VLAN are monitored). Remote port mirroring is configured by adding the RSPAN VLAN ID. At the source switch, the destination is configured as the RSPAN VLAN and at the destination switch, the source is configured as the RSPAN VLAN.

Note: The source and destination cannot be configured as remote on the same device.

The commands described below add a mirrored port (source port) to a session identified with *session-id*. The *session-id* parameter is an integer value used to identify the session. The maximum number of sessions which can be configured is L7_MIRRORING_MAX_SESSIONS. Option *rx* is used to monitor only ingress packets. Option *tx* is used to monitor only egress packets. If no option is specified, both ingress and egress packets, RX and TX, are monitored.

A VLAN can also be configured as the source to a session (all the member ports of that VLAN are monitored).

Note: If an interface participates in some VLAN and is a LAG member, this VLAN cannot be assigned as a source VLAN for a Monitor session. At the same time, if an interface participates in some VLAN and this VLAN is assigned as a source VLAN for a Monitor session, the interface can be assigned as a LAG member.

Remote port mirroring is configured by giving the RSPAN VLAN ID. At the source switch the destination is configured as RSPAN VLAN and at the destination switch the source is configured as RSPAN VLAN.

Note: On the intermediate switch, RSPAN VLAN should be created, the ports connected towards Source and Destination switch should have the RSPAN VLAN participation. RSPAN VLAN egress tagging should be enabled on the interface on the intermediate switch connected towards the Destination switch.

<table>
<tr><td>Default</td><td>None</td></tr>
<tr><td>Format</td><td>monitor session <i>session-id</i> source {interface {<i>unit/slot/port</i> | cpu | lag } | vlan <i>vlan-id</i> | remote vlan <i>vlan-id</i> }[{rx | tx}]</td></tr>
<tr><td>Mode</td><td>Global Config</td></tr>
</table>

no monitor session source

This command removes the specified mirrored port from the selected port mirroring session.

Default	None
Format	no monitor session *session-id* source {interface {*unit/slot/port* | cpu | lag } | vlan | remote vlan}
Mode	Global Config

monitor session destination

This command configures the probe interface for a selected monitor session. This command configures a probe port and a monitored port for monitor session (port monitoring). Use `rx` to monitor only ingress packets, or use *`tx`* to monitor only egress packets. If you do not specify an `{rx | tx}` option, the destination port monitors both ingress and egress packets.

A VLAN can be configured as the source to a session (all member ports of that VLAN are monitored). Remote port mirroring is configured by adding the RSPAN VLAN ID. At the source switch, the destination is configured as the RSPAN VLAN and at the destination switch, the source is configured as the RSPAN VLAN.

Note: The source and destination cannot be configured as remote on the same device.

The `reflector-port` is configured at the source switch along with the destination RSPAN VLAN. The `reflector-port` forwards the mirrored traffic towards the destination switch.

Note: This port must be configured with RSPAN VLAN membership.

Use the `destination interface` *`unit/slot/port`* to specify the interface to receive the monitored traffic.

The commands described below add a mirrored port (source port) to a session identified with *session-id*. The *session-id* parameter is an integer value used to identify the session. The maximum number of sessions which can be configured is L7_MIRRORING_MAX_SESSIONS. Option *rx* is used to monitor only ingress packets. Option *tx* is used to monitor only egress packets. If no option is specified, both ingress and egress packets, RX and TX, are monitored.

A VLAN can also be configured as the source to a session (all the member ports of that VLAN are monitored).

Note: If an interface participates in some VLAN and is a LAG member, this VLAN cannot be assigned as a source VLAN for a Monitor session. At the same time, if an interface participates in some VLAN and this VLAN is assigned as a source VLAN for a Monitor session, the interface can be assigned as a LAG member.

Remote port mirroring is configured by giving the RSPAN VLAN ID. At the source switch the destination is configured as RSPAN VLAN and at the destination switch the source is configured as RSPAN VLAN.

Note: On the intermediate switch: RSPAN VLAN should be created, the ports connected towards Source and Destination switch should have the RSPAN VLAN participation. RSPAN VLAN egress tagging should be enabled on the interface on the intermediate switch connected towards the Destination switch.

Default	None
Format	monitor session *session-id* destination {interface *unit/slot/port* [remove-rspan-tag] |remote vlan *vlan-id* reflector-port *unit/slot/port*}

Mode	Global Config

no monitor session destination

This command removes the specified probe port from the selected port mirroring session.

Format	no monitor session *session-id* destination {interface *unit/slot/port* | remote vlan *vlan-id* reflector-port *unit/slot/port*}
Mode	Global Config

monitor session filter

This command attaches an IP/MAC ACL to a selected monitor session. This command configures a probe port and a monitored port for monitor session (port monitoring).

An IP/MAC ACL can be attached to a session by giving the access list number/name.

Use the `filter` parameter to filter a specified access group either by IP address or MAC address.

The commands described below add a mirrored port (source port) to a session identified with *session-id*. The *session-id* parameter is an integer value used to identify the session. The maximum number of sessions which can be configured is L7_MIRRORING_MAX_SESSIONS.

Remote port mirroring is configured by giving the RSPAN VLAN ID. At the source switch the destination is configured as RSPAN VLAN and at the destination switch the source is configured as RSPAN VLAN.

Note: Note the following:

- Source and destination cannot be configured as remote on the same device.
- IP/MAC ACL can be attached to a session by giving the access list number/name. On the platforms that do not support both IP and MAC ACLs to be assigned on the same Monitor session, an error message is thrown when user tries to configure ACLs of both types.

Default	None
Format	monitor session *session-id* filter {ip access-group *acl-id/aclname* | mac access-group *acl-name*}
Mode	Global Config

no monitor session filter

This command removes the specified IP/MAC ACL from the selected monitoring session.

Format	no smonitor session *session-id* filter {ip access-group | mac access-group }
Mode	Global Config

monitor session mode

This command enables the selected port mirroring session. This command configures a probe port and a monitored port for monitor session (port monitoring).

A VLAN can be configured as the source to a session (all member ports of that VLAN are monitored). Remote port mirroring is configured by adding the RSPAN VLAN ID. At the source switch, the destination is configured as the RSPAN VLAN and at the destination switch, the source is configured as the RSPAN VLAN.

Note: The source and destination cannot be configured as remote on the same device.

The commands described below add a mirrored port (source port) to a session identified with *session-id*. The *session-id* parameter is an integer value used to identify the session. The maximum number of sessions which can be configured is L7_MIRRORING_MAX_SESSIONS. Option *rx* is used to monitor only ingress packets. Option *tx* is used to monitor only egress packets. If no option is specified, both ingress and egress packets, RX and TX, are monitored.

A VLAN can also be configured as the source to a session (all the member ports of that VLAN are monitored).

Note: If an interface participates in some VLAN and is a LAG member, this VLAN cannot be assigned as a source VLAN for a Monitor session. At the same time, if an interface participates in some VLAN and this VLAN is assigned as a source VLAN for a Monitor session, the interface can be assigned as a LAG member.

Remote port mirroring is configured by giving the RSPAN VLAN ID. At the source switch the destination is configured as RSPAN VLAN and at the destination switch the source is configured as RSPAN VLAN.

Note: Note the following:

- Source and destination cannot be configured as remote on the same device.
- On the intermediate switch: RSPAN VLAN should be created, the ports connected towards the Source and Destination switch should have the RSPAN VLAN participation. RSPAN VLAN egress tagging should be enabled on interface on intermediate switch connected towards Destination switch.

Default	None
Format	monitor session *session-id* mode
Mode	Global Config

no monitor session mode

This command disables the selected port mirroring session.

Format	no monitor session *session-id* mode
Mode	Global Config

no monitor session

Use this command without optional parameters to remove the monitor session (port monitoring) designation from the source probe port, the destination monitored port and all VLANs. Once the port is removed from the VLAN, you must manually add the port to any desired VLANs. Use the `source interface unit/slot/port` parameter or `destination interface` to remove the specified interface from the port monitoring session. Use the `mode` parameter to disable the administrative mode of the session.

Format	no monitor session *session-id* {source {interface *unit/slot/port* | cpu | lag} |vlan| remote vlan} | destination { interface | remote vlan | mode |filter {ip access-group |mac access-group}}]
Mode	Global Config

no monitor

This command removes all the source ports and a destination port and restores the default value for mirroring session mode for all the configured sessions.

Note: This is a stand-alone `no` command. This command does not have a "normal" form.

Default	enabled
Format	no monitor
Mode	Global Config

monitor session type erspan-source

This command configures an ERSPAN source session number and enters ERSPAN Source Session Configuration mode for the session.

Format	monitor session *session-id* type erspan-source
Mode	Global Config

no monitor session type erspan-source

This command removes the specified ERSPAN source session configuration.

Format	no monitor session *session-id* erspan-source
Mode	Global Config

monitor session type erspan-destination

This command configures an ERSPAN destination session number and enters ERSPAN Destination Session Configuration mode for the session.

Format	monitor session *session-id* erspan-destination
Mode	Global Config

no monitor session type erspan-destination

This command removes the specified ERSPAN destination session configuration.

Format	no monitor session *session-id* erspan-destination
Mode	Global Config

show monitor session

This command displays the Port monitoring information for a particular mirroring session.

Note: The *`session-id`* parameter is an integer value used to identify the session. In the current version of the software, the *`session-id`* parameter is always one (1).

Format	show monitor session {*session-id* | *all*}
Mode	Privileged EXEC

Parameter	Definition
Session ID	An integer value used to identify the session. Its value can be anything between 1 and the maximum number of mirroring sessions allowed on the platform.
Admin Mode	Indicates whether the Port Mirroring feature is enabled or disabled for the session identified with *`session-id`*. The possible values are Enabled and Disabled.
Probe Port	Probe port (destination port) for the session identified with *`session-id`*. If probe port is not set then this field is blank.
Remove RSPAN Tag	Remove RSPAN VLAN tag on the probe (destination) port. To configure this value probe port and remove RSPAN tag values should be specified simultaneously. If no probe port is configured for the session then this field is blank.
Mirrored Port(s)	The port that is configured as a mirrored port (source port) for the session identified with *`session-id.`* If no source port is configured for the session, this field is blank.
Session Type	The type of monitor session.
Source VLAN	All member ports of this VLAN are mirrored. If the source VLAN is not configured, this field is blank.
Reflector Port	This port carries all the mirrored traffic at the source switch.
Source RSPAN VLAN	The source VLAN configured at the destination switch. If remote VLAN is not configured, this field is blank
Destination RSPAN VLAN	The destination VLAN configured at the source switch. If remote VLAN is not configured, this field is blank
Source ERSPAN Flow ID	The ID number used by the source session to identify the ERSPAN traffic.
Destination ERSPAN Flow ID	The ID number used by the destination session to identify the ERSPAN traffic, must also be entered in the ERSPAN destination session configuration.
Source ERSPAN IP address	The ERSPAN flow destination IP address , which must be an address on a local interface and match the address entered in the ERSPAN destination session configuration.

Parameter	Definition
Destination ERSPAN IP address	The ERSPAN flow destination IPv4 address , which must also be configured on an interface on the destination switch and be entered in the ERSPAN destination session configuration.
Destination ERSPAN Origin IP address	The IPv4 address used as the source of the ERSPAN traffic.
Destination ERSPAN IP TTL	The IPv4 TTL value of the packets in the ERSPAN traffic.
Destination ERSPAN IP DSCP	The IP DSCP value of the packets in the ERSPAN traffic.
Destination ERSPAN IP Precedence	The IP precedence value of the packets in the ERSPAN traffic.
IP ACL	The IP access-list id or name attached to the port mirroring session.
MAC ACL	The MAC access-list name attached to the port mirroring session.

Example: This example shows the command output when the session ID is specified.

```
(Switch)#show monitor session 1
Session ID..................................... 1
Session Type................................... ERSPAN Source
Admin Mode..................................... Enabled
Probe Port..................................... 1/0/8
Remove RSPAN Tag............................... False
Source VLAN....................................
Mirrored Port(s)...............................
Reflector Port.................................
Source RSPAN VLAN..............................
Destination RSPAN VLAN.........................
Source ERSPAN Flow ID.......................... 1023
Source ERSPAN IP Address....................... 255.255.255.255
Destination ERSPAN Flow ID.....................
Destination ERSPAN IP Address..................
Destination ERSPAN Origin IP...................
Destination ERSPAN IP TTL......................
Destination ERSPAN IP DSCP.....................
Destination ERSPAN IP Precedence...............
IP ACL.........................................
MAC ACL........................................ mymac
```

Example: This example shows the command output when `all` is specified.

```
(Routing)#show monitor session all

Session ID..................................... 1
Session Type................................... ERSPAN Destination
Admin Mode..................................... Enable
Probe Port..................................... 1/0/8
Remove RSPAN Tag............................... False
Source VLAN....................................
Mirrored Port(s)...............................
Reflector Port.................................
Source RSPAN VLAN..............................
Destination RSPAN VLAN.........................
Source ERSPAN Flow ID.......................... 1023
Source ERSPAN IP Address....................... 255.255.255.255
Destination ERSPAN Flow ID.....................
Destination ERSPAN IP Address..................
Destination ERSPAN Origin IP...................
Destination ERSPAN IP TTL......................
Destination ERSPAN IP DSCP.....................
Destination ERSPAN IP Precedence...............
IP ACL.........................................
MAC ACL....................................... mymac

Session ID.................................... 2
Session Type.................................. Local
Admin Mode.................................... Disabled
Probe Port.................................... 1/0/2
Remove RSPAN Tag.............................. False
Source VLAN...................................
Mirrored Port(s).............................. 1/0/1(Rx), 1/0/19(Rx,Tx), 1/0/20(Tx)
Reflector Port................................
Source RSPAN VLAN.............................
Destination RSPAN VLAN........................
Source ERSPAN Flow ID.........................
Source ERSPAN IP Address......................
Destination ERSPAN Flow ID....................
Destination ERSPAN IP Address.................
Destination ERSPAN Origin IP..................
Destination ERSPAN IP TTL.....................
Destination ERSPAN IP DSCP....................
Destination ERSPAN IP Precedence..............
IP ACL........................................
MAC ACL.......................................

Session ID.................................... 3
Session Type.................................. RSPAN Source
Admin Mode.................................... Disabled
Probe Port....................................
Remove RSPAN Tag..............................
Source VLAN...................................
Mirrored Port(s).............................. 0/5/1(Rx,Tx)
Reflector Port................................ 1/0/10
Source RSPAN VLAN.............................
Destination RSPAN VLAN........................ 2
Source ERSPAN Flow ID.........................
Source ERSPAN IP Address......................
Destination ERSPAN Flow ID....................
Destination ERSPAN IP Address.................
Destination ERSPAN Origin IP..................
Destination ERSPAN IP TTL.....................
Destination ERSPAN IP DSCP....................
Destination ERSPAN IP Precedence..............
IP ACL........................................
MAC ACL.......................................

Session ID.................................... 4
Session Type.................................. RSPAN Destination
Admin Mode.................................... Disabled
Probe Port....................................
Remove RSPAN Tag..............................
Source VLAN...................................
Mirrored Port(s).............................. 0/3/1(Rx,Tx)
Reflector Port................................ 1/0/3
Source RSPAN VLAN.............................
Destination RSPAN VLAN........................ 2
Source ERSPAN Flow ID.........................
Source ERSPAN IP Address......................
Destination ERSPAN Flow ID....................
Destination ERSPAN IP Address.................
Destination ERSPAN Origin IP..................
Destination ERSPAN IP TTL.....................
Destination ERSPAN IP DSCP....................
Destination ERSPAN IP Precedence..............
IP ACL........................................ ipacl
MAC ACL....................................... mmac
```

show vlan remote-span

This command displays the configured RSPAN VLAN.

Format	show vlan remote-span
Mode	Privileged EXEC Mode

Example: The following shows example output for the command.

```
(Switch)# show vlan remote-span

Remote SPAN VLAN
--------------------------------------------------------------
100,102,201,303
```

Encapsulated Remote Switched Port Analyzer Commands

The Encapsulated Remote Port Analyzer (ERSPAN) feature allows port-mirroring collection points to be located anywhere across a routed network. This is achieved by encapsulating L2 mirrored packets using GRE with IP delivery. After a packet has been encapsulated, it can be forwarded throughout the L3-routed network.

ERSPAN uses a GRE tunnel to carry traffic between switches. ERSPAN consists of an ERSPAN source session, an ERSPAN destination session, and routable ERSPAN GRE-encapsulated traffic. All participating switches must be connected at Layer 3, and the network path must support the size of the ERSPAN traffic for the egress mirroring session.

To configure the source ERSPAN session, the following parameters should be configured at the source switch:

- Source ports (i.e. the traffic on this port is mirrored)
- ERSPAN destination IPv4 address
- ERSPAN origin IPv4 address
- ERSPAN session ID
- TX/RX

To configure the destination ERSPAN session, the following parameters should be configured at the destination switch:

- ERSPAN destination IPv4 address (as source)
- ERSPAN session ID
- Probe port

ERSPAN Destination Configuration Commands

ERSPAN uses separate source and destination sessions. The source session and destination session should be configured on different switches. This section describes the commands to configure the ERSPAN destination session.

source

This command configures the source interface for selected ERSPAN monitor session.

Default	None
Format	source {interface {*unit/slot/port* | cpu | lag *lag-group-id*} | vlan *vlan-id* }[rx | tx]
Mode	ERSPAN Source Session Configuration Mode

no source

This command removes the specified mirrored port from the selected ERSPAN mirroring session.

Format	no source {interface {*unit/slot/port* | cpu | lag *lag-group-id*} | vlan *vlan-id* }

Mode	ERSPAN Source Session Configuration Mode

destination

Use this command to enter the ERSPAN Source Session Destination Configuration mode.

Default	None
Format	destination
Mode	ERSPAN Source Session Configuration Mode

ip address

This command configures the ERSPAN destination IP address.

Note: The same IP address must also be configured on an interface on the destination switch and be entered in the ERSPAN destination session configuration.

Default	None
Format	ip address *ip-address*
Mode	ERSPAN Source Session Destination Configuration Mode

no ip address

This command removes the ERSPAN destination IP address configuration.

Format	no ip address
Mode	ERSPAN Source Session Destination Configuration Mode

erspan-id

This command configures the ERSPAN flow ID number used by the source and destination sessions to identify the ERSPAN traffic. The valid range for ***`erspan-id`*** is 1 to 1023

Note: The same ERSPAN flow ID must also be configured in the ERSPAN destination session configuration.

Default	None
Format	erspan-id *erspan-id*
Mode	ERSPAN Source Session Destination Configuration Mode

no erspan-id

This command removes the ERSPAN destination IP address configuration..

Format	no erspan-id
Mode	ERSPAN Source Session Destination Configuration Mode

origin ip address

This command configures the IP address used as the source of the ERSPAN traffic.

Default	None
Format	origin ip address *ip-address*
Mode	ERSPAN Source Session Destination Configuration Mode

no origin ip address

This command removes the ERSPAN origin IP address configuration.

Format	no origin ip address
Mode	ERSPAN Source Session Destination Configuration Mode

ip ttl

This command configures the IP time-to-live (TTL) value of the packets in the ERSPAN traffic. The valid range for `ttl-value` is 1 to 255.

Default	64
Format	ip ttl *ttl-value*
Mode	ERSPAN Source Session Destination Configuration Mode

no ip ttl

This command removes the ERSPAN IP TTL value configuration.

Format	no ip ttl
Mode	ERSPAN Source Session Destination Configuration Mode

ip dscp

This command configures the IP DSCP value of the packets in the ERSPAN traffic. The valid range for `dscp-value` is 0 to 63.

Default	64
Format	ip dscp *dscp-value*
Mode	ERSPAN Source Session Destination Configuration Mode

no ip dscp

This command removes the ERSPAN IP DSCP value configuration.

Format	no ip dscp
Mode	ERSPAN Source Session Destination Configuration Mode

ip prec

This command configures the IP precedence value of the packets in the ERSPAN traffic. The valid range for `precedence-value` is 0 to 7.

Default	0
Format	ip prec *precedence-value*
Mode	ERSPAN Source Session Destination Configuration Mode

no ip prec

This command removes the ERSPAN IP precedence value configuration.

Format	no ip prec
Mode	ERSPAN Source Session Destination Configuration Mode

reflector-port

This command configures the reflector interface for the selected ERSPAN monitor session.

Default	0
Format	reflector-port *unit/slot/port*
Mode	ERSPAN Source Session Configuration Mode

no reflector-port

This command removes the reflector port from the selected ERSPAN mirroring session.

Format	no reflector-port
Mode	ERSPAN Source Session Configuration Mode

ERSPAN Source Configuration Commands

ERSPAN uses separate source and destination sessions. The source session and destination session should be configured on different switches. This section describes the commands to configure the ERSPAN source session.

destination interface

This command configures the destination interface (probe port) for the selected ERSPAN monitor session.

Default	None
Format	destination interface *unit/slot/port*
Mode	ERSPAN Destination Session Configuration Mode

no destination interface

This command removes the specified probe port from the selected ERSPAN mirroring session.

Format	no destination interface
Mode	ERSPAN Destination Session Configuration Mode

source

Use this command to enter the ERSPAN Destination Session Source Configuration Mode.

Default	None
Format	source
Mode	ERSPAN Destination Session Configuration Mode

no source

This command removes the ERSPAN Destination Session Source Configuration.

Format	no source
Mode	ERSPAN Destination Session Configuration Mode

ip address

This command configures the ERSPAN destination IP address.

Note: This IP address must be an address on a local interface and match the address entered in the ERSPAN source session configuration.

Default	None
Format	ip address *ip-address*
Mode	ERSPAN Destination Session Source Configuration Mode

no ip address

This command removes the ERSPAN destination IP address configuration.

Format	no ip address
Mode	ERSPAN Destination Session Source Configuration Mode

erspan-id

This command configures the ERSPAN flow ID number used by the source and destination sessions to identify the ERSPAN traffic. The valid range for `erspan-id` is 1 to 1023.

Note: The same ERSPAN flow ID must also be configured in the ERSPAN source session configuration.

Default	None
Format	erspan-id *erspan-id*
Mode	ERSPAN Destination Session Source Configuration Mode

no erspan-id

This command removes the ERSPAN destination IP address configuration..

Format	no erspan-id
Mode	ERSPAN Destination Session Source Configuration Mode

Static MAC Filtering Commands

The commands in this section describe how to configure static MAC filtering. Static MAC filtering allows you to configure destination ports for a static multicast MAC filter irrespective of the platform.

macfilter

This command adds a static MAC filter entry for the MAC address `macaddr` on the VLAN `vlanid`. The value of the `macaddr` parameter is a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The restricted MAC Addresses are: 00:00:00:00:00:00, 01:80:C2:00:00:00 to 01:80:C2:00:00:0F, 01:80:C2:00:00:20 to 01:80:C2:00:00:21, and FF:FF:FF:FF:FF:FF. The `vlanid` parameter must identify a valid VLAN.

The number of static mac filters supported on the system is different for MAC filters where source ports are configured and MAC filters where destination ports are configured.

For current Lenovo CE0128XB/CE0152XB platforms, you can configure the following combinations:

- Unicast MAC and source port
- Multicast MAC and source port
- Multicast MAC and destination port (only)
- Multicast MAC and source ports and destination ports

Format	macfilter *macaddr vlanid*
Mode	Global Config

no macfilter

This command removes all filtering restrictions and the static MAC filter entry for the MAC address `macaddr` on the VLAN `vlanid`. The `macaddr` parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The `vlanid` parameter must identify a valid VLAN.

Format	no macfilter *macaddr vlanid*
Mode	Global Config

macfilter adddest

Use this command to add the interface or range of interfaces to the destination filter set for the MAC filter with the given `macaddr` and VLAN of `vlanid`. The `macaddr` parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The `vlanid` parameter must identify a valid VLAN.

Note: Configuring a destination port list is only valid for multicast MAC addresses.

Format	macfilter adddest *macaddr*
Mode	Interface Config

no macfilter adddest

This command removes a port from the destination filter set for the MAC filter with the given *macaddr* and VLAN of *vlanid*. The *macaddr* parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The *vlanid* parameter must identify a valid VLAN.

Format	no macfilter adddest *macaddr*
Mode	Interface Config

macfilter adddest all

This command adds all interfaces to the destination filter set for the MAC filter with the given *macaddr* and VLAN of *vlanid*. The *macaddr* parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The *vlanid* parameter must identify a valid VLAN.

Note: Configuring a destination port list is only valid for multicast MAC addresses.

Format	macfilter adddest all *macaddr*
Mode	Global Config

no macfilter adddest all

This command removes all ports from the destination filter set for the MAC filter with the given *macaddr* and VLAN of *vlanid*. The *macaddr* parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The *vlanid* parameter must identify a valid VLAN.

Format	no macfilter adddest all *macaddr*
Mode	Global Config

macfilter addsrc

This command adds the interface or range of interfaces to the source filter set for the MAC filter with the MAC address of *macaddr* and VLAN of *vlanid*. The *macaddr* parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The *vlanid* parameter must identify a valid VLAN.

Format	macfilter addsrc *macaddr vlanid*
Mode	Interface Config

no macfilter addsrc

This command removes a port from the source filter set for the MAC filter with the MAC address of `macaddr` and VLAN of `vlanid`. The `macaddr` parameter must be specified as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The `vlanid` parameter must identify a valid VLAN.

Format	no macfilter addsrc *macaddr vlanid*
Mode	Interface Config

macfilter addsrc all

This command adds all interfaces to the source filter set for the MAC filter with the MAC address of `macaddr` and `vlanid`. You must specify the `macaddr` parameter as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6. The `vlanid` parameter must identify a valid VLAN.

Format	macfilter addsrc all *macaddr vlanid*
Mode	Global Config

no macfilter addsrc all

This command removes all interfaces to the source filter set for the MAC filter with the MAC address of `macaddr` and VLAN of `vlanid`. You must specify the `macaddr` parameter as a 6-byte hexadecimal number in the format of b1:b2:b3:b4:b5:b6.

The `vlanid` parameter must identify a valid VLAN.

Format	no macfilter addsrc all *macaddr vlanid*
Mode	Global Config

show mac-address-table static

This command displays the Static MAC Filtering information for all Static MAC Filters. If you specify `all`, all the Static MAC Filters in the system are displayed. If you supply a value for `macaddr`, you must also enter a value for `vlanid`, and the system displays Static MAC Filter information only for that MAC address and VLAN.

Format	show mac-address-table static {*macaddr vlanid* | all}
Mode	Privileged EXEC

Parameter	Definition
MAC Address	The MAC Address of the static MAC filter entry.
VLAN ID	The VLAN ID of the static MAC filter entry.
Source Port(s)	The source port filter set's slot and port(s).

Note: Only multicast address filters will have destination port lists.

show mac-address-table staticfiltering

This command displays the Static Filtering entries in the Multicast Forwarding Database (MFDB) table.

Format	show mac-address-table staticfiltering
Mode	Privileged EXEC

Parameter	Definition
VLAN ID	The VLAN in which the MAC Address is learned.
MAC Address	A unicast MAC address for which the switch has forwarding and or filtering information. As the data is gleaned from the MFDB, the address will be a multicast address. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 80:96:21:67:89:AB.
Type	The type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

DHCP L2 Relay Agent Commands

You can enable the switch to operate as a DHCP Layer 2 relay agent to relay DHCP requests from clients to a Layer 3 relay agent or server. The Circuit ID and Remote ID can be added to DHCP requests relayed from clients to a DHCP server. This information is included in DHCP Option 82, as specified in sections 3.1 and 3.2 of RFC3046.

dhcp l2relay

This command enables the DHCP Layer 2 Relay agent for an interface a range of interfaces in, or all interfaces. The subsequent commands mentioned in this section can only be used when the DHCP L2 relay is enabled.

Format	dhcp l2relay
Mode	• Global Config • Interface Config

no dhcp l2relay

This command disables DHCP Layer 2 relay agent for an interface or range of interfaces.

Format	no dhcp l2relay
Mode	• Global Config • Interface Config

dhcp l2relay circuit-id subscription

This command sets the Option-82 Circuit ID for a given service subscription identified by *`subscription-string`* on a given interface. The *`subscription-string`* is a character string which needs to be matched with a configured DOT1AD subscription string for correct operation. When circuit-id is enabled using this command, all Client DHCP requests that fall under this service subscription are added with Option-82 circuit-id as the incoming interface number.

Default	disabled
Format	dhcp l2relay circuit-id subscription subscription-string
Mode	Interface Config

no dhcp l2relay circuit-id subscription

This command resets the Option-82 Circuit ID for a given service subscription identified by *`subscription-string`* on a given interface. The *`subscription-string`* is a character string which needs to be matched with a configured DOT1AD subscription string for correct operation. When circuit-id is disabled using this command, all Client DHCP requests that fall under this service subscription are no longer added with Option-82 circuit-id.

Format	no dhcp l2relay circuit-id subscription *subscription-string*

Mode Interface Config

dhcp l2relay circuit-id vlan

This parameter sets the DHCP Option-82 Circuit ID for a VLAN. When enabled, the interface number is added as the Circuit ID in DHCP option 82.

Format dhcp l2relay circuit-id vlan *vlan-list*

Mode Global Config

Parameter	Description
vlan–list	The VLAN ID. The range is 1–4093. Separate nonconsecutive IDs with a comma (,) no spaces and no zeros in between the range. Use a dash (–) for the range.

no dhcp l2relay circuit-id vlan

This parameter clears the DHCP Option-82 Circuit ID for a VLAN.

Format no dhcp l2relay circuit-id vlan *vlan-list*

Mode Global Config

dhcp l2relay remote-id subscription

This command sets the Option-82 Remote-ID string for a given service subscription identified by `subscription-string` on a given interface or range of interfaces. The *subscription-string* is a character string which needs to be matched with a configured DOT1AD subscription string for correct operation. The *remoteid-string* is a character string. When remote-id string is set using this command, all Client DHCP requests that fall under this service subscription are added with Option-82 Remote-id as the configured remote-id string.

Default empty string

Format dhcp l2relay remote-id *remoteid-string* subscription-name *subscription-string*

Mode Interface Config

no dhcp l2relay remote-id subscription

This command resets the Option-82 Remote-ID string for a given service subscription identified by *subscription-string* on a given interface. The *subscription-string* is a character string which needs to be matched with a configured DOT1AD subscription string for correct operation. When remote-id string is reset using this command, the Client DHCP requests that fall under this service subscription are not added with Option-82 Remote-id.

Format no dhcp l2relay remote-id *remoteid-string* subscription-name *subscription-string*

Mode Interface Config

dhcp l2relay remote-id vlan

This parameter sets the DHCP Option-82 Remote ID for a VLAN and subscribed service (based on subscription-name).

Format dhcp l2relay remote-id *remote-id-string* vlan *vlan-list*

Mode Global Config

Parameter	Description
vlan–list	The VLAN ID. The range is 1–4093. Separate nonconsecutive IDs with a comma (,) no spaces and no zeros in between the range. Use a dash (–) for the range.

no dhcp l2relay remote-id vlan

This parameter clears the DHCP Option-82 Remote ID for a VLAN and subscribed service (based on subscription-name).

Format `no dhcp l2relay remote-id vlan` *`vlan-list`*

Mode Global Config

dhcp l2relay subscription

This command enables relaying DHCP packets on an interface or range of interfaces that fall under the specified service subscription. The *subscription-string* is a character string that needs to be matched with configured DOT1AD subscription string for correct operation.

Default disabled (i.e. no DHCP packets are relayed)

Format dhcp l2relay subscription-name *subscription-string*

Mode Interface Config

no dhcp l2relay subscription

This command disables relaying DHCP packets that fall under the specified service subscription. The *subscription-string* is a character string that needs to be matched with configured DOT1AD subscription string for correct operation.

Format no dhcp l2relay subscription-name *subscription-string*

Mode Interface Config

dhcp l2relay trust

Use this command to configure an interface or range of interfaces as trusted for Option-82 reception.

Default untrusted

Format dhcp l2relay trust

Mode	Interface Config

no dhcp l2relay trust

Use this command to configure an interface to the default untrusted for Option-82 reception.

Format	no dhcp l2relay trust
Mode	Interface Config

dhcp l2relay vlan

Use this command to enable the DHCP L2 Relay agent for a set of VLANs. All DHCP packets which arrive on interfaces in the configured VLAN are subject to L2 Relay processing.

Default	`disable`
Format	`dhcp l2relay vlan` *`vlan-list`*
Mode	Global Config

Parameter	Description
vlan–list	The VLAN ID. The range is 1–4093. Separate nonconsecutive IDs with a comma (,) no spaces and no zeros in between the range. Use a dash (–) for the range.

no dhcp l2relay vlan

Use this command to disable the DHCP L2 Relay agent for a set of VLANs.

Format	`no dhcp l2relay vlan` *`vlan-list`*
Mode	Global Config

show dhcp l2relay all

This command displays the summary of DHCP L2 Relay configuration.

Format	show dhcp l2relay all
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switching) #show dhcp l2relay all

DHCP L2 Relay is Enabled.

Interface  L2RelayMode   TrustMode
----------  -----------  --------------
 0/2       Enabled     untrusted
 0/4       Disabled    trusted

VLAN Id    L2 Relay  CircuitId  RemoteId
```

```
--------- ----------  ----------- ------------
 3        Disabled    Enabled    --NULL--
 5        Enabled     Enabled    --NULL--
 6        Enabled     Enabled    Lenovo
 7        Enabled     Disabled   --NULL--
 8        Enabled     Disabled   --NULL--
 9        Enabled     Disabled   --NULL--
 10        Enabled     Disabled   --NULL--
```

show dhcp l2relay circuit-id vlan

This command displays DHCP circuit-id vlan configuration.

Format	show dhcp l2relay circuit-id vlan *vlan-list*
Mode	Privileged EXEC

Parameter	Description
vlan-list	Enter VLAN IDs in the range 1–4093. Use a dash (–) to specify a range or a comma (,) to separate VLAN IDs in a list. Spaces and zeros are not permitted.

show dhcp l2relay interface

This command displays DHCP L2 relay configuration specific to interfaces.

Format	show dhcp l2relay interface {all | *interface-num*}
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switching) #show dhcp l2relay interface all

DHCP L2 Relay is  Enabled.

Interface  L2RelayMode   TrustMode
----------  -----------  --------------
 0/2       Enabled      untrusted
 0/4       Disabled     trusted
```

show dhcp l2relay remote-id vlan

This command displays DHCP Remote-id vlan configuration.

Format	show dhcp l2relay remote-id vlan *vlan-list*
Mode	Privileged EXEC

Parameter	Description
vlan-list	Enter VLAN IDs in the range 1–4093. Use a dash (–) to specify a range or a comma (,) to separate VLAN IDs in a list. Spaces and zeros are not permitted.

show dhcp l2relay stats interface

This command displays statistics specific to DHCP L2 Relay configured interface.

Format	show dhcp l2relay stats interface {all | *interface-num*}
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switching) #show dhcp l2relay stats interface all

DHCP L2 Relay is  Enabled.

Interface  UntrustedServer    UntrustedClient  TrustedServer     TrustedClient
                                                    MsgsWithOpt82    MsgsWithOpt82
MsgsWithoutOpt82                                    MsgsWithoutOpt82
---------  --------------- -----------------  ----------------- --------------
 0/1        0                                      0          0          0
 0/2                                               0          0          3          7
 0/3                                               0          0          0          0
 0/4                                               0          12          0          0
 0/5                                               0          0          0          0
 0/6                                               3          0          0  0
 0/7                                               0          0          0          0
 0/8                                               0          0          0          0
 0/9        0          0          0          0
```

show dhcp l2relay subscription interface

This command displays DHCP L2 Relay configuration specific to a service subscription on an interface.

Format	show dhcp l2relay subscription interface {all|*interface-num*}
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switching) #show dhcp l2relay subscription interface all
Interface   SubscriptionName    L2Relay mode  Circuit-Id mode  Remote-Id mode
-----------  ----------------   -------------- ---------------  ----------------
 0/1          sub1           Enabled      Disabled       --NULL--
 0/2          sub3           Enabled      Disabled       EnterpriseSwitch
 0/2          sub22           Disabled      Enabled       --NULL--
 0/4          sub4           Enabled      Enabled       --NULL--
```

show dhcp l2relay agent-option vlan

This command displays the DHCP L2 Relay Option-82 configuration specific to VLAN.

Format	show dhcp l2relay agent-option vlan *vlan-range*
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switching) #show dhcp l2relay agent-option vlan 5-10

DHCP L2 Relay is  Enabled.
```

```
VLAN Id    L2 Relay                                   CircuitId  RemoteId
--------- ----------                                  ----------- ------------
5          Enabled     Enabled    --NULL--
6          Enabled     Enabled    Lenovo
7          Enabled     Disabled   --NULL--
8          Enabled     Disabled   --NULL--
9          Enabled     Disabled   --NULL--
10          Enabled     Disabled   --NULL--
```

show dhcp l2relay vlan

This command displays DHCP vlan configuration.

Format	show dhcp l2relay vlan *vlan-list*
Mode	Privileged EXEC

Parameter	Description
vlan-list	Enter VLAN IDs in the range 1–4093. Use a dash (–) to specify a range or a comma (,) to separate VLAN IDs in a list. Spaces and zeros are not permitted.

clear dhcp l2relay statistics interface

Use this command to reset the DHCP L2 relay counters to zero. Specify the port with the counters to clear, or use the `all` keyword to clear the counters on all ports.

Format	clear dhcp l2relay statistics interface {*unit/slot/port* | *all*}
Mode	Privileged EXEC

DHCP Client Commands

CE0128XB/CE0152XB can include vendor and configuration information in DHCP client requests relayed to a DHCP server. This information is included in DHCP Option 60, Vendor Class Identifier. The information is a string of 128 octets.

dhcp client vendor-id-option

This command enables the inclusion of DHCP Option-60, Vendor Class Identifier included in the requests transmitted to the DHCP server by the DHCP client operating in the CE0128XB/CE0152XB switch.

Format	dhcp client vendor-id-option *string*
Mode	Global Config

no dhcp client vendor-id-option

This command disables the inclusion of DHCP Option-60, Vendor Class Identifier included in the requests transmitted to the DHCP server by the DHCP client operating in the CE0128XB/CE0152XB switch.

Format	no dhcp client vendor-id-option
Mode	Global Config

dhcp client vendor-id-option-string

This parameter sets the DHCP Vendor Option-60 string to be included in the requests transmitted to the DHCP server by the DHCP client operating in the CE0128XB/CE0152XB switch.

Format	dhcp client vendor-id-option-string *string*
Mode	Global Config

no dhcp client vendor-id-option-string

This parameter clears the DHCP Vendor Option-60 string.

Format	`no dhcp client vendor-id-option-string`
Mode	Global Config

show dhcp client vendor-id-option

This command displays the configured administration mode of the vendor-id-option and the vendor-id string to be included in Option-43 in DHCP requests.

Format	`show dhcp client vendor-id-option`
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Switching)#show dhcp client vendor-id-option

DHCP Client Vendor Identifier Option is Enabled
DHCP Client Vendor Identifier Option string is LenovoClient.
```

DHCP Snooping Configuration Commands

This section describes commands you use to configure DHCP Snooping.

ip dhcp snooping

Use this command to enable DHCP Snooping globally.

Default	disabled
Format	ip dhcp snooping
Mode	Global Config

no ip dhcp snooping

Use this command to disable DHCP Snooping globally.

Format	no ip dhcp snooping
Mode	Global Config

ip dhcp snooping vlan

Use this command to enable DHCP Snooping on a list of comma-separated VLAN ranges.

Default	disabled
Format	ip dhcp snooping vlan *vlan-list*
Mode	Global Config

no ip dhcp snooping vlan

Use this command to disable DHCP Snooping on VLANs.

Format	no ip dhcp snooping vlan *vlan-list*
Mode	Global Config

ip dhcp snooping verify mac-address

Use this command to enable verification of the source MAC address with the client hardware address in the received DCHP message.

Default	enabled
Format	ip dhcp snooping verify mac-address
Mode	Global Config

no ip dhcp snooping verify mac-address

Use this command to disable verification of the source MAC address with the client hardware address.

Format	no ip dhcp snooping verify mac-address
Mode	Global Config

ip dhcp snooping database

Use this command to configure the persistent location of the DHCP Snooping database. This can be local or a remote file on a given IP machine.

Default	local
Format	ip dhcp snooping database {local|tftp://hostIP/filename}
Mode	Global Config

ip dhcp snooping database write-delay

Use this command to configure the interval in seconds at which the DHCP Snooping database will be persisted. The interval value ranges from 15 to 86400 seconds.

Default	300 seconds
Format	ip dhcp snooping database write-delay in seconds
Mode	Global Config

no ip dhcp snooping database write-delay

Use this command to set the write delay value to the default value.

Format	no ip dhcp snooping database write-delay
Mode	Global Config

ip dhcp snooping binding

Use this command to configure static DHCP Snooping binding.

Format	ip dhcp snooping binding *mac-address* vlan *vlan id ip address* interface *interface id*
Mode	Global Config

no ip dhcp snooping binding

Use this command to remove the DHCP static entry from the DHCP Snooping database.

Format	no ip dhcp snooping binding *mac-address*
Mode	Global Config

ip dhcp filtering trust

Use this command to enable trusted mode on the interface if the previously saved configuration or applied script contains this command.

Format	ip dhcp filtering trust *interface id*
Mode	Global Config

no ip dhcp filtering trust

Use this command to disable trusted mode on the interface.

Format	no ip dhcp filtering trust *interface id*
Mode	Global Config

ip verify binding

Use this command to configure static IP source guard (IPSG) entries.

Format	ip verify binding *mac-address* vlan *vlan id ip address* interface *interface id*
Mode	Global Config

no ip verify binding

Use this command to remove the IPSG static entry from the IPSG database.

Format	no ip verify binding *mac-address* vlan *vlan id ip address* interface *interface id*
Mode	Global Config

ip dhcp snooping limit

Use this command to control the rate at which the DHCP Snooping messages come on an interface or range of interfaces. By default, rate limiting is disabled. When enabled, the rate can range from 0 to 300 packets per second. The burst level range is 1 to 15 seconds.

Default	disabled (no limit)
Format	ip dhcp snooping limit {rate pps [*burst interval seconds*]}
Mode	Interface Config

no ip dhcp snooping limit

Use this command to set the rate at which the DHCP Snooping messages come, and the burst level, to the defaults.

Format	no ip dhcp snooping limit
Mode	Interface Config

ip dhcp snooping log-invalid

Use this command to control the logging DHCP messages filtration by the DHCP Snooping application. This command can be used to configure a single interface or a range of interfaces.

Default	disabled
Format	ip dhcp snooping log-invalid
Mode	Interface Config

no ip dhcp snooping log-invalid

Use this command to disable the logging DHCP messages filtration by the DHCP Snooping application.

Format	no ip dhcp snooping log-invalid
Mode	Interface Config

ip dhcp snooping trust

Use this command to configure an interface or range of interfaces as trusted.

Default	disabled
Format	ip dhcp snooping trust
Mode	Interface Config

no ip dhcp snooping trust

Use this command to configure the port as untrusted.

Format	no ip dhcp snooping trust
Mode	Interface Config

ip verify source

Use this command to configure the IPSG source ID attribute to filter the data traffic in the hardware. Source ID is the combination of IP address and MAC address. Normal command allows data traffic filtration based on the IP address. With the `port-security` option, the data traffic will be filtered based on the IP and MAC addresses.

This command can be used to configure a single interface or a range of interfaces.

Default	the source ID is the IP address
Format	ip verify source {port-security}
Mode	Interface Config

no ip verify source

Use this command to disable the IPSG configuration in the hardware. You cannot disable port-security alone if it is configured.

Format	no ip verify source
Mode	Interface Config

show ip dhcp snooping

Use this command to display the DHCP Snooping global configurations and per port configurations.

Format	show ip dhcp snooping
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	The interface for which data is displayed.
Trusted	If it is enabled, DHCP snooping considers the port as trusted. The factory default is disabled.
Log Invalid Pkts	If it is enabled, DHCP snooping application logs invalid packets on the specified interface.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip dhcp snooping

DHCP snooping is Disabled
DHCP snooping source MAC verification is enabled
DHCP snooping is enabled on the following VLANs:
11 - 30, 40

Interface   Trusted    Log Invalid Pkts
---------   --------   ----------------
0/1         Yes          No
0/2         No           Yes
0/3         No           Yes
0/4         No            No
0/6         No            No
```

show ip dhcp snooping binding

Use this command to display the DHCP Snooping binding entries. To restrict the output, use the following options:

- Dynamic: Restrict the output based on DCHP snooping.
- Interface: Restrict the output based on a specific interface.
- Static: Restrict the output based on static entries.
- VLAN: Restrict the output based on VLAN.

Format	show ip dhcp snooping binding [{static/dynamic}] [interface *unit/slot/port*] [vlan id]

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
MAC Address	Displays the MAC address for the binding that was added. The MAC address is the key to the binding database.
IP Address	Displays the valid IP address for the binding rule.
VLAN	The VLAN for the binding rule.
Interface	The interface to add a binding into the DHCP snooping interface.
Type	Binding type; statically configured from the CLI or dynamically learned.
Lease (sec)	The remaining lease time for the entry.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip dhcp snooping binding

Total number of bindings: 2

MAC Address        IP Address   VLAN  Interface  Type  Lease time (Secs)
------------------  ------------  ----  ---------  ----                 ------------------
00:02:B3:06:60:80   210.1.1.3     10   0/1                        86400
00:0F:FE:00:13:04   210.1.1.4     10   0/1                          86400
```

show ip dhcp snooping database

Use this command to display the DHCP Snooping configuration related to the database persistence.

Format show ip dhcp snooping database

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
Agent URL	Bindings database agent URL.
Write Delay	The maximum write time to write the database into local or remote.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip dhcp snooping database

agent url:  /10.131.13.79:/sai1.txt

write-delay:  5000
```

show ip dhcp snooping interfaces

Use this command to show the DHCP Snooping status of the interfaces.

Format show ip dhcp snooping interfaces

Mode Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(switch) #show ip dhcp snooping interfaces

 Interface    Trust State                                  Rate LimitBurst Interval
                                                          (pps) (seconds)
-----------   ----------   ----------   --------------
                                                          1/g1No151
                                                          1/g2No151
                                                          1/g3No151

(switch) #show ip dhcp snooping interfaces ethernet 1/g15

 Interface    Trust State                                  Rate LimitBurst Interval
                                                          (pps) (seconds)
-----------   ----------   ----------   --------------
                                                          1/g15Yes151
```

show ip dhcp snooping statistics

Use this command to list statistics for DHCP Snooping security violations on untrusted ports.

Format	show ip dhcp snooping statistics
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	The IP address of the interface in *`unit/slot/port`* format.
MAC Verify Failures	Represents the number of DHCP messages that were filtered on an untrusted interface because of source MAC address and client HW address mismatch.
Client Ifc Mis-match	Represents the number of DHCP release and Deny messages received on the different ports than learned previously.
DHCP Server Msgs Rec'd	Represents the number of DHCP server messages received on Untrusted ports.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip dhcp snooping statistics

 Interface    MAC Verify   Client Ifc   DHCP Server
              Failures     Mismatch     Msgs Rec'd
-----------   ----------   ----------   -----------
1/0/2              0          0            0
1/0/3              0          0            0
1/0/4              0          0            0
1/0/5              0          0            0
1/0/6              0          0            0
1/0/7              0          0            0
1/0/8              0          0            0
1/0/9              0          0            0
1/0/10              0          0            0
1/0/11              0          0            0
1/0/12              0          0            0
1/0/13              0          0            0
1/0/14              0          0            0
1/0/15              0          0            0
1/0/16              0          0            0
```

```
1/0/17          0         0          0
1/0/18          0         0          0
1/0/19          0         0          0
1/0/20          0         0          0
```

clear ip dhcp snooping binding

Use this command to clear all DHCP Snooping bindings on all interfaces or on a specific interface.

Format	clear ip dhcp snooping binding [interface *unit/slot/port*]
Mode	• Privileged EXEC • User EXEC

clear ip dhcp snooping statistics

Use this command to clear all DHCP Snooping statistics.

Format	clear ip dhcp snooping statistics
Mode	• Privileged EXEC • User EXEC

show ip verify source

Use this command to display the IPSG configurations on all ports.

Format	show ip verify source
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	Interface address in `unit/slot/port` format.
Filter Type	Is one of two values: • ip-mac: User has configured MAC address filtering on this interface. • ip: Only IP address filtering on this interface.
IP Address	IP address of the interface
MAC Address	If MAC address filtering is not configured on the interface, the MAC Address field is empty. If port security is disabled on the interface, then the MAC Address field displays “permit-all.”
VLAN	The VLAN for the binding rule.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip verify source

Interface  Filter Type    IP Address       MAC Address       Vlan
---------  -----------  ---------------  -----------------  -----
   0/1     ip-mac       210.1.1.3       00:02:B3:06:60:80    10
   0/1     ip-mac       210.1.1.4       00:0F:FE:00:13:04    10
```

show ip verify interface

Use this command to display the IPSG filter type for a specific interface.

Format	show ip verify interface unit/slot/port
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	Interface address in `unit/slot/port` format.
Filter Type	Is one of two values: • ip-mac: User has configured MAC address filtering on this interface. • ip: Only IP address filtering on this interface.

show ip source binding

Use this command to display the IPSG bindings.

Format	show ip source binding [{dhcp-snooping|static}] [interface *unit/slot/port*] [vlan id]
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
MAC Address	The MAC address for the entry that is added.
IP Address	The IP address of the entry that is added.
Type	Entry type; statically configured from CLI or dynamically learned from DHCP Snooping.
VLAN	VLAN for the entry.
Interface	IP address of the interface in `unit/slot/port` format.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip source binding

MAC Address       IP Address       Type         Vlan    Interface
-----------------  ---------------  -------------  -----  -------------
00:00:00:00:00:08         1.2.3.4  dhcp-snooping    2       1/0/1
00:00:00:00:00:09         1.2.3.4  dhcp-snooping    3       1/0/1
00:00:00:00:00:0A         1.2.3.4  dhcp-snooping    4       1/0/1
```

Dynamic ARP Inspection Commands

Dynamic ARP Inspection (DAI) is a security feature that rejects invalid and malicious ARP packets. DAI prevents a class of man-in-the-middle attacks, where an unfriendly station intercepts traffic for other stations by poisoning the ARP caches of its unsuspecting neighbors. The miscreant sends ARP requests or responses mapping another station's IP address to its own MAC address.

DAI relies on DHCP snooping. DHCP snooping listens to DHCP message exchanges and builds a binding database of valid {MAC address, IP address, VLAN, and interface} tuples.

When DAI is enabled, the switch drops ARP packets whose sender MAC address and sender IP address do not match an entry in the DHCP snooping bindings database. You can optionally configure additional ARP packet validation.

ip arp inspection vlan

Use this command to enable Dynamic ARP Inspection on a list of comma-separated VLAN ranges.

Default	disabled
Format	ip arp inspection vlan *vlan-list*
Mode	Global Config

no ip arp inspection vlan

Use this command to disable Dynamic ARP Inspection on a list of comma-separated VLAN ranges.

Format	no ip arp inspection vlan *vlan-list*
Mode	Global Config

ip arp inspection validate

Use this command to enable additional validation checks like source-mac validation, destination-mac validation, and ip address validation on the received ARP packets. Each command overrides the configuration of the previous command. For example, if a command enables src-mac and dst-mac validations, and a second command enables IP validation only, the src-mac and dst-mac validations are disabled as a result of the second command.

Default	disabled
Format	ip arp inspection validate {[src-mac] [dst-mac] [ip]}
Mode	Global Config

no ip arp inspection validate

Use this command to disable the additional validation checks on the received ARP packets.

Format	no ip arp inspection validate {[src-mac] [dst-mac] [ip]}
Mode	Global Config

ip arp inspection validate interface

Use this command to enable source interface validation checks in the DHCP snooping binding database on the received ARP packets.

Default	enabled
Format	ip arp inspection validate interface
Mode	Global Config

no ip arp inspection validate interface

Use this command to disable the source interface check against the DHCP snooping binding database entry on the received ARP packets.

Format	no ip arp inspection validate interface
Mode	Global Config

ip arp inspection vlan logging

Use this command to enable logging of invalid ARP packets on a list of comma-separated VLAN ranges.

Default	enabled
Format	ip arp inspection vlan *vlan-list* logging
Mode	Global Config

no ip arp inspection vlan logging

Use this command to disable logging of invalid ARP packets on a list of comma-separated VLAN ranges.

Format	no ip arp inspection vlan *vlan-list* logging
Mode	Global Config

ip arp inspection trust

Use this command to configure an interface or range of interfaces as trusted for Dynamic ARP Inspection.

Default	disabled
Format	ip arp inspection trust
Mode	Interface Config

no ip arp inspection trust

Use this command to configure an interface as untrusted for Dynamic ARP Inspection.

Format	no ip arp inspection trust
Mode	Interface Config

ip arp inspection limit

Use this command to configure the rate limit and burst interval values for an interface or range of interfaces. Configuring `none` for the limit means the interface is not rate limited for Dynamic ARP Inspections. The maximum pps value shown in the range for the rate option might be more than the hardware allowable limit. Therefore you need to understand the switch performance and configure the maximum rate pps accordingly.

Note: The user interface will accept a rate limit for a trusted interface, but the limit will not be enforced unless the interface is configured to be untrusted.

Default	15 pps for rate and 1 second for burst-interval
Format	ip arp inspection limit {rate *pps* [burst interval *seconds*] | none}
Mode	Interface Config

no ip arp inspection limit

Use this command to set the rate limit and burst interval values for an interface to the default values of 15 pps and 1 second, respectively.

Format	no ip arp inspection limit
Mode	Interface Config

ip arp inspection filter

Use this command to configure the ARP ACL used to filter invalid ARP packets on a list of comma-separated VLAN ranges. If the static keyword is given, packets that do not match a permit statement are dropped without consulting the DHCP snooping bindings.

Default	No ARP ACL is configured on a VLAN
Format	ip arp inspection filter *acl-name* vlan *vlan-list* [static]
Mode	Global Config

no ip arp inspection filter

Use this command to unconfigure the ARP ACL used to filter invalid ARP packets on a list of comma-separated VLAN ranges.

Format	no ip arp inspection filter *acl-name* vlan *vlan-list* [static]
Mode	Global Config

arp access-list

Use this command to create an ARP ACL.

Format	arp access-list *acl-name*
Mode	Global Config

no arp access-list

Use this command to delete a configured ARP ACL.

Format	no arp access-list *acl-name*
Mode	Global Config

deny ip host mac host

Use this command to configure an explicit deny rule for a valid IP address and MAC address combination used in ARP packet validation.

Format	deny ip {any | host *sender-ip}* mac {any | host *sender-mac}*
Mode	ARP Access-list Config

no deny ip host mac host

Use this command to delete a deny rule for a valid IP address and MAC address combination.

Format	no deny ip {any | host *sender-ip}* mac {any | host *sender-mac}*
Mode	ARP Access-list Config

permit ip host mac host

Use this command to configure an explicit permit rule for a valid IP address and MAC address combination used in ARP packet validation.

Format	permit ip {any | host *sender-ip}* mac {any | host *sender-mac}*
Mode	ARP Access-list Config

no permit ip host mac host

Use this command to delete an explicit permit rule for a valid IP and MAC combination.

Format	no permit ip {any | host *sender-ip}* mac {any | host *sender-mac}*
Mode	ARP Access-list Config

show ip arp inspection

Use this command to display the Dynamic ARP Inspection global configuration and configuration on all the VLANs. With the *vlan-list* argument (i.e. comma separated VLAN ranges), the command displays the global configuration and configuration on all the VLANs in the given VLAN list. The global configuration includes the **source mac validation**, **destination mac validation** and **invalid IP validation** information.

Format	show ip arp inspection [{interfaces *unit/slot/port* | vlan *vlan-list*]
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Source MAC Validation	Displays whether Source MAC Validation of ARP frame is enabled or disabled.
Destination MAC Validation	Displays whether Destination MAC Validation is enabled or disabled.
IP Address Validation	Displays whether IP Address Validation is enabled or disabled.
VLAN	The VLAN ID for each displayed row.
Configuration	Displays whether DAI is enabled or disabled on the VLAN.
Log Invalid	Displays whether logging of invalid ARP packets is enabled on the VLAN.
ACL Name	The ARP ACL Name, if configured on the VLAN.
Static Flag	If the ARP ACL is configured static on the VLAN.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip arp inspection vlan 10-12

Source Mac Validation      : Disabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled

 Vlan        Configuration    Log Invalid   ACL Name   Static flag
 ----       -------------    -----------   ---------  ----------
   10           Enabled        Enabled   H2        Enabled
   11          Disabled        Enabled
   12          Enabled        Disabled
```

show ip arp inspection statistics

Use this command to display the statistics of the ARP packets processed by Dynamic ARP Inspection. Give the vlan-list argument and the command displays the statistics on all DAI-enabled VLANs in that list. Give the single vlan argument and the command displays the statistics on that VLAN. If no argument is included, the command lists a summary of the forwarded and dropped ARP packets.

Format	show ip arp inspection statistics [vlan vlan-list]
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
VLAN	The VLAN ID for each displayed row.
Forwarded	The total number of valid ARP packets forwarded in this VLAN.
Dropped	The total number of not valid ARP packets dropped in this VLAN.
DHCP Drops	The number of packets dropped due to DHCP snooping binding database match failure.
ACL Drops	The number of packets dropped due to ARP ACL rule match failure.
DHCP Permits	The number of packets permitted due to DHCP snooping binding database match.
ACL Permits	The number of packets permitted due to ARP ACL permit rule match.
ACL Denials	The number of packets denied due to ARP ACL deny rule match.
Bad Src MAC	The number of packets dropped due to Source MAC validation failure.
Bad Dest MAC	The number of packets dropped due to Destination MAC validation failure.
Invalid IP	The number of packets dropped due to invalid IP checks.

Example: The following shows example CLI display output for the command `show ip arp inspection statistics` which lists the summary of forwarded and dropped ARP packets on all DAI-enabled VLANs.

```
VLAN  Forwarded  Dropped
----  ---------  -------
 10        90      14
 20        10       3
```

Example: The following shows example CLI display output for the command `show ip arp inspection statistics vlan 10,20.`

```
VLAN    DHCP     ACL      DHCP      ACL             ACLBad Src   Bad Dest   Invalid
                                                    Drops Drops      Permits    Permits DenialsMAC
MAC       IP
----- -------- --------- ----------- ---------      --------- ---------- ----------- ---------
10                                                  11 1  65         25 51 1         0
20                                                  1 0 8         2 30 1         1
```

clear ip arp inspection statistics

Use this command to reset the statistics for Dynamic ARP Inspection on all VLANs.

Default	none
Format	clear ip arp inspection statistics
Mode	Privileged EXEC

show ip arp inspection interfaces

Use this command to display the Dynamic ARP Inspection configuration on all the DAI-enabled interfaces. An interface is said to be enabled for DAI if at least one VLAN, that the interface is a member of, is enabled for DAI. Given a *unit/slot/port* interface argument, the command displays the values for that interface whether the interface is enabled for DAI or not.

Format show ip arp inspection interfaces [*unit*/*slot*/*port*]

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
Interface	The interface ID for each displayed row.
Trust State	Whether the interface is trusted or untrusted for DAI.
Rate Limit	The configured rate limit value in packets per second.
Burst Interval	The configured burst interval value in seconds.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip arp inspection interfaces

Interface      Trust State  Rate Limit  Burst Interval
                              (pps)       (seconds)
--------------- ----------- ---------- ---------------
0/1            Untrusted       15            1
0/2            Untrusted       10           10
```

show arp access-list

Use this command to display the configured ARP ACLs with the rules. Giving an ARP ACL name as the argument will display only the rules in that ARP ACL.

Format show arp access-list [acl-name]

Mode
- Privileged EXEC
- User EXEC

Example: The following shows example CLI display output for the command.

```
Switch#show arp access-list
ARP access list H2
permit ip host 1.1.1.1 mac host 00:01:02:03:04:05
permit ip host 1.1.1.2 mac host 00:03:04:05:06:07
deny ip host 1.1.1.3 mac host 00:08:09:0A:0B:0C
ARP access list H3
ARP access list H4
permit ip host 1.1.1.3 mac any
deny ip any mac host 00:11:11:11:11:11
ARP access list H5
permit ip host 2.1.1.2 mac host 00:03:04:05:06:08
```

IGMP Snooping Configuration Commands

This section describes the commands you use to configure IGMP snooping. CE0128XB/CE0152XB software supports IGMP Versions 1, 2, and 3. The IGMP snooping feature can help conserve bandwidth because it allows the switch to forward IP multicast traffic only to connected hosts that request multicast traffic. IGMPv3 adds source filtering capabilities to IGMP versions 1 and 2.

Note: This note clarifies the prioritization of MGMD Snooping Configurations. Many of the IGMP/MLD Snooping commands are available both in the Interface and VLAN modes. Operationally the system chooses or prefers the VLAN configured values over the Interface configured values for most configurations when the interface participates in the VLAN.

set igmp

This command enables IGMP Snooping on the system (Global Config Mode), an interface, or a range of interfaces. This command also enables IGMP snooping on a particular VLAN (VLAN Database Mode) and can enable IGMP snooping on all interfaces participating in a VLAN.

If an interface has IGMP Snooping enabled and you enable this interface for routing or enlist it as a member of a port-channel (LAG), IGMP Snooping functionality is disabled on that interface. IGMP Snooping functionality is re-enabled if you disable routing or remove port-channel (LAG) membership from an interface that has IGMP Snooping enabled.

The IGMP application supports the following activities:

- Validation of the IP header checksum (as well as the IGMP header checksum) and discarding of the frame upon checksum error.
- Maintenance of the forwarding table entries based on the MAC address versus the IP address.
- Flooding of unregistered multicast data packets to all ports in the VLAN.

Default	disabled
Format	set igmp [*vlan_id*]
Mode	• Global Config • Interface Config • VLAN Database

no set igmp

This command disables IGMP Snooping on the system, an interface, a range of interfaces, or a VLAN.

Format	no set igmp [*vlan_id*]
Mode	• Global Config • Interface Config • VLAN Database

set igmp header-validation

This command enables header validation for IGMP messages.

When header validation is enabled, IGMP Snooping checks:

- The time-to-live (TTL) field in the IGMP header and drops packets where TTL is not equal to 1. The TTL field should always be set to 1 in the headers of IGMP reports and queries.
- The presence of the router alert option (9404) in the IP packet header of the IGMPv2 message and drops packets that do not include this option.
- The presence of the router alert option (9404) and ToS Byte = 0xC0 (Internet Control) in the IP packet header of IGMPv3 message and drops packets that do not include these options.

Default	enabled
Format	set igmp header-validation
Mode	Global Config

no set igmp header-validation

This command disables header validation for IGMP messages.

Format	no set igmp header-validation
Mode	Global Config

set igmp interfacemode

This command enables IGMP Snooping on all interfaces. If an interface has IGMP Snooping enabled and you enable this interface for routing or enlist it as a member of a port-channel (LAG), IGMP Snooping functionality is disabled on that interface. IGMP Snooping functionality is re-enabled if you disable routing or remove port-channel (LAG) membership from an interface that has IGMP Snooping enabled.

Default	disabled
Format	set igmp interfacemode
Mode	Global Config

no set igmp interfacemode

This command disables IGMP Snooping on all interfaces.

Format	no set igmp interfacemode
Mode	Global Config

set igmp fast-leave

This command enables or disables IGMP Snooping fast-leave admin mode on a selected interface, a range of interfaces, or a VLAN. Enabling fast-leave allows the switch to immediately remove the layer 2 LAN interface from its forwarding table entry upon receiving an IGMP leave message for that multicast group without first sending out MAC-based general queries to the interface.

You should enable fast-leave admin mode only on VLANs where only one host is connected to each layer 2 LAN port. This prevents the inadvertent dropping of the other hosts that were connected to the same layer 2 LAN port but were still interested in receiving multicast traffic directed to that group. Also, fast-leave processing is supported only with IGMP version 2 hosts.

Default	disabled
Format	set igmp fast-leave [*vlan_id*]
Mode	Interface Config Interface Range VLAN Database

no set igmp fast-leave

This command disables IGMP Snooping fast-leave admin mode on a selected interface.

Format	no set igmp fast-leave [*vlan_id*]
Mode	Interface Config Interface Range VLAN Database

set igmp groupmembership-interval

This command sets the IGMP Group Membership Interval time on a VLAN, one interface, a range of interfaces, or all interfaces. The Group Membership Interval time is the amount of time in seconds that a switch waits for a report from a particular group on a particular interface before deleting the interface from the entry. This value must be greater than the IGMPv3 Maximum Response time value. The range is 2 to 3600 seconds.

Default	260 seconds
Format	set igmp groupmembership-interval [*vlan_id*] *2-3600*
Mode	• Interface Config • Global Config • VLAN Database

no set igmp groupmembership-interval

This command sets the IGMPv3 Group Membership Interval time to the default value.

Format	no set igmp groupmembership-interval [*vlan_id*]
Mode	• Interface Config • Global Config • VLAN Database

set igmp maxresponse

This command sets the IGMP Maximum Response time for the system, on a particular interface or VLAN, or on a range of interfaces. The Maximum Response time is the amount of time in seconds that a switch will wait after sending a query on an interface because it did not receive a report for a particular group in that interface. This value must be less than the IGMP Query Interval time value. The range is 1 to 25 seconds.

Default	10 seconds
Format	set igmp maxresponse [*vlan_id*] *1-25*
Mode	• Global Config • Interface Config • VLAN Database

no set igmp maxresponse

This command sets the max response time (on the interface or VLAN) to the default value.

Format	no set igmp maxresponse [*vlan_id*]
Mode	• Global Config • Interface Config • VLAN Database

set igmp mcrtrexpiretime

This command sets the Multicast Router Present Expiration time. The time is set for the system, on a particular interface or VLAN, or on a range of interfaces. This is the amount of time in seconds that a switch waits for a query to be received on an interface before the interface is removed from the list of interfaces with multicast routers attached. The range is 0 to 3600 seconds. A value of 0 indicates an infinite time-out, i.e. no expiration.

Default	0
Format	set igmp mcrtrexpiretime [*vlan_id*] *0-3600*

Mode	• Global Config • Interface Config • VLAN Database

no set igmp mcrtrexpiretime

This command sets the Multicast Router Present Expiration time to 0. The time is set for the system, on a particular interface or a VLAN.

Format	no set igmp mcrtrexpiretime [*vlan_id*]
Mode	• Global Config • Interface Config • VLAN Database

set igmp mrouter

This command configures the VLAN ID (`vlan_id`) that has the multicast router mode enabled.

Format	set igmp mrouter *vlan_id*
Mode	Interface Config

no set igmp mrouter

This command disables multicast router mode for a particular VLAN ID (`vlan_id`).

Format	no set igmp mrouter *vlan_id*
Mode	Interface Config

set igmp mrouter interface

This command configures the interface or range of interfaces as a multicast router interface. When configured as a multicast router interface, the interface is treated as a multicast router interface in all VLANs.

Default	disabled
Format	set igmp mrouter interface
Mode	Interface Config

no set igmp mrouter interface

This command disables the status of the interface as a statically configured multicast router interface.

Format	no set igmp mrouter interface

Mode	Interface Config

set igmp report-suppression

Use this command to suppress the IGMP reports on a given VLAN ID. In order to optimize the number of reports traversing the network with no added benefits, a Report Suppression mechanism is implemented. When more than one client responds to an MGMD query for the same Multicast Group address within the max-response-time, only the first response is forwarded to the query and others are suppressed at the switch.

Default	disabled
Format	set igmp report-suppression *vlan-id*
Mode	VLAN Database

Parameter	Description
vlan-id	A valid VLAN ID. Range is 1 to 4093.

Example: The following shows an example of the command.

```
(Switching) #vlan database
(Switching) (Vlan)#set igmp report-suppression 1
```

no set igmp report-suppression

Use this command to return the system to the default.

Format	no set igmp report-suppression
Mode	VLAN Database

show igmpsnooping

This command displays IGMP Snooping information for a given `unit/slot/port` or VLAN. Configured information is displayed whether or not IGMP Snooping is enabled.

Format	show igmpsnooping [*unit/slot/port* | *vlan_id*]
Mode	Privileged EXEC

When the optional arguments *`unit/slot/port`* or *`vlan_id`* are not used, the command displays the following information:

Parameter	Definition
Admin Mode	Indicates whether or not IGMP Snooping is active on the switch.
Multicast Control Frame Count	The number of multicast control frames that are processed by the CPU.
Interface Enabled for IGMP Snooping	The list of interfaces on which IGMP Snooping is enabled.

Parameter	Definition
VLANS Enabled for IGMP Snooping	The list of VLANS on which IGMP Snooping is enabled.

When you specify the *unit/slot/port* values, the following information appears.

Parameter	Definition
IGMP Snooping Admin Mode	Indicates whether IGMP Snooping is active on the interface.
Fast Leave Mode	Indicates whether IGMP Snooping Fast-leave is active on the interface.
Group Membership Interval	The amount of time in seconds that a switch will wait for a report from a particular group on a particular interface before deleting the interface from the entry.This value may be configured.
Maximum Response Time	The amount of time the switch waits after it sends a query on an interface because it did not receive a report for a particular group on that interface. This value may be configured.
Multicast Router Expiry Time	The amount of time to wait before removing an interface from the list of interfaces with multicast routers attached. The interface is removed if a query is not received. This value may be configured.

When you specify a value for *vlan_id*, the following information appears.

Parameter	Definition
VLAN ID	The VLAN ID.
IGMP Snooping Admin Mode	Indicates whether IGMP Snooping is active on the VLAN.
Fast Leave Mode	Indicates whether IGMP Snooping Fast-leave is active on the VLAN.
Group Membership Interval (secs)	The amount of time in seconds that a switch will wait for a report from a particular group on a particular interface, which is participating in the VLAN, before deleting the interface from the entry.This value may be configured.
Maximum Response Time (secs)	The amount of time the switch waits after it sends a query on an interface, participating in the VLAN, because it did not receive a report for a particular group on that interface. This value may be configured.
Multicast Router Expiry Time (secs)	The amount of time to wait before removing an interface that is participating in the VLAN from the list of interfaces with multicast routers attached. The interface is removed if a query is not received. This value may be configured.
Report Suppression Mode	Indicates whether IGMP reports (set by the command "set igmp report-suppression" on page 524) in enabled or not.

Example: The following shows example CLI display output for the command.

```
(Switching) #show igmpsnooping 1

VLAN ID........................................ 1
IGMP Snooping Admin Mode....................... Disabled
Fast Leave Mode................................ Disabled
Group Membership Interval (secs)............... 260
Max Response Time (secs)....................... 10
```

```
Multicast Router Expiry Time (secs)............ 0
Report Suppression Mode........................ Enabled
```

show igmpsnooping mrouter interface

This command displays information about statically configured ports.

Format	show igmpsnooping mrouter interface *unit/slot/port*
Mode	Privileged EXEC

Parameter	Definition
Interface	The port on which multicast router information is being displayed.
Multicast Router Attached	Indicates whether multicast router is statically enabled on the interface.
VLAN ID	The list of VLANs of which the interface is a member.

show igmpsnooping mrouter vlan

This command displays information about statically configured ports.

Format	show igmpsnooping mrouter vlan *unit/slot/port*
Mode	Privileged EXEC

Parameter	Definition
Interface	The port on which multicast router information is being displayed.
VLAN ID	The list of VLANs of which the interface is a member.

show igmpsnooping ssm

This command displays information about Source Specific Multicasting (SSM) by entry, group, or statistics. SSM delivers multicast packets to receivers that originated from a source address specified by the receiver. SSM is only available with IGMPv3 and MLDv2.

Format	show igmpsnooping ssm {entries | groups | stats}
Mode	Privileged EXEC

show mac-address-table igmpsnooping

This command displays the IGMP Snooping entries in the MFDB table.

Format	show mac-address-table igmpsnooping
Mode	Privileged EXEC

Parameter	Definition
VLAN ID	The VLAN in which the MAC address is learned.

Parameter	Definition
MAC Address	A multicast MAC address for which the switch has forwarding or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 81:96:21:67:89:AB.
Type	The type of the entry, which is either static (added by the user) or dynamic (added to the table as a result of a learning process or protocol).
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

IGMP Snooping Querier Commands

IGMP Snooping requires that one central switch or router periodically query all end-devices on the network to announce their multicast memberships. This central device is the “IGMP Querier”. The IGMP query responses, known as IGMP reports, keep the switch updated with the current multicast group membership on a port-by-port basis. If the switch does not receive updated membership information in a timely fashion, it will stop forwarding multicasts to the port where the end device is located.

This section describes commands used to configure and display information on IGMP Snooping Queriers on the network and, separately, on VLANs.

Note: This note clarifies the prioritization of MGMD Snooping Configurations. Many of the IGMP/MLD Snooping commands are available both in the Interface and VLAN modes. Operationally the system chooses or prefers the VLAN configured values over the Interface configured values for most configurations when the interface participates in the VLAN.

set igmp querier

Use this command to enable IGMP Snooping Querier on the system, using Global Config mode, or on a VLAN. Using this command, you can specify the IP Address that the Snooping Querier switch should use as the source address while generating periodic queries.

If a VLAN has IGMP Snooping Querier enabled and IGMP Snooping is operationally disabled on it, IGMP Snooping Querier functionality is disabled on that VLAN. IGMP Snooping functionality is re-enabled if IGMP Snooping is operational on the VLAN.

Note: The Querier IP Address assigned for a VLAN takes preference over global configuration.

The IGMP Snooping Querier application supports sending periodic general queries on the VLAN to solicit membership reports.

Default	disabled
Format	set igmp querier [*vlan-id*] [address *ipv4_address*]
Mode	• Global Config • VLAN Mode

no set igmp querier

Use this command to disable IGMP Snooping Querier on the system. Use the optional `address` parameter to reset the querier address to 0.0.0.0.

Format	no set igmp querier [*vlan-id*] [address]
Mode	• Global Config • VLAN Mode

set igmp querier query-interval

Use this command to set the IGMP Querier Query Interval time. It is the amount of time in seconds that the switch waits before sending another general query.

Default	disabled
Format	set igmp querier query-interval *1-1800*
Mode	Global Config

no set igmp querier query-interval

Use this command to set the IGMP Querier Query Interval time to its default value.

Format	no set igmp querier query-interval
Mode	Global Config

set igmp querier timer expiry

Use this command to set the IGMP Querier timer expiration period. It is the time period that the switch remains in Non-Querier mode once it has discovered that there is a Multicast Querier in the network.

Default	60 seconds
Format	set igmp querier timer expiry *60-300*
Mode	Global Config

no set igmp querier timer expiry

Use this command to set the IGMP Querier timer expiration period to its default value.

Format	no set igmp querier timer expiry
Mode	Global Config

set igmp querier version

Use this command to set the IGMP version of the query that the snooping switch is going to send periodically.

Default	1
Format	set igmp querier version *1-2*
Mode	Global Config

no set igmp querier version

Use this command to set the IGMP Querier version to its default value.

Format	no set igmp querier version
Mode	Global Config

set igmp querier election participate

Use this command to enable the Snooping Querier to participate in the Querier Election process when it discovers the presence of another Querier in the VLAN. When this mode is enabled, if the Snooping Querier finds that the other Querier's source address is better (less) than the Snooping Querier's address, it stops sending periodic queries. If the Snooping Querier wins the election, then it will continue sending periodic queries.

Default	disabled
Format	set igmp querier election participate
Mode	VLAN Database

no set igmp querier election participate

Use this command to set the Snooping Querier not to participate in querier election but go into non-querier mode as soon as it discovers the presence of another querier in the same VLAN.

Format	no set igmp querier election participate
Mode	VLAN Database

show igmpsnooping querier

Use this command to display IGMP Snooping Querier information. Configured information is displayed whether or not IGMP Snooping Querier is enabled.

Format	show igmpsnooping querier [{detail | vlan *vlanid*}]
Mode	Privileged EXEC

When the optional argument `vlanid` is not used, the command displays the following information.

Field	Description
Admin Mode	Indicates whether or not IGMP Snooping Querier is active on the switch.
Admin Version	The version of IGMP that will be used while sending out the queries.
Querier Address	The IP Address which will be used in the IPv4 header while sending out IGMP queries. It can be configured using the appropriate command.
Query Interval	The amount of time in seconds that a Snooping Querier waits before sending out the periodic general query.
Querier Timeout	The amount of time to wait in the Non-Querier operational state before moving to a Querier state.

When you specify a value for `vlanid`, the following additional information appears.

Field	Description
VLAN Admin Mode	Indicates whether IGMP Snooping Querier is active on the VLAN.

Field	Description
VLAN Operational State	Indicates whether IGMP Snooping Querier is in “Querier” or “Non-Querier” state. When the switch is in `Querier` state, it will send out periodic general queries. When in `Non-Querier` state, it will wait for moving to Querier state and does not send out any queries.
VLAN Operational Max Response Time	Indicates the time to wait before removing a Leave from a host upon receiving a Leave request. This value is calculated dynamically from the Queries received from the network. If the Snooping Switch is in Querier state, then it is equal to the configured value.
Querier Election Participation	Indicates whether the IGMP Snooping Querier participates in querier election if it discovers the presence of a querier in the VLAN.
Querier VLAN Address	The IP address will be used in the IPv4 header while sending out IGMP queries on this VLAN. It can be configured using the appropriate command.
Operational Version	The version of IPv4 will be used while sending out IGMP queries on this VLAN.
Last Querier Address	Indicates the IP address of the most recent Querier from which a Query was received.
Last Querier Version	Indicates the IGMP version of the most recent Querier from which a Query was received on this VLAN.

When the optional argument `detail` is used, the command shows the global information and the information for all Querier-enabled VLANs.

MLD Snooping Commands

This section describes commands used for MLD Snooping. In IPv4, Layer 2 switches can use IGMP Snooping to limit the flooding of multicast traffic by dynamically configuring Layer 2 interfaces so that multicast traffic is forwarded only to those interfaces associated with IP multicast addresses. In IPv6, MLD Snooping performs a similar function. With MLD Snooping, IPv6 multicast data is selectively forwarded to a list of ports that want to receive the data, instead of being flooded to all ports in a VLAN. This list is constructed by snooping IPv6 multicast control packets.

Note: This note clarifies the prioritization of MGMD Snooping Configurations. Many of the IGMP/MLD Snooping commands are available both in the Interface and VLAN modes. Operationally the system chooses or prefers the VLAN configured values over the Interface configured values for most configurations when the interface participates in the VLAN.

set mld

This command enables MLD Snooping on the system (Global Config Mode) or an Interface (Interface Config Mode). This command also enables MLD Snooping on a particular VLAN and enables MLD Snooping on all interfaces participating in a VLAN.

If an interface has MLD Snooping enabled and you enable this interface for routing or enlist it as a member of a port-channel (LAG), MLD Snooping functionality is disabled on that interface. MLD Snooping functionality is re-enabled if you disable routing or remove port channel (LAG) membership from an interface that has MLD Snooping enabled.

MLD Snooping supports the following activities:

- Validation of address version, payload length consistencies and discarding of the frame upon error.
- Maintenance of the forwarding table entries based on the MAC address versus the IPv6 address.
- Flooding of unregistered multicast data packets to all ports in the VLAN.

Default	disabled
Format	set mld *vlanid*
Mode	• Global Config • Interface Config • VLAN Mode

no set mld

Use this command to disable MLD Snooping on the system.

Format	set mld *vlanid*
Mode	• Global Config • Interface Config • VLAN Mode

set mld interfacemode

Use this command to enable MLD Snooping on all interfaces. If an interface has MLD Snooping enabled and you enable this interface for routing or enlist it as a member of a port-channel (LAG), MLD Snooping functionality is disabled on that interface. MLD Snooping functionality is re-enabled if you disable routing or remove port-channel (LAG) membership from an interface that has MLD Snooping enabled.

Default	disabled
Format	set mld interfacemode
Mode	Global Config

no set mld interfacemode

Use this command to disable MLD Snooping on all interfaces.

Format	no set mld interfacemode
Mode	Global Config

set mld fast-leave

Use this command to enable MLD Snooping fast-leave admin mode on a selected interface or VLAN. Enabling fast-leave allows the switch to immediately remove the Layer 2 LAN interface from its forwarding table entry upon receiving and MLD done message for that multicast group without first sending out MAC-based general queries to the interface.

Note: Note the following:

- You should enable fast-leave admin mode only on VLANs where only one host is connected to each Layer 2 LAN port. This prevents the inadvertent dropping of the other hosts that were connected to the same layer 2 LAN port but were still interested in receiving multicast traffic directed to that group.
- Fast-leave processing is supported only with MLD version 1 hosts.

Default	disabled
Format	set mld fast-leave *vlanid*
Mode	• Interface Config • VLAN Mode

no set mld fast-leave

Use this command to disable MLD Snooping fast-leave admin mode on a selected interface.

Format	no set mld fast-leave *vlanid*
Mode	• Interface Config • VLAN Mode

set mld groupmembership-interval

Use this command to set the MLD Group Membership Interval time on a VLAN, one interface or all interfaces. The Group Membership Interval time is the amount of time in seconds that a switch waits for a report from a particular group on a particular interface before deleting the interface from the entry. This value must be greater than the MLDv2 Maximum Response time value. The range is 2 to 3600 seconds.

Default	260 seconds
Format	set mld groupmembership-interval *vlanid 2-3600*
Mode	• Interface Config • Global Config • VLAN Mode

no set groupmembership-interval

Use this command to set the MLDv2 Group Membership Interval time to the default value.

Format	no set mld groupmembership-interval
Mode	• Interface Config • Global Config • VLAN Mode

set mld maxresponse

Use this command to set the MLD Maximum Response time for the system, on a particular interface or VLAN. The Maximum Response time is the amount of time in seconds that a switch will wait after sending a query on an interface because it did not receive a report for a particular group in that interface. This value must be less than the MLD Query Interval time value. The range is 1 to 65 seconds.

Default	10 seconds
Format	set mld maxresponse *1-65*
Mode	• Global Config • Interface Config • VLAN Mode

no set mld maxresponse

Use this command to set the max response time (on the interface or VLAN) to the default value.

Format	no set mld maxresponse
Mode	• Global Config • Interface Config • VLAN Mode

set mld mcrtexpiretime

Use this command to set the Multicast Router Present Expiration time. The time is set for the system, on a particular interface or VLAN. This is the amount of time in seconds that a switch waits for a query to be received on an interface before the interface is removed from the list of interfaces with multicast routers attached. The range is 0 to 3600 seconds. A value of 0 indicates an infinite timeout, i.e. no expiration.

Default	0
Format	set mld mcrtexpiretime *vlanid 0-3600*
Mode	• Global Config • Interface Config

no set mld mcrtexpiretime

Use this command to set the Multicast Router Present Expiration time to 0. The time is set for the system, on a particular interface or a VLAN.

Format	no set mld mcrtexpiretime *vlanid*
Mode	• Global Config • Interface Config

set mld mrouter

Use this command to configure the VLAN ID for the VLAN that has the multicast router attached mode enabled.

Format	set mld mrouter *vlanid*
Mode	Interface Config

no set mld mrouter

Use this command to disable multicast router attached mode for a VLAN with a particular VLAN ID.

Format	no set mld mrouter *vlanid*
Mode	Interface Config

set mld mrouter interface

Use this command to configure the interface as a multicast router-attached interface. When configured as a multicast router interface, the interface is treated as a multicast router-attached interface in all VLANs.

Default	disabled
Format	set mld mrouter interface
Mode	Interface Config

no set mld mrouter interface

Use this command to disable the status of the interface as a statically configured multicast router-attached interface.

Format	no set mld mrouter interface
Mode	Interface Config

show mldsnooping

Use this command to display MLD Snooping information. Configured information is displayed whether or not MLD Snooping is enabled.

Format	show mldsnooping *[unit/slot/port | vlanid]*
Mode	Privileged EXEC

When the optional arguments *`unit/slot/port`* or *`vlanid`* are not used, the command displays the following information.

Parameter	Definition
Admin Mode	Indicates whether or not MLD Snooping is active on the switch.
Interfaces Enabled for MLD Snooping	Interfaces on which MLD Snooping is enabled.
MLD Control Frame Count	Displays the number of MLD Control frames that are processed by the CPU.
VLANs Enabled for MLD Snooping	VLANs on which MLD Snooping is enabled.

When you specify the *`unit/slot/port`* values, the following information displays.

Parameter	Definition
MLD Snooping Admin Mode	Indicates whether MLD Snooping is active on the interface.
Fast Leave Mode	Indicates whether MLD Snooping Fast Leave is active on the VLAN.
Group Membership Interval	Shows the amount of time in seconds that a switch will wait for a report from a particular group on a particular interface, which is participating in the VLAN, before deleting the interface from the entry. This value may be configured.
Max Response Time	Displays the amount of time the switch waits after it sends a query on an interface, participating in the VLAN, because it did not receive a report for a particular group on that interface. This value may be configured.
Multicast Router Present Expiration Time	Displays the amount of time to wait before removing an interface that is participating in the VLAN from the list of interfaces with multicast routers attached. The interface is removed if a query is not received. This value may be configured.

When you specify a value for `vlanid`, the following information appears.

Parameter	Definition
VLAN Admin Mode	Indicates whether MLD Snooping is active on the VLAN.

show mldsnooping mrouter interface

Use this command to display information about statically configured multicast router attached interfaces.

Format	show mldsnooping mrouter interface *unit/slot/port*
Mode	Privileged EXEC

Parameter	Definition
Interface	Shows the interface on which multicast router information is being displayed.
Multicast Router Attached	Indicates whether multicast router is statically enabled on the interface.
VLAN ID	Displays the list of VLANs of which the interface is a member.

show mldsnooping mrouter vlan

Use this command to display information about statically configured multicast router-attached interfaces.

Format	show mldsnooping mrouter vlan *unit/slot/port*
Mode	Privileged EXEC

Parameter	Definition
Interface	Shows the interface on which multicast router information is being displayed.
VLAN ID	Displays the list of VLANs of which the interface is a member.

show mldsnooping ssm entries

Use this command to display the source specific multicast forwarding database built by MLD snooping.

A given {Source, Group, VLAN} combination can have few interfaces in INCLUDE mode and few interfaces in EXCLUDE mode. In such instances, two rows for the same {Source, Group, VLAN} combinations are displayed.

Format	show mldsnooping ssm entries
Mode	Privileged EXEC

Parameter	Definition
VLAN	The VLAN on which the entry is learned.
Group	The IPv6 multicast group address.
Source	The IPv6 source address.
Source Filter Mode	The source filter mode (Include/Exclude) for the specified group.
Interfaces	1)If Source Filter Mode is “Include,” specifies the list of interfaces on which a incoming packet is forwarded. If it’s source IP address is equal to the current entry’s Source, the destination IP address is equal to the current entry’s Group and the VLAN ID on which it arrived is current entry’s VLAN. 2) If Source Filter Mode is “Exclude,” specifies the list of interfaces on which a incoming packet is forwarded. If it’s source IP address is *not* equal to the current entry’s Source, the destination IP address is equal to current entry’s Group and VLAN ID on which it arrived is current entry’s VLAN.

show mldsnooping ssm stats

Use this command to display the statistics of MLD snooping’s SSMFDB. This command takes no options.

Format	show mldsnooping ssm stats
Mode	Privileged EXEC

Parameter	Definition
Total Entries	The total number of entries that can possibly be in the MLD snooping’s SSMFDB.
Most SSMFDB Entries Ever Used	The largest number of entries that have been present in the MLD snooping’s SSMFDB.
Current Entries	The current number of entries in the MLD snooping’s SSMFDB.

show mldsnooping ssm groups

Use this command to display the MLD SSM group membership information.

Format	show mldsnooping ssm groups
Mode	Privileged EXEC

Parameter	Definition
VLAN	VLAN on which the MLD v2 report is received.
Group	The IPv6 multicast group address.
Interface	The interface on which the MLD v2 report is received.
Reporter	The IPv6 address of the host that sent the MLDv2 report.
Source Filter Mode	The source filter mode (Include/Exclude) for the specified group.
Source Address List	List of source IP addresses for which source filtering is requested.

show mac-address-table mldsnooping

Use this command to display the MLD Snooping entries in the Multicast Forwarding Database (MFDB) table.

Format	show mac-address-table mldsnooping
Mode	Privileged EXEC

Parameter	Definition
VLAN ID	The VLAN in which the MAC address is learned.
MAC Address	A multicast MAC address for which the switch has forwarding or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 01:23:45:67:89:AB.
Type	The type of entry, which is either static (added by the user) or dynamic (added to the table as a result of a learning process or protocol.)
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).

clear mldsnooping

Use this command to delete all MLD snooping entries from the MFDB table.

Format	clear mldsnooping
Mode	Privileged EXEC

MLD Snooping Querier Commands

In an IPv6 environment, MLD Snooping requires that one central switch or router periodically query all end-devices on the network to announce their multicast memberships. This central device is the MLD Querier. The MLD query responses, known as MLD reports, keep the switch updated with the current multicast group membership on a port-by-port basis. If the switch does not receive updated membership information in a timely fashion, it will stop forwarding multicasts to the port where the end device is located.

This section describes the commands you use to configure and display information on MLD Snooping queries on the network and, separately, on VLANs.

Note: This note clarifies the prioritization of MGMD Snooping Configurations. Many of the IGMP/MLD Snooping commands are available both in the Interface and VLAN modes. Operationally the system chooses or prefers the VLAN configured values over the Interface configured values for most configurations when the interface participates in the VLAN.

set mld querier

Use this command to enable MLD Snooping Querier on the system (Global Config Mode) or on a VLAN. Using this command, you can specify the IP address that the snooping querier switch should use as a source address while generating periodic queries.

If a VLAN has MLD Snooping Querier enabled and MLD Snooping is operationally disabled on it, MLD Snooping Querier functionality is disabled on that VLAN. MLD Snooping functionality is re-enabled if MLD Snooping is operational on the VLAN.

The MLD Snooping Querier sends periodic general queries on the VLAN to solicit membership reports.

Default	disabled
Format	set mld querier [*vlan-id*] [address *ipv6_address*]
Mode	• Global Config • VLAN Mode

no set mld querier

Use this command to disable MLD Snooping Querier on the system. Use the optional parameter `address` to reset the querier address.

Format	no set mld querier [*vlan-id*][address]
Mode	• Global Config • VLAN Mode

set mld querier query_interval

Use this command to set the MLD Querier Query Interval time. It is the amount of time in seconds that the switch waits before sending another general query.

Default	60 seconds
Format	set mld querier query_interval *1-1800*
Mode	Global Config

no set mld querier query_interval

Use this command to set the MLD Querier Query Interval time to its default value.

Format	no set mld querier query_interval
Mode	Global Config

set mld querier timer expiry

Use this command to set the MLD Querier timer expiration period. It is the time period that the switch remains in Non-Querier mode once it has discovered that there is a Multicast Querier in the network.

Default	60 seconds
Format	set mld querier timer expiry *60-300*
Mode	Global Config

no set mld querier timer expiry

Use this command to set the MLD Querier timer expiration period to its default value.

Format	no set mld querier timer expiry
Mode	Global Config

set mld querier election participate

Use this command to enable the Snooping Querier to participate in the Querier Election process when it discovers the presence of another Querier in the VLAN. When this mode is enabled, if the Snooping Querier finds that the other Querier's source address is better (less) than the Snooping Querier's address, it stops sending periodic queries. If the Snooping Querier wins the election, then it will continue sending periodic queries.

Default	disabled
Format	set mld querier election participate
Mode	VLAN Database

no set mld querier election participate

Use this command to set the snooping querier not to participate in querier election but go into a non-querier mode as soon as it discovers the presence of another querier in the same VLAN.

Format	no set mld querier election participate
Mode	VLAN Database

show mldsnooping querier

Use this command to display MLD Snooping Querier information. Configured information is displayed whether or not MLD Snooping Querier is enabled.

Format	show mldsnooping querier [{detail | vlan *vlanid*}]
Mode	Privileged EXEC

When the optional arguments `vlandid` are not used, the command displays the following information.

Field	Description
Admin Mode	Indicates whether or not MLD Snooping Querier is active on the switch.
Admin Version	Indicates the version of MLD that will be used while sending out the queries. This is defaulted to `MLD v1` and it cannot be changed.
Querier Address	Shows the IP address which will be used in the IPv6 header while sending out MLD queries. It can be configured using the appropriate command.
Query Interval	Shows the amount of time in seconds that a Snooping Querier waits before sending out the periodic general query.
Querier Timeout	Displays the amount of time to wait in the Non-Querier operational state before moving to a Querier state.

When you specify a value for `vlanid`, the following information appears.

Field	Description
VLAN Admin Mode	Indicates whether MLD Snooping Querier is active on the VLAN.
VLAN Operational State	Indicates whether MLD Snooping Querier is in “`Querier`” or “`Non-Querier`” state. When the switch is in `Querier` state, it will send out periodic general queries. When in `Non-Querier` state, it will wait for moving to `Querier` state and does not send out any queries.
VLAN Operational Max Response Time	Indicates the time to wait before removing a Leave from a host upon receiving a Leave request. This value is calculated dynamically from the Queries received from the network. If the Snooping Switch is in Querier state, then it is equal to the configured value.
Querier Election Participate	Indicates whether the MLD Snooping Querier participates in querier election if it discovers the presence of a querier in the VLAN.
Querier VLAN Address	The IP address will be used in the IPv6 header while sending out MLD queries on this VLAN. It can be configured using the appropriate command.
Operational Version	This version of IPv6 will be used while sending out MLD queriers on this VLAN.
Last Querier Address	Indicates the IP address of the most recent Querier from which a Query was received.
Last Querier Version	Indicates the MLD version of the most recent Querier from which a Query was received on this VLAN.

When the optional argument `detail` is used, the command shows the global information and the information for all Querier-enabled VLANs.

Port Security Commands

This section describes the command you use to configure Port Security on the switch. Port security, which is also known as port MAC locking, allows you to secure the network by locking allowable MAC addresses on a given port. Packets with a matching source MAC address are forwarded normally, and all other packets are discarded.

Note: To enable the SNMP trap specific to port security, see "snmp-server enable traps violation" on page 115.

port-security

This command enables port locking on an interface, a range of interfaces, or at the system level.

Default	disabled
Format	port-security
Mode	• Global Config (to enable port locking globally) • Interface Config (to enable port locking on an interface or range of interfaces)

no port-security

This command disables port locking for one (Interface Config) or all (Global Config) ports.

Format	no port-security
Mode	• Global Config • Interface Config

port-security max-dynamic

This command sets the maximum number of dynamically locked MAC addresses allowed on a specific port. The valid range is 0–600.

Default	600
Format	port-security max-dynamic *maxvalue*
Mode	Interface Config

no port-security max-dynamic

This command resets the maximum number of dynamically locked MAC addresses allowed on a specific port to its default value.

Format	no port-security max-dynamic
Mode	Interface Config

port-security max-static

This command sets the maximum number of statically locked MAC addresses allowed on a port. The valid range is 0–20.

Default	1
Format	port-security max-static *maxvalue*
Mode	Interface Config

no port-security max-static

This command sets maximum number of statically locked MAC addresses to the default value.

Format	no port-security max-static
Mode	Interface Config

port-security mac-address

This command adds a MAC address to the list of statically locked MAC addresses for an interface or range of interfaces. The `vid` is the VLAN ID.

Format	port-security mac-address *mac-address vid*
Mode	Interface Config

no port-security mac-address

This command removes a MAC address from the list of statically locked MAC addresses.

Format	no port-security mac-address *mac-address vid*
Mode	Interface Config

port-security mac-address move

This command converts dynamically locked MAC addresses to statically locked addresses for an interface or range of interfaces.

Format	port-security mac-address move
Mode	Interface Config

port-security mac-address sticky

This command enables sticky mode Port MAC Locking on a port. If accompanied by a MAC address and a VLAN id (for interface config mode only), it adds a sticky MAC address to the list of statically locked MAC addresses. These sticky addresses are converted back to dynamically locked addresses if sticky mode is disabled on the port. The <vid> is the VLAN ID. The Global command applies the “sticky” mode to all valid interfaces (physical and LAG). There is no global sticky mode as such.

Sticky addresses that are dynamically learned will appear in “show running-config” on page 191 as “port-security mac-address sticky <mac> <vid>” entries. This distinguishes them from static entries.

Format	port-security mac-address sticky [<mac-address> <vid>]
Mode	• Global Config • Interface Config

Example: The following shows an example of the command.

```
(Routing)(Config)# port-security mac-address sticky
(Routing)(Interface)# port-security mac-address sticky
(Routing)(Interface)# port-security mac-address sticky
 00:00:00:00:00:01 2
```

no port-security mac-address sticky

The `no` form removes the sticky mode. The sticky MAC address can be deleted by using the command `no port-security mac-address <mac-address> <vid>`.

Format	no port-security mac-address sticky [<mac-address> <vid>]
Mode	• Global Config • Interface Config

mac-address-table limit

This command enables VLAN port security. VLAN MAC locking allows you to secure the network by locking down allowable MAC addresses on a given VLAN. Packets with a matching source MAC address can be forwarded normally. All other packets will be discarded. VLAN MAC locking will lock the dynamic MAC entries.

If VLAN and port MAC locking are enabled, VLAN MAC locking will be given precedence over port MAC locking.

Default	disabled
Format	mac-address-table limit [action shutdown] [notification trap] [*maximum-num*] [vlan *vlan-id*]
Mode	Global Config

Parameter	Description
[action shutdown]	After the MAC limit has been reached, the action will shut down the ports participating in the VLAN.
[notification trap]	Enables `snmp-server enable traps` violation on the ports participating in the VLAN. After the MAC limit has been reached, log message will be generated with the violation MAC address details.
[*maximum-num*]	MAC limit to be configured.

Parameter	Description
[vlan *vlan*]	VLAN on which the MAC limit is to be applied. **NOTE:** Packets on all other VLAN will be discarded.

Example: The following shows an example of the command.

```
(Routing) (Config)#mac-address-table limit 3 vlan 10
(Routing) (Config)#mac-address-table limit action shutdown 5 vlan 20
(Routing) (Config)#mac-address-table limit notification trap 4 vlan 30
(Routing) (Config)#mac-address-table limit action shutdown notification trap 6 vlan 100
```

no mac-address-table limit

This command disables VLAN port security on the specified VLAN.

Default	disabled
Format	nomac-address-tablelimit[actionshutdown][notificationtrap][*maximum-num*][vlan*vlan-id*]
Mode	Global Config

show port-security

This command displays the port-security settings for the port(s). If you do not use a parameter, the command displays the Port Security Administrative mode. Use the optional parameters to display the settings on a specific interface or on all interfaces. Instead of *unit/slot/port*, *lag lag-intf-num* can be used as an alternate way to specify the LAG interface. *lag lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Format	show port-security [{*unit/slot/port* | all}]
Mode	Privileged EXEC

Parameter	Definition
Admin Mode	Port Locking mode for the entire system. This field displays if you do not supply any parameters.

For each interface, or for the interface you specify, the following information appears.

Parameter	Definition
Admin Mode	Port Locking mode for the Interface.
Dynamic Limit	Maximum dynamically allocated MAC Addresses.
Static Limit	Maximum statically allocated MAC Addresses.
Violation Trap Mode	Whether violation traps are enabled.
Sticky Mode	The administrative mode of the port security Sticky Mode feature on the interface.

Example: The following shows example CLI display output for the command.

```
(Routing) #show port-security 0/1
```

```
      Admin    Dynamic    Static    Violation  Sticky
Intf   Mode     Limit     Limit     Trap Mode  Mode
------ -------  ---------- --------- --------- --------
0/1    Disabled 1          1         Disabled   Enabled
```

show port-security dynamic

This command displays the dynamically locked MAC addresses for the port. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Format	show port-security dynamic *unit/slot/port*
Mode	Privileged EXEC

Parameter	Definition
MAC Address	MAC Address of dynamically locked MAC.

show port-security static

This command displays the statically locked MAC addresses for port. Instead of *unit/slot/port*, *lag lag-intf-num* can be used as an alternate way to specify the LAG interface. *lag lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Format	show port-security static {*unit/slot/port* | *lag lag-intf-num}*
Mode	Privileged EXEC

Parameter	Definition
Statically Configured MAC Address	The statically configured MAC address.
VLAN ID	The ID of the VLAN that includes the host with the specified MAC address.
Sticky	Indicates whether the static MAC address entry is added in sticky mode.

Example: The following shows example CLI display output for the command.

```
(Routing) #show port-security static 1/0/1

 Number of static MAC addresses configured: 2

 Statically configured MAC Address   VLAN ID   Sticky
 ---------------------------------   -------   ------
 00:00:00:00:00:01                   2         Yes
 00:00:00:00:00:02                   2         No
```

show port-security violation

This command displays the source MAC address of the last packet discarded on a locked port. Instead of *unit/slot/port*, *lag lag-intf-num* can be used as an alternate way to specify the LAG interface. *lag lag-intf-num* can also be used to specify the LAG interface where *lag-intf-num* is the LAG port number.

Format show port-security violation {*unit/slot/port* | *lag lag-id}*

Mode Privileged EXEC

Parameter	Definition
MAC Address	The source MAC address of the last frame that was discarded at a locked port.
VLAN ID	The VLAN ID, if applicable, associated with the MAC address of the last frame that was discarded at a locked port.

show mac-address-table limit

This command displays the VLAN port security configuration.

Format *show mac-address-table limit [vlan-id]*

Mode Privileged EXEC

Parameter	Definition
VLAN ID	The VLAN ID on which MAC locking has been configured.

Example:

```
(Routing) #show mac-address-table limit

Vlan MAC Locking Administration Mode:  Enabled

For Vlan 10
Configured mac limit 3
Operational mac limit 3
Violation trap mode  Enabled
Violation shutdown mode  Disabled

vlan    Interface Mac-Address
------- --------- -----------------
10      0/2       00:00:00:00:44:44
10      0/2       00:00:00:00:44:45
10      0/2       00:00:00:00:44:46

For Vlan 20
Configured mac limit 3
Operational mac limit 3
Violation trap mode  Enabled
Violation shutdown mode  Disabled

vlan    Interface Mac-Address
------- --------- -----------------
20      0/28      00:00:00:00:00:11
20      0/28      00:00:00:00:00:12
```

```
20      0/28      00:00:00:00:00:13

(Routing) #show mac-address-table limit 10

Vlan MAC Locking Administration Mode:  Enabled

For Vlan 10
Configured mac limit 3
Operational mac limit 3

vlan    Interface Mac-Address
------- --------- -----------------
10      0/2       00:00:00:00:44:44
10      0/2       00:00:00:00:44:45
10      0/2       00:00:00:00:44:46
```

LLDP (802.1AB) Commands

This section describes the command you use to configure Link Layer Discovery Protocol (LLDP), which is defined in the IEEE 802.1AB specification. LLDP allows stations on an 802 LAN to advertise major capabilities and physical descriptions. The advertisements allow a network management system (NMS) to access and display this information.

lldp transmit

Use this command to enable the LLDP advertise capability on an interface or a range of interfaces.

Default	disabled
Format	lldp transmit
Mode	Interface Config

no lldp transmit

Use this command to return the local data transmission capability to the default.

Format	no lldp transmit
Mode	Interface Config

lldp receive

Use this command to enable the LLDP receive capability on an interface or a range of interfaces.

Default	disabled
Format	lldp receive
Mode	Interface Config

no lldp receive

Use this command to return the reception of LLDPDUs to the default value.

Format	no lldp receive
Mode	Interface Config

lldp timers

Use this command to set the timing parameters for local data transmission on ports enabled for LLDP. The *interval-seconds* determines the number of seconds to wait between transmitting local data LLDPDUs. The range is 1-32768 seconds. The *hold-value* is the multiplier on the transmit interval that sets the TTL in local data LLDPDUs. The multiplier range is 2-10. The *reinit-seconds* is the delay before reinitialization, and the range is 1-0 seconds.

Default
- interval—30 seconds
- hold—4
- reinit—2 seconds

Format lldp timers [interval *interval-seconds*] [hold *hold-value*] [reinit *reinit-seconds*]

Mode Global Config

no lldp timers

Use this command to return any or all timing parameters for local data transmission on ports enabled for LLDP to the default values.

Format no lldp timers [interval] [hold] [reinit]

Mode Global Config

lldp transmit-tlv

Use this command to specify which optional type length values (TLVs) in the 802.1AB basic management set are transmitted in the LLDPDUs from an interface or range of interfaces. Use *`sys-name`* to transmit the system name TLV. To configure the system name, see “snmp-server” on page 114. Use *`sys-desc`* to transmit the system description TLV. Use *`sys-cap`* to transmit the system capabilities TLV. Use *`port-desc`* to transmit the port description TLV. To configure the port description, see “description” on page 339

Default no optional TLVs are included

Format lldp transmit-tlv [sys-desc] [sys-name] [sys-cap] [port-desc]

Mode Interface Config

no lldp transmit-tlv

Use this command to remove an optional TLV from the LLDPDUs. Use the command without parameters to remove all optional TLVs from the LLDPDU.

Format no lldp transmit-tlv [sys-desc] [sys-name] [sys-cap] [port-desc]

Mode Interface Config

lldp transmit-mgmt

Use this command to include transmission of the local system management address information in the LLDPDUs. This command can be used to configure a single interface or a range of interfaces.

Format lldp transmit-mgmt

Mode Interface Config

no lldp transmit-mgmt

Use this command to include transmission of the local system management address information in the LLDPDUs. Use this command to cancel inclusion of the management information in LLDPDUs.

Format	no lldp transmit-mgmt
Mode	Interface Config

lldp notification

Use this command to enable remote data change notifications on an interface or a range of interfaces.

Default	disabled
Format	lldp notification
Mode	Interface Config

no lldp notification

Use this command to disable notifications.

Default	disabled
Format	no lldp notification
Mode	Interface Config

lldp notification-interval

Use this command to configure how frequently the system sends remote data change notifications. The *interval* parameter is the number of seconds to wait between sending notifications. The valid interval range is 5-3600 seconds.

Default	5
Format	lldp notification-interval *interval*
Mode	Global Config

no lldp notification-interval

Use this command to return the notification interval to the default value.

Format	no lldp notification-interval
Mode	Global Config

clear lldp statistics

Use this command to reset all LLDP statistics, including MED-related information.

Format	clear lldp statistics
Mode	Privileged EXEC

clear lldp remote-data

Use this command to delete all information from the LLDP remote data table, including MED-related information.

Format	clear lldp remote-data
Mode	Global Config

show lldp

Use this command to display a summary of the current LLDP configuration.

Format	show lldp
Mode	Privileged EXEC

Parameter	Definition
Transmit Interval	How frequently the system transmits local data LLDPDUs, in seconds.
Transmit Hold Multiplier	The multiplier on the transmit interval that sets the TTL in local data LLDPDUs.
Re-initialization Delay	The delay before reinitialization, in seconds.
Notification Interval	How frequently the system sends remote data change notifications, in seconds.

show lldp interface

Use this command to display a summary of the current LLDP configuration for a specific interface or for all interfaces.

Format	show lldp interface {*unit/slot/port* | all}
Mode	Privileged EXEC

Parameter	Definition
Interface	The interface in a `unit/slot/port` format.
Link	Shows whether the link is up or down.
Transmit	Shows whether the interface transmits LLDPDUs.
Receive	Shows whether the interface receives LLDPDUs.
Notify	Shows whether the interface sends remote data change notifications.
TLVs	Shows whether the interface sends optional TLVs in the LLDPDUs. The TLV codes can be 0 (Port Description), 1 (System Name), 2 (System Description), or 3 (System Capability).
Mgmt	Shows whether the interface transmits system management address information in the LLDPDUs.

show lldp statistics

Use this command to display the current LLDP traffic and remote table statistics for a specific interface or for all interfaces.

Format show lldp statistics {*unit/slot/port* | all}

Mode Privileged EXEC

Parameter	Definition
Last Update	The amount of time since the last update to the remote table in days, hours, minutes, and seconds.
Total Inserts	Total number of inserts to the remote data table.
Total Deletes	Total number of deletes from the remote data table.
Total Drops	Total number of times the complete remote data received was not inserted due to insufficient resources.
Total Ageouts	Total number of times a complete remote data entry was deleted because the Time to Live interval expired.

The table contains the following column headings:

Parameter	Definition
Interface	The interface in `unit/slot/port` format.
TX Total	Total number of LLDP packets transmitted on the port.
RX Total	Total number of LLDP packets received on the port.
Discards	Total number of LLDP frames discarded on the port for any reason.
Errors	The number of invalid LLDP frames received on the port.
Ageouts	Total number of times a complete remote data entry was deleted for the port because the Time to Live interval expired.
TVL Discards	The number of TLVs discarded.
TVL Unknowns	Total number of LLDP TLVs received on the port where the type value is in the reserved range, and not recognized.
TLV MED	The total number of LLDP-MED TLVs received on the interface.
TLV 802.1	The total number of LLDP TLVs received on the interface which are of type 802.1.
TLV 802.3	The total number of LLDP TLVs received on the interface which are of type 802.3.

show lldp remote-device

Use this command to display summary information about remote devices that transmit current LLDP data to the system. You can show information about LLDP remote data received on all ports or on a specific port.

Format show lldp remote-device {*unit/slot/port* | all}

Mode Privileged EXEC

Parameter	Definition
Local Interface	The interface that received the LLDPDU from the remote device.
RemID	An internal identifier to the switch to mark each remote device to the system.
Chassis ID	The ID that is sent by a remote device as part of the LLDP message, it is usually a MAC address of the device.

Parameter	Definition
Port ID	The port number that transmitted the LLDPDU.
System Name	The system name of the remote device.

Example: The following shows example CLI display output for the command.

```
(Switching) #show lldp remote-device all

LLDP Remote Device Summary

Local
Interface RemID    Chassis ID          Port ID           System Name
-------  -------   ------------------  ----------------  ----------------
0/1
0/2
0/3
0/4
0/5
0/6
0/7       2      00:FC:E3:90:01:0F     00:FC:E3:90:01:11
0/7       3      00:FC:E3:90:01:0F     00:FC:E3:90:01:12
0/7       4      00:FC:E3:90:01:0F     00:FC:E3:90:01:13
0/7       5      00:FC:E3:90:01:0F     00:FC:E3:90:01:14
0/7       1      00:FC:E3:90:01:0F     00:FC:E3:90:03:11
0/7       6      00:FC:E3:90:01:0F     00:FC:E3:90:04:11
0/8
0/9
0/10
0/11
0/12
--More-- or (q)uit
```

show lldp remote-device detail

Use this command to display detailed information about remote devices that transmit current LLDP data to an interface on the system.

Format	show lldp remote-device detail *unit/slot/port*
Mode	Privileged EXEC

Parameter	Definition
Local Interface	The interface that received the LLDPDU from the remote device.
Remote Identifier	An internal identifier to the switch to mark each remote device to the system.
Chassis ID Subtype	The type of identification used in the Chassis ID field.
Chassis ID	The chassis of the remote device.
Port ID Subtype	The type of port on the remote device.
Port ID	The port number that transmitted the LLDPDU.
System Name	The system name of the remote device.
System Description	Describes the remote system by identifying the system name and versions of hardware, operating system, and networking software supported in the device.
Port Description	Describes the port in an alpha-numeric format. The port description is configurable.

Parameter	Definition
System Capabilities Supported	Indicates the primary function(s) of the device.
System Capabilities Enabled	Shows which of the supported system capabilities are enabled.
Management Address	For each interface on the remote device with an LLDP agent, lists the type of address the remote LLDP agent uses and specifies the address used to obtain information related to the device.
Time To Live	The amount of time (in seconds) the remote device's information received in the LLDPDU should be treated as valid information.

Example: The following shows example CLI display output for the command.

```
(Switching) #show lldp remote-device detail 0/7

LLDP Remote Device Detail

Local Interface: 0/7


Remote Identifier: 2
Chassis ID Subtype: MAC Address
Chassis ID: 00:FC:E3:90:01:0F
Port ID Subtype: MAC Address
Port ID: 00:FC:E3:90:01:11
System Name:
System Description:
Port Description:
System Capabilities Supported:
System Capabilities Enabled:
Time to Live: 24 seconds
```

show lldp local-device

Use this command to display summary information about the advertised LLDP local data. This command can display summary information or detail for each interface.

Format	show lldp local-device {*unit/slot/port* | all}
Mode	Privileged EXEC

Parameter	Definition
Interface	The interface in a `unit/slot/port` format.
Port ID	The port ID associated with this interface.
Port Description	The port description associated with the interface.

show lldp local-device detail

Use this command to display detailed information about the LLDP data a specific interface transmits.

Format	show lldp local-device detail *unit/slot/port*

Mode Privileged EXEC

Parameter	Definition
Interface	The interface that sends the LLDPDU.
Chassis ID Subtype	The type of identification used in the Chassis ID field.
Chassis ID	The chassis of the local device.
Port ID Subtype	The type of port on the local device.
Port ID	The port number that transmitted the LLDPDU.
System Name	The system name of the local device.
System Description	Describes the local system by identifying the system name and versions of hardware, operating system, and networking software supported in the device.
Port Description	Describes the port in an alpha-numeric format.
System Capabilities Supported	Indicates the primary function(s) of the device.
System Capabilities Enabled	Shows which of the supported system capabilities are enabled.
Management Address	The type of address and the specific address the local LLDP agent uses to send and receive information.

LLDP-MED Commands

Link Layer Discovery Protocol - Media Endpoint Discovery (LLDP-MED) (ANSI-TIA-1057) provides an extension to the LLDP standard. Specifically, LLDP-MED provides extensions for network configuration and policy, device location, Power over Ethernet (PoE) management and inventory management.

lldp med

Use this command to enable MED on an interface or a range of interfaces. By enabling MED, you will be effectively enabling the transmit and receive function of LLDP.

Default	disabled
Format	lldp med
Mode	Interface Config

no lldp med

Use this command to disable MED.

Format	no lldp med
Mode	Interface Config

lldp med confignotification

Use this command to configure an interface or a range of interfaces to send the topology change notification.

Default	disabled
Format	lldp med confignotification
Mode	Interface Config

no ldp med confignotification

Use this command to disable notifications.

Format	no lldp med confignotification
Mode	Interface Config

lldp med transmit-tlv

Use this command to specify which optional Type Length Values (TLVs) in the LLDP MED set will be transmitted in the Link Layer Discovery Protocol Data Units (LLDPDUs) from this interface or a range of interfaces.

Default	By default, the capabilities and network policy TLVs are included.
Format	lldp med transmit-tlv [capabilities] [ex-pd] [ex-pse] [inventory] [location] [network-policy]

Mode Interface Config

Parameter	Definition
capabilities	Transmit the LLDP capabilities TLV.
ex-pd	Transmit the LLDP extended PD TLV.
ex-pse	Transmit the LLDP extended PSE TLV.
inventory	Transmit the LLDP inventory TLV.
location	Transmit the LLDP location TLV.
network-policy	Transmit the LLDP network policy TLV.

no lldp med transmit-tlv

Use this command to remove a TLV.

Format nolldpmedtransmit-tlv[capabilities][network-policy][ex-pse][ex-pd][location][inventory]

Mode Interface Config

lldp med all

Use this command to configure LLDP-MED on all the ports.

Format lldp med all

Mode Global Config

lldp med confignotification all

Use this command to configure all the ports to send the topology change notification.

Format lldp med confignotification all

Mode Global Config

lldp med faststartrepeatcount

Use this command to set the value of the fast start repeat count. `[count]` is the number of LLDP PDUs that will be transmitted when the product is enabled. The range is 1 to 10.

Default 3

Format lldp med faststartrepeatcount *[count]*

Mode Global Config

no lldp med faststartrepeatcount

Use this command to return to the factory default value.

Format no lldp med faststartrepeatcount

Mode Global Config

lldp med transmit-tlv all

Use this command to specify which optional Type Length Values (TLVs) in the LLDP MED set will be transmitted in the Link Layer Discovery Protocol Data Units (LLDPDUs).

Default	By default, the capabilities and network policy TLVs are included.
Format	lldpmedtransmit-tlvall[capabilities][ex-pd][ex-pse][inventory][location][network-policy]
Mode	Global Config

Parameter	Definition
capabilities	Transmit the LLDP capabilities TLV.
ex-pd	Transmit the LLDP extended PD TLV.
ex-pse	Transmit the LLDP extended PSE TLV.
inventory	Transmit the LLDP inventory TLV.
location	Transmit the LLDP location TLV.
network-policy	Transmit the LLDP network policy TLV.

no lldp med transmit-tlv

Use this command to remove a TLV.

Format	nolldpmedtransmit-tlv[capabilities][network-policy][ex-pse][ex-pd][location][inventory]
Mode	Global Config

show lldp med

Use this command to display a summary of the current LLDP MED configuration.

Format	show lldp med
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show lldp med
LLDP MED Global Configuration

Fast Start Repeat Count: 3
Device Class: Network Connectivity

(Routing) #
```

show lldp med interface

Use this command to display a summary of the current LLDP MED configuration for a specific interface. `unit/slot/port` indicates a specific physical interface. `all` indicates all valid LLDP interfaces.

Format	show lldp med interface {*unit/slot/port* | all}
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show lldp med interface all

Interface  Link    configMED operMED   ConfigNotify TLVsTx
---------  ------  --------- --------  ------------ -----------
1/0/1      Down    Disabled  Disabled  Disabled     0,1
1/0/2      Up      Disabled  Disabled  Disabled     0,1
1/0/3      Down    Disabled  Disabled  Disabled     0,1
1/0/4      Down    Disabled  Disabled  Disabled     0,1
1/0/5      Down    Disabled  Disabled  Disabled     0,1
1/0/6      Down    Disabled  Disabled  Disabled     0,1
1/0/7      Down    Disabled  Disabled  Disabled     0,1
1/0/8      Down    Disabled  Disabled  Disabled     0,1
1/0/9      Down    Disabled  Disabled  Disabled     0,1
1/0/10     Down    Disabled  Disabled  Disabled     0,1
1/0/11     Down    Disabled  Disabled  Disabled     0,1
1/0/12     Down    Disabled  Disabled  Disabled     0,1
1/0/13     Down    Disabled  Disabled  Disabled     0,1
1/0/14     Down    Disabled  Disabled  Disabled     0,1

TLV Codes: 0- Capabilities,       1- Network Policy
           2- Location,           3- Extended PSE
           4- Extended Pd,        5- Inventory
--More-- or (q)uit
(Routing) #show lldp med interface 1/0/2

Interface  Link    configMED operMED   ConfigNotify TLVsTx
---------  ------  --------- --------  ------------ -----------
1/0/2      Up      Disabled  Disabled  Disabled     0,1

TLV Codes: 0- Capabilities,       1- Network Policy
           2- Location,           3- Extended PSE
           4- Extended Pd,        5- Inventory

(Routing) #
```

show lldp med local-device detail

Use this command to display detailed information about the LLDP MED data that a specific interface transmits. `unit/slot/port` indicates a specific physical interface.

Format	show lldp med local-device detail *unit/slot/port*
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show lldp med local-device detail 1/0/8

LLDP MED Local Device Detail

Interface: 1/0/8

Network Policies
Media Policy Application Type : voice
Vlan ID: 10
Priority: 5
DSCP: 1
Unknown: False
Tagged: True
```

```
Media Policy Application Type : streamingvideo
Vlan ID: 20
Priority: 1
DSCP: 2
Unknown: False
Tagged: True

Inventory
Hardware Rev: xxx xxx xxx
Firmware Rev: xxx xxx xxx
Software Rev: xxx xxx xxx
Serial Num: xxx xxx xxx
Mfg Name: xxx xxx xxx
Model Name: xxx xxx xxx
Asset ID: xxx xxx xxx

Location
Subtype: elin
Info: xxx xxx xxx

Extended POE
Device Type: pseDevice

Extended POE PSE
Available: 0.3 Watts
Source: primary
Priority: critical

Extended POE PD

Required: 0.2 Watts
Source: local
Priority: low
```

show lldp med remote-device

Use this command to display the summary information about remote devices that transmit current LLDP MED data to the system. You can show information about LLDP MED remote data received on all valid LLDP interfaces or on a specific physical interface.

Format	show lldp med remote-device {*unit/slot/port* | all}
Mode	Privileged EXEC

Parameter	Definition
Local Interface	The interface that received the LLDPDU from the remote device.
Remote ID	An internal identifier to the switch to mark each remote device to the system.
Device Class	Device classification of the remote device.

Example: The following shows example CLI display output for the command.

```
(Routing) #show lldp med remote-device all

LLDP MED Remote Device Summary

Local
Interface  Remote ID  Device Class
```

```
--------- --------- ------------
1/0/8                                        1Class I
1/0/9                                        2Not Defined
1/0/10                                       3Class II
1/0/11                                        4Class III
1/0/12                                       5    Network Con
```

show lldp med remote-device detail

Use this command to display detailed information about remote devices that transmit current LLDP MED data to an interface on the system.

Format	show lldp med remote-device detail *unit/slot/port*
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show lldp med remote-device detail 1/0/8

LLDP MED Remote Device Detail

Local Interface: 1/0/8
Remote Identifier: 18
Capabilities
MED Capabilities Supported: capabilities, networkpolicy, location, extendedpse
MED Capabilities Enabled: capabilities, networkpolicy
Device Class: Endpoint Class I

Network Policies
Media Policy Application Type : voice
Vlan ID: 10
Priority: 5
DSCP: 1
Unknown: False
Tagged: True

Media Policy Application Type : streamingvideo
Vlan ID: 20
Priority: 1
DSCP: 2
Unknown: False
Tagged: True


Inventory
Hardware Rev: xxx xxx xxx
Firmware Rev: xxx xxx xxx
Software Rev: xxx xxx xxx
Serial Num: xxx xxx xxx
Mfg Name: xxx xxx xxx
Model Name: xxx xxx xxx
Asset ID: xxx xxx xxx

Location
Subtype: elin
Info: xxx xxx xxx

Extended POE
Device Type: pseDevice

Extended POE PSE
```

Available: 0.3 Watts
Source: primary
Priority: critical

Extended POE PD

Required: 0.2 Watts
Source: local
Priority: low

Denial of Service Commands

Note: Denial of Service (DataPlane) is supported on XGS-III and later platforms only.

This section describes the commands you use to configure Denial of Service (DoS) Control. CE0128XB/CE0152XB software provides support for classifying and blocking specific types of Denial of Service attacks. You can configure your system to monitor and block these types of attacks:

- **SIP = DIP:** Source IP address = Destination IP address.
- **First Fragment:**TCP Header size smaller then configured value.
- **TCP Fragment:** Allows the device to drop packets that have a TCP payload where the IP payload length minus the IP header size is less than the minimum allowed TCP header size.
- **TCP Flag:** TCP Flag SYN set and Source Port < 1024 or TCP Control Flags = 0 and TCP Sequence Number = 0 or TCP Flags FIN, URG, and PSH set and TCP Sequence Number = 0 or TCP Flags SYN and FIN set.
- **L4 Port:** Source TCP/UDP Port = Destination TCP/UDP Port.
- **ICMP:** Limiting the size of ICMP Ping packets.

Note: Monitoring and blocking of the types of attacks listed below are only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636, and BCM56820 platforms.

- **SMAC = DMAC:** Source MAC address = Destination MAC address
- **TCP Port:** Source TCP Port = Destination TCP Port
- **UDP Port**: Source UDP Port = Destination UDP Port
- **TCP Flag & Sequence:** TCP Flag SYN set and Source Port < 1024 or TCP Control Flags = 0 and TCP Sequence Number = 0 or TCP Flags FIN, URG, and PSH set and TCP Sequence Number = 0 or TCP Flags SYN and FIN set.
- **TCP Offset:** Allows the device to drop packets that have a TCP header Offset set to 1.
- **TCP SYN:** TCP Flag SYN set.
- **TCP SYN & FIN:** TCP Flags SYN and FIN set.
- **TCP FIN & URG & PSH:** TCP Flags FIN and URG and PSH set and TCP Sequence Number = 0.
- **ICMP V6**: Limiting the size of ICMPv6 Ping packets.
- **ICMP Fragment**: Checks for fragmented ICMP packets.

dos-control all

This command enables Denial of Service protection checks globally.

Default	disabled
Format	dos-control all
Mode	Global Config

no dos-control all

This command disables Denial of Service prevention checks globally.

Format	no dos-control all
Mode	Global Config

dos-control sipdip

This command enables Source IP address = Destination IP address (SIP = DIP) Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress with SIP = DIP, the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control sipdip
Mode	Global Config

no dos-control sipdip

This command disables Source IP address = Destination IP address (SIP = DIP) Denial of Service prevention.

Format	no dos-control sipdip
Mode	Global Config

dos-control firstfrag

This command enables Minimum TCP Header Size Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having a TCP Header Size smaller then the configured value, the packets will be dropped if the mode is enabled.The default is *`disabled`.* If you enable dos-control firstfrag, but do not provide a Minimum TCP Header Size, the system sets that value to *`20`*.

Default	disabled (20)
Format	dos-control firstfrag [*0-255*]
Mode	Global Config

no dos-control firstfrag

This command sets Minimum TCP Header Size Denial of Service protection to the default value of *`disabled`*.

Format	no dos-control firstfrag
Mode	Global Config

dos-control tcpfrag

This command enables TCP Fragment Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack and packets that have a TCP payload in which the IP payload length minus the IP header size is less than the minimum allowed TCP header size are dropped.

Default	disabled
Format	dos-control tcpfrag
Mode	Global Config

no dos-control tcpfrag

This command disables TCP Fragment Denial of Service protection.

Format	no dos-control tcpfrag
Mode	Global Config

dos-control tcpflag

This command enables TCP Flag Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attacks. If packets ingress having TCP Flag SYN set and a source port less than 1024 or having TCP Control Flags set to 0 and TCP Sequence Number set to 0 or having TCP Flags FIN, URG, and PSH set and TCP Sequence Number set to 0 or having TCP Flags SYN and FIN both set, the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control tcpflag
Mode	Global Config

no dos-control tcpflag

This command sets disables TCP Flag Denial of Service protections.

Format	no dos-control tcpflag
Mode	Global Config

dos-control l4port

This command enables L4 Port Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having Source TCP/UDP Port Number equal to Destination TCP/UDP Port Number, the packets will be dropped if the mode is enabled.

Note: Some applications mirror source and destination L4 ports - RIP for example uses 520 for both. If you enable dos-control l4port, applications such as RIP may experience packet loss which would render the application inoperable.

Default	disabled
Format	dos-control l4port
Mode	Global Config

no dos-control l4port

This command disables L4 Port Denial of Service protections.

Format	no dos-control l4port
Mode	Global Config

dos-control smacdmac

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636, and BCM56820 platforms.

This command enables Source MAC address = Destination MAC address (SMAC = DMAC) Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress with SMAC = DMAC, the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control smacdmac
Mode	Global Config

no dos-control smacdmac

This command disables Source MAC address = Destination MAC address (SMAC = DMAC) DoS protection.

Format	no dos-control smacdmac
Mode	Global Config

dos-control tcpport

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP L4 source = destination port number (Source TCP Port = Destination TCP Port) Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress with Source TCP Port = Destination TCP Port, the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control tcpport
Mode	Global Config

no dos-control tcpport

This command disables TCP L4 source = destination port number (Source TCP Port = Destination TCP Port) Denial of Service protection.

Format	no dos-control tcpport
Mode	Global Config

dos-control udpport

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables UDP L4 source = destination port number (Source UDP Port = Destination UDP Port) DoS protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress with Source UDP Port = Destination UDP Port, the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control udpport
Mode	Global Config

no dos-control udpport

This command disables UDP L4 source = destination port number (Source UDP Port = Destination UDP Port) Denial of Service protection.

Format	no dos-control udpport
Mode	Global Config

dos-control tcpflagseq

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP Flag and Sequence Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP Flag SYN set and a source port less than 1024 or having TCP Control Flags set to 0 and TCP Sequence Number set to 0 or having TCP Flags FIN, URG, and PSH set and TCP Sequence Number set to 0 or having TCP Flags SYN and FIN both set, the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control tcpflagseq
Mode	Global Config

no dos-control tcpflagseq

This command sets disables TCP Flag and Sequence Denial of Service protection.

Format	no dos-control tcpflagseq
Mode	Global Config

dos-control tcpoffset

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP Offset Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP Header Offset equal to one (1), the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control tcpoffset
Mode	Global Config

no dos-control tcpoffset

This command disabled TCP Offset Denial of Service protection.

Format	no dos-control tcpoffset
Mode	Global Config

dos-control tcpsyn

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP SYN and L4 source = 0-1023 Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP flag SYN set and an L4 source port from 0 to 1023, the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control tcpsyn
Mode	Global Config

no dos-control tcpsyn

This command sets disables TCP SYN and L4 source = 0-1023 Denial of Service protection.

Format	no dos-control tcpsyn
Mode	Global Config

dos-control tcpsynfin

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP SYN and FIN Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP flags SYN and FIN set, the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control tcpsynfin
Mode	Global Config

no dos-control tcpsynfin

This command sets disables TCP SYN & FIN Denial of Service protection.

Format	no dos-control tcpsynfin
Mode	Global Config

dos-control tcpfinurgpsh

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables TCP FIN and URG and PSH and SEQ = 0 checking Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP FIN, URG, and PSH all set and TCP Sequence Number set to 0, the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control tcpfinurgpsh
Mode	Global Config

no dos-control tcpfinurgpsh

This command sets disables TCP FIN and URG and PSH and SEQ = 0 checking Denial of Service protections.

Format	no dos-control tcpfinurgpsh
Mode	Global Config

dos-control icmpv4

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables Maximum ICMPv4 Packet Size Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If ICMPv4 Echo Request (PING) packets ingress having a size greater than the configured value, the packets will be dropped if the mode is enabled.

Default	disabled (512)
Format	dos-control icmpv4 [0-16376]

Mode	Global Config

no dos-control icmpv4

This command disables Maximum ICMP Packet Size Denial of Service protections.

Format	no dos-control icmpv4
Mode	Global Config

dos-control icmpv6

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables Maximum ICMPv6 Packet Size Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If ICMPv6 Echo Request (PING) packets ingress having a size greater than the configured value, the packets will be dropped if the mode is enabled.

Default	disabled (512)
Format	dos-control icmpv6 *0-16376*
Mode	Global Config

no dos-control icmpv6

This command disables Maximum ICMP Packet Size Denial of Service protections.

Format	no dos-control icmpv6
Mode	Global Config

dos-control icmpfrag

Note: This command is only supported on the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

This command enables ICMP Fragment Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having fragmented ICMP packets, the packets will be dropped if the mode is enabled.

Default	disabled
Format	dos-control icmpfrag
Mode	Global Config

no dos-control icmpfrag

This command disabled ICMP Fragment Denial of Service protection.

Format	no dos-control icmpfrag

Mode	Global Config

show dos-control

This command displays Denial of Service configuration information.

Format	show dos-control
Mode	Privileged EXEC

Note: Some of the information below displays only if you are using the BCM56224, BCM56514, BCM56624, BCM56634, BCM56636 and BCM56820 platforms.

Parameter	Definition
First Fragment Mode	The administrative mode of First Fragment DoS prevention. When enabled, this causes the switch to drop packets that have a TCP header smaller then the configured Min TCP Hdr Size.
Min TCP Hdr Size	The minimum TCP header size the switch will accept if First Fragment DoS prevention is enabled.
ICMPv4 Mode	The administrative mode of ICMPv4 DoS prevention. When enabled, this causes the switch to drop ICMP packets that have a type set to ECHO_REQ (ping) and a size greater than the configured ICMPv4 Payload Size.
Max ICMPv4 Payload Size	The maximum ICMPv4 payload size to accept when ICMPv4 DoS protection is enabled.
ICMPv6 Mode	The administrative mode of ICMPv6 DoS prevention. When enabled, this causes the switch to drop ICMP packets that have a type set to ECHO_REQ (ping) and a size greater than the configured ICMPv6 Payload Size.
Max ICMPv6 Payload Size	The maximum ICMPv6 payload size to accept when ICMPv6 DoS protection is enabled.
ICMPv4 Fragment Mode	The administrative mode of ICMPv4 Fragment DoS prevention. When enabled, this causes the switch to drop fragmented ICMPv4 packets.
TCP Port Mode	The administrative mode of TCP Port DoS prevention. When enabled, this causes the switch to drop packets that have the TCP source port equal to the TCP destination port.
UDP Port Mode	The administrative mode of UDP Port DoS prevention. When enabled, this causes the switch to drop packets that have the UDP source port equal to the UDP destination port.
SIPDIP Mode	The administrative mode of SIP=DIP DoS prevention. Enabling this causes the switch to drop packets that have a source IP address equal to the destination IP address. The factory default is disabled.
SMACDMAC Mode	The administrative mode of SMAC=DMAC DoS prevention. Enabling this causes the switch to drop packets that have a source MAC address equal to the destination MAC address.
TCP FIN&URG& PSH Mode	The administrative mode of TCP FIN & URG & PSH DoS prevention. Enabling this causes the switch to drop packets that have TCP flags FIN, URG, and PSH set and TCP Sequence Number = 0.

Parameter	Definition
TCP Flag & Sequence Mode	The administrative mode of TCP Flag DoS prevention. Enabling this causes the switch to drop packets that have TCP control flags set to 0 and TCP sequence number set to 0.
TCP SYN Mode	The administrative mode of TCP SYN DoS prevention. Enabling this causes the switch to drop packets that have TCP Flags SYN set.
TCP SYN & FIN Mode	The administrative mode of TCP SYN & FIN DoS prevention. Enabling this causes the switch to drop packets that have TCP Flags SYN and FIN set.
TCP Fragment Mode	The administrative mode of TCP Fragment DoS prevention. Enabling this causes the switch to drop packets that have a TCP payload in which the IP payload length minus the IP header size is less than the minimum allowed TCP header size.
TCP Offset Mode	The administrative mode of TCP Offset DoS prevention. Enabling this causes the switch to drop packets that have a TCP header Offset equal to 1.

MAC Database Commands

This section describes the commands you use to configure and view information about the MAC databases.

bridge aging-time

This command configures the forwarding database address aging timeout in seconds. The `seconds` parameter must be within the range of 10 to 1,000,000 seconds. In an SVL system, the [fdbid/all] parameter is not used and will be ignored if entered. In an SVL system, the [fdbid/all] parameter is not used and will be ignored if entered.

Default	300
Format	bridge aging-time *10-1,000,000*
Mode	Global Config

no bridge aging-time

This command sets the forwarding database address aging timeout to the default value. In an SVL system, the [fdbid/all] parameter is not used and will be ignored if entered.

Format	no bridge aging-time
Mode	Global Config

show forwardingdb agetime

This command displays the timeout for address aging.

Default	all
Format	show forwardingdb agetime
Mode	Privileged EXEC

Parameter	Definition
Address Aging Timeout	Displays the system's address aging timeout value in seconds.

show mac-address-table multicast

This command displays the Multicast Forwarding Database (MFDB) information. If you enter the command with no parameter, the entire table is displayed. You can display the table entry for one MAC Address by specifying the MAC address as an optional parameter.

Format	show mac-address-table multicast *macaddr*
Mode	Privileged EXEC

Parameter	Definition
VLAN ID	The VLAN in which the MAC address is learned.
MAC Address	A multicast MAC address for which the switch has forwarding or filtering information. The format is 6 two-digit hexadecimal numbers that are separated by colons, for example 81:96:21:67:89:AB.
Source	The component that is responsible for this entry in the Multicast Forwarding Database. The source can be IGMP Snooping, GMRP, and Static Filtering.
Type	The type of the entry. Static entries are those that are configured by the end user. Dynamic entries are added to the table as a result of a learning process or protocol.
Description	The text description of this multicast table entry.
Interfaces	The list of interfaces that are designated for forwarding (Fwd:) and filtering (Flt:).
Fwd Interface	The resultant forwarding list is derived from combining all the component's forwarding interfaces and removing the interfaces that are listed as the static filtering interfaces.

Example: If one or more entries exist in the multicast forwarding table, the command output looks similar to the following:

```
(Routing) #show mac-address-table multicast

                                          Fwd
VLAN ID MAC Address          Source  Type    Description      Interface Interface
------- ----------------- ------- ------- --------------- --------- ---------
1      01:00:5E:01:02:03 Filter  Static  Mgmt Config     Fwd:      Fwd:
                                    1/0/1,    1/0/1,
                                    1/0/2,    1/0/2,
                                    1/0/3,    1/0/3,
                                    1/0/4,    1/0/4,
                                    1/0/5,    1/0/5,
                                    1/0/6,    1/0/6,
                                    1/0/7,    1/0/7,
                                    1/0/8,    1/0/8,
                                    1/0/9,    1/0/9,

--More-- or (q)uit
```

show mac-address-table stats

This command displays the Multicast Forwarding Database (MFDB) statistics.

Format	show mac-address-table stats
Mode	Privileged EXEC

Parameter	Definition
Total Entries	The total number of entries that can possibly be in the Multicast Forwarding Database table.
Most MFDB Entries Ever Used	The largest number of entries that have been present in the Multicast Forwarding Database table. This value is also known as the MFDB high-water mark.
Current Entries	The current number of entries in the MFDB.

ISDP Commands

This section describes the commands you use to configure the industry standard Discovery Protocol (ISDP).

isdp run

This command enables ISDP on the switch.

Default	enabled
Format	isdp run
Mode	Global Config

no isdp run

This command disables ISDP on the switch.

Format	no isdp run
Mode	Global Config

isdp holdtime

This command configures the hold time for ISDP packets that the switch transmits. The hold time specifies how long a receiving device should store information sent in the ISDP packet before discarding it. The range is given in seconds.

Default	180 seconds
Format	isdp holdtime *10-255*
Mode	Global Config

isdp timer

This command sets the period of time between sending new ISDP packets. The range is given in seconds.

Default	60 seconds
Format	isdp timer *5-254*
Mode	Global Config

isdp advertise-v2

This command enables the sending of ISDP version 2 packets from the device.

Default	enabled
Format	isdp advertise-v2
Mode	Global Config

no isdp advertise-v2

This command disables the sending of ISDP version 2 packets from the device.

Format	no isdp advertise-v2
Mode	Global Config

isdp enable

This command enables ISDP on an interface or range of interfaces.

Note: ISDP must be enabled both globally and on the interface in order for the interface to transmit ISDP packets. If ISDP is globally disabled on the switch, the interface will not transmit ISDP packets, regardless of the ISDP status on the interface. To enable ISDP globally, use the "isdp run" on page 578 command.

Default	enabled
Format	isdp enable
Mode	Interface Config

no isdp enable

This command disables ISDP on the interface.

Format	no isdp enable
Mode	Interface Config

clear isdp counters

This command clears ISDP counters.

Format	clear isdp counters
Mode	Privileged EXEC

clear isdp table

This command clears entries in the ISDP table.

Format	clear isdp table
Mode	Privileged EXEC

show isdp

This command displays global ISDP settings.

Format	show isdp
Mode	Privileged EXEC

Parameter	Definition
Timer	The frequency with which this device sends ISDP packets. This value is given in seconds.

Parameter	Definition
Hold Time	The length of time the receiving device should save information sent by this device. This value is given in seconds.
Version 2 Advertisements	The setting for sending ISDPv2 packets. If disabled, version 1 packets are transmitted.
Neighbors table time since last change	The amount of time that has passed since the ISPD neighbor table changed.
Device ID	The Device ID advertised by this device. The format of this Device ID is characterized by the value of the Device ID Format object.
Device ID Format Capability	Indicates the Device ID format capability of the device. • `serialNumber` indicates that the device uses a serial number as the format for its Device ID. • `macAddress` indicates that the device uses a Layer 2 MAC address as the format for its Device ID. • `other` indicates that the device uses its platform-specific format as the format for its Device ID.
Device ID Format	Indicates the Device ID format of the device. • `serialNumber` indicates that the value is in the form of an ASCII string containing the device serial number. • `macAddress` indicates that the value is in the form of a Layer 2 MAC address. • `other` indicates that the value is in the form of a platform specific ASCII string containing info that identifies the device. For example, ASCII string contains serialNumber appended/prepended with system name.

Example: The following shows example CLI display output for the command.

```
(Routing) #show isdp

Timer.......................................... 30
Hold Time...................................... 180
Version 2 Advertisements....................... Enabled
Neighbors table time since last change......... 0 days 00:00:00
Device ID...................................... 1114728
Device ID format capability.................... Serial Number, Host Name
Device ID format............................... Serial Number
```

show isdp interface

This command displays ISDP settings for the specified interface.

Format	show isdp interface {all | *unit/slot/port*}
Mode	Privileged EXEC

Parameter	Definition
Interface	The *unit/slot/port* of the specified interface.
Mode	ISDP mode enabled/disabled status for the interface(s).

Example: The following shows example CLI display output for the command.

```
(Routing) #show isdp interface 0/1
```

```
Interface       Mode
--------------- ----------
0/1           Enabled
```

Example: The following shows example CLI display output for the command.

```
(Switching) #show isdp interface all

Interface       Mode
--------------- ----------

0/1             Enabled

0/2             Enabled

0/3             Enabled

0/4             Enabled

0/5             Enabled

0/6             Enabled

0/7             Enabled

0/8             Enabled
```

show isdp entry

This command displays ISDP entries. If the device id is specified, then only entries for that device are shown.

Format	show isdp entry {all | deviceid}
Mode	Privileged EXEC

Parameter	Definition
Device ID	The device ID associated with the neighbor which advertised the information.
IP Addresses	The IP address(es) associated with the neighbor.
Capability	ISDP Functional Capabilities advertised by the neighbor.
Platform	The hardware platform advertised by the neighbor.
Interface	The interface (unit/slot/port) on which the neighbor's advertisement was received.
Port ID	The port ID of the interface from which the neighbor sent the advertisement.
Hold Time	The hold time advertised by the neighbor.
Version	The software version that the neighbor is running.
Advertisement Version	The version of the advertisement packet received from the neighbor.
Entry Last Changed Time	The time when the entry was last changed.

Example: The following shows example CLI display output for the command.

```
(Switching) #show isdp entry Switch
```

```
Device ID                                    Switch

Address(es):
                                             IP Address:172.20.1.18
                                             IP Address: 172.20.1.18
Capability                                   Router IGMP

Platform                                     cisco WS-C4948

Interface                                    0/1

Port ID                                      GigabitEthernet1/1

Holdtime                                     64

Advertisement Version                        2

Entry last changed time                      0 days 00:13:50
```

show isdp neighbors

This command displays the list of neighboring devices.

Format	show isdp neighbors [{*unit/slot/port* | detail}]
Mode	Privileged EXEC

Parameter	Definition
Device ID	The device ID associated with the neighbor which advertised the information.
IP Addresses	The IP addresses associated with the neighbor.
Capability	ISDP functional capabilities advertised by the neighbor.
Platform	The hardware platform advertised by the neighbor.
Interface	The interface (*unit/slot/port*) on which the neighbor's advertisement was received.
Port ID	The port ID of the interface from which the neighbor sent the advertisement.
Hold Time	The hold time advertised by the neighbor.
Advertisement Version	The version of the advertisement packet received from the neighbor.
Entry Last Changed Time	Time when the entry was last modified.
Version	The software version that the neighbor is running.

Example: The following shows example CLI display output for the command.

```
(Switching) #show isdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge,

             S - Switch, H - Host, I - IGMP, r - Repeater

 Device ID         Intf Holdtime  Capability   Platform      Port ID
-------------------- ----- --------- ------------ -------------------- --------------------
Switch             0/1   165       RI            cisco WS-C4948   GigabitEthernet1/1
```

Example: The following shows example CLI display output for the command.

```
(Switching) #show isdp neighbors detail
```

```
Device ID                                   0001f45f1bc0
Address(es):
   IP Address:                              10.27.7.57
Capability                                  Router Trans Bridge Switch IGMP
Platform                                    SecureStack C2
Interface                                   0/48
Port ID                                     ge.3.14
Holdtime                                    131
Advertisement Version                       2
Entry last changed time                     0 days 00:01:59
Version:                                    05.00.56
```

show isdp traffic

This command displays ISDP statistics.

Format	show isdp traffic
Mode	Privileged EXEC

Parameter	Definition
ISDP Packets Received	Total number of ISDP packets received
ISDP Packets Transmitted	Total number of ISDP packets transmitted
ISDPv1 Packets Received	Total number of ISDPv1 packets received
ISDPv1 Packets Transmitted	Total number of ISDPv1 packets transmitted
ISDPv2 Packets Received	Total number of ISDPv2 packets received
ISDPv2 Packets Transmitted	Total number of ISDPv2 packets transmitted
ISDP Bad Header	Number of packets received with a bad header
ISDP Checksum Error	Number of packets received with a checksum error
ISDP Transmission Failure	Number of packets which failed to transmit
ISDP Invalid Format	Number of invalid packets received
ISDP Table Full	Number of times a neighbor entry was not added to the table due to a full database
ISDP IP Address Table Full	Displays the number of times a neighbor entry was added to the table without an IP address.

Example: The following shows example CLI display output for the command.

```
(Routing) #show isdp traffic

ISDP Packets Received.......................... 4253
ISDP Packets Transmitted....................... 127
ISDPv1 Packets Received........................ 0
ISDPv1 Packets Transmitted..................... 0
ISDPv2 Packets Received........................ 4253
ISDPv2 Packets Transmitted..................... 4351
ISDP Bad Header................................ 0
ISDP Checksum Error............................ 0
ISDP Transmission Failure...................... 0
ISDP Invalid Format............................ 0
ISDP Table Full................................ 392
ISDP IP Address Table Full..................... 737
```

debug isdp packet

This command enables tracing of ISDP packets processed by the switch. ISDP must be enabled on both the device and the interface in order to monitor packets for a particular interface.

Format	debug isdp packet [{receive | transmit}]
Mode	Privileged EXEC

no debug isdp packet

This command disables tracing of ISDP packets on the receive or the transmit sides or on both sides.

Format	no debug isdp packet [{receive | transmit}]
Mode	Privileged EXEC

Interface Error Disable and Auto Recovery

Interface error disable automatically disables an interface when an error is detected; no traffic is allowed until the interface is either manually re-enabled or, if auto recovery is configured, the configured auto recovery time interval has passed.

For interface error disable and auto recovery, an error condition is detected for an interface, the interface is placed in a diagnostic disabled state by shutting down the interface. The error disabled interface does not allow any traffic until the interface is re-enabled. The error disabled interface can be manually enabled. Alternatively administrator can enable auto recovery feature. CE0128XB/CE0152XB Auto Recovery re-enables the interface after the expiry of configured time interval.

errdisable recovery cause

Use this command to enable auto recovery for a specified cause or all causes. When auto recovery is enabled, ports in the diag-disable state are recovered (link up) when the recovery interval expires. If the interface continues to experience errors, the interface may be placed back in the diag-disable state and disabled (link down). Interfaces in the diag-disable state can be manually recovered by entering the `no shutdown` command for the interface.

Default	none
Format	errdisablerecoverycause{all|arp-inspection|bpduguard|dhcp-rate-limit|sfp-mismatch|udld | ucast-storm | bcast-storm | mcast-storm | bpdustorm | keep-alive | mac-locking | denial-of-service | link-flap}
Mode	Global Config

no errdisable recovery cause

Use this command to disable auto recovery for a specific cause. When disabled, auto recovery will not occur for interfaces in a diag-disable state due to that cause.

Format	noerrdisablerecoverycause{all|arp-inspection|bpduguard|dhcp-rate-limit|sfp-mismatch| udld | ucast-storm | bcast-storm | mcast-storm | bpdustorm | keep-alive | mac-locking | denial-of-service | link-flap}
Mode	Global Config

errdisable recovery interval

Use this command to configure the auto recovery time interval. The auto recovery time interval is common for all causes. The time can be any value from 30 to 86400 seconds.When the recovery interval expires, the system attempts to bring interfaces in the diag-disable state back into service (link up).

Default	300
Format	errdisable recovery interval *30-86400*
Mode	Global Config

no errdisable recovery interval

Use this command to reset the auto recovery interval to the factory default value of 300.

Format	no errdisable recovery interval
Mode	Global Config

show errdisable recovery

Use this command to display the errdisable configuration status of all configurable causes.

Format	show errdisable recovery
Mode	Privileged EXEC

The following information is displayed.

Parameter	Description
dhcp-rate-limit	Enable/Disable status of dhcp-rate-limit auto recovery.
arp-inspection	Enable/Disable status of arp-inspection auto recovery.
sfp-mismatch	Enable/Disable status of sfp-mismatch auto recovery.
udld	Enable/Disable status of UDLD auto recovery.
bcast-storm	Enable/Disable status of broadcast storm auto recovery.
mcast-storm	Enable/Disable status of multicast storm auto recovery.
ucast-storm	Enable/Disable status of unicast storm auto recovery.
bpdguard	Enable/Disable status of bpduguard auto recovery.
bpdustorm	Enable/Disable status of bpdustorm auto recovery.
keepalive	Enable/Disable status of keepalive auto recovery.
mac-locking	Enable/Disable status of MAC locking auto recovery.
denial-of-service	Enable/Disable status of DoS auto recovery.
link-flap	Enable/Disable status of link-flap auto recovery.
time interval	Time interval for auto recovery in seconds.

Example:

```
Errdisable Reason      Auto-recovery Status
------------------     ---------------------
dhcp-rate-limit          Disabled
arp-inspection           Disabled
udld                  Disabled
bcast-storm              Disabled
mcast-storm               Disabled
ucast-storm              Disabled
bpduguard                 Disabled
bpdustorm                 Disabled
sfp-mismatch              Disabled
keepalive              Disabled
mac-locking               Disabled
denial-of-service         Disabled
link-flap              Disabled
Timeout for Auto-recovery from D-Disable state  300
```

show interfaces status err-disabled

Use this command to display the interfaces that are error disabled and the amount of time remaining for auto recovery.

Format	show interfaces status err-disabled
Mode	Privileged EXEC

The following information is displayed.

Parameter	Description
interface	An interface that is error disabled.
Errdisable Reason	The cause of the interface being error disabled.
Auto-Recovery Time Left	The amount of time left before auto recovery begins.

Example:

```
(Routing) #show interfaces status err-disabled

Interface   Errdisable Reason   Auto-Recovery Time Left(sec)
----------  -----------------  ------------------
0/1         udld              279
0/2         bpduguard           285
0/3         bpdustorm           291
0/4         keepalive          11
```

UniDirectional Link Detection Commands

The purpose of the UniDirectional Link Detection (UDLD) feature is to detect and avoid unidirectional links. A unidirectional link is a forwarding anomaly in a Layer 2 communication channel in which a bi-directional link stops passing traffic in one direction. Use the UDLD commands to detect unidirectional links' physical ports. UDLD must be enabled on both sides of the link in order to detect a unidirectional link. The UDLD protocol operates by exchanging packets containing information about neighboring devices.

udld enable (Global Config)

This command enables UDLD globally on the switch.

Default	disable
Format	udld enable
Mode	Global Config

no udld enable (Global Config)

This command disables udld globally on the switch.

Format	no udld enable
Mode	Global Config

udld message time

This command configures the interval between UDLD probe messages on ports that are in the advertisement phase. The range is from 1 to 90 seconds.

Default	15 seconds
Format	udld message time *interval*
Mode	Global Config

udld timeout interval

This command configures the time interval after which UDLD link is considered to be unidirectional. The range is from 3 to 60 seconds.

Default	5 seconds
Format	udld timeout interval *interval*
Mode	Global Config

udld reset

This command resets all interfaces that have been shutdown by UDLD.

Default	none

Format	udld reset
Mode	Privileged EXEC

udld enable (Interface Config)

This command enables UDLD on the specified interface.

Default	disable
Format	udld enable
Mode	Interface Config

no udld enable (Interface Config)

This command disables UDLD on the specified interface.

Format	no udld enable
Mode	Interface Config

udld port

This command selects the UDLD mode operating on this interface. If the keyword `aggressive` is not entered, the port operates in normal mode.

Default	normal
Format	udld port [aggressive]
Mode	Interface Config

show udld

This command displays the global settings of UDLD.

Format	show udld
Mode	• User EXEC • Privileged EXEC

Parameter	Description
Admin Mode	The global administrative mode of UDLD.
Message Interval	The time period (in seconds) between the transmission of UDLD probe packets.
Timeout Interval	The time period (in seconds) before making a decision that the link is uni-directional.

Example: The following shows example CLI display output for the command after the feature was enabled and nondefault interval values were configured.

```
(Routing) #show udld

Admin Mode..................................... Enabled
Message Interval............................... 13
```

```
Timeout Interval.............................. 31
```

show udld *unit/slot/port*

This command displays the UDLD settings for the specified unit/slot/port. If the `all` keyword is entered, it displays information for all ports.

Format	show udld {*unit/slot/port* | all}
Mode	• User EXEC • Privileged EXEC

Parameter	Description
Port	The identifying port of the interface.
Admin Mode	The administrative mode of UDLD configured on this interface. This is either `Enabled` or `Disabled`.
UDLD Mode	The UDLD mode configured on this interface. This is either `Normal` or `Aggressive`.
UDLD Status	The status of the link as determined by UDLD. The options are: • **Undetermined** – UDLD has not collected enough information to determine the state of the port. • **Not applicable** – UDLD is disabled, either globally or on the port. • **Shutdown** – UDLD has detected a unidirectional link and shutdown the port. That is, the port is in an errDisabled state. • **Bidirectional** – UDLD has detected a bidirectional link. • **Undetermined (Link Down)** – The port would transition into this state when the port link physically goes down due to any reasons other than the port been put into D-Disable mode by the UDLD protocol on the switch.

Example: The following shows example CLI display output for the command.

```
(Switching) #show udld 0/1

Port    Admin Mode  UDLD Mode    UDLD Status
-----   ----------  -----------  --------------
0/1     Enabled     Normal       Not Applicable
```

Example: The following shows example CLI display output for the command.

```
(Switching) #show udld all

Port    Admin Mode  UDLD Mode    UDLD Status
-----   ----------  -----------  --------------
0/1     Enabled     Normal       Shutdown
0/2     Enabled     Normal       Undetermined
0/3     Enabled     Normal       Bidirectional
0/4     Enabled     Normal       Not Applicable
0/5     Enabled     Normal       Not Applicable
0/6     Enabled     Normal       Not Applicable
0/7     Enabled     Normal       Not Applicable
0/8     Enabled     Normal       Shutdown
0/9     Enabled     Normal       Not Applicable
0/10     Enabled     Normal       Not Applicable
0/11     Enabled     Normal       Not Applicable
0/12     Enabled     Normal       Undetermined
0/13     Enabled     Normal       Bidirectional
0/14     Disabled    Normal       Not Applicable
0/15     Disabled    Normal       Not Applicable
```

```
0/16    Disabled    Normal      Not Applicable
0/17    Disabled    Normal      Not Applicable
0/18    Disabled    Normal      Not Applicable
0/19    Disabled    Normal      Not Applicable
0/20    Disabled    Normal      Not Applicable
--More-- or (q)uit

(Switching) #
```

Chapter 7. Routing Commands

This chapter describes the routing commands available in the CE0128XB/CE0152XB CLI.

Note: The commands in this chapter are in one of three functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Clear commands clear some or all of the settings to factory defaults.

Address Resolution Protocol Commands

This section describes the commands you use to configure Address Resolution Protocol (ARP) and to view ARP information on the switch. ARP associates IP addresses with MAC addresses and stores the information as ARP entries in the ARP cache.

arp

This command creates an ARP entry in the default router. The value for *`ipaddress`* is the IP address of a device on a subnet attached to an existing routing interface. The parameter *`macaddr`* is a unicast MAC address for that device. The interface parameter specifies the next hop interface.

The format of the MAC address is 6 two-digit hexadecimal numbers that are separated by colons, for example 00:06:29:32:81:40.

Format	arp *ipaddress macaddr* interface {*unit/slot/port* | vlan *id*}
Mode	Global Config

no arp

This command deletes an ARP entry in the default router. The value for *`arpentry`* is the IP address of the interface. The value for *`ipaddress`* is the IP address of a device on a subnet attached to an existing routing interface. The parameter *`macaddr`* is a unicast MAC address for that device. The interface parameter specifies the next hop interface.

Format	no arp *ipaddress macaddr* interface *unit/slot/port*
Mode	Global Config

ip proxy-arp

This command enables proxy ARP on a router interface or range of interfaces. Without proxy ARP, a device only responds to an ARP request if the target IP address is an address configured on the interface where the ARP request arrived.

With proxy ARP, the device may also respond if the target IP address is reachable. The device only responds if all next hops in its route to the destination are through interfaces other than the interface that received the ARP request.

Default	enabled
Format	ip proxy-arp
Mode	Interface Config

no ip proxy-arp

This command disables proxy ARP on a router interface.

Format	no ip proxy-arp
Mode	Interface Config

ip local-proxy-arp

Use this command to allow an interface to respond to ARP requests for IP addresses within the subnet and to forward traffic between hosts in the subnet.

Default	disabled
Format	ip local-proxy-arp
Mode	Interface Config

no ip local-proxy-arp

This command resets the local proxy ARP mode on the interface to the default value.

Format	no ip local-proxy-arp
Mode	Interface Config

arp cachesize

This command configures the ARP cache size. The ARP cache size value is a platform specific integer value. The default size also varies depending on the platform.

Format	arp cachesize *platform specific integer value*
Mode	Global Config

no arp cachesize

This command configures the default ARP cache size.

Format	no arp cachesize
Mode	Global Config

arp dynamicrenew

This command enables the ARP component to automatically renew dynamic ARP entries when they age out. When an ARP entry reaches its maximum age, the system must decide whether to retain or delete the entry. If the entry has recently been used to forward data packets, the system will renew the entry by sending an ARP request to the neighbor. If the neighbor responds, the age of the ARP cache entry is reset to 0 without removing the entry from the hardware. Traffic to the host continues to be forwarded in hardware without interruption. If the entry is not being used to forward data packets, then the entry is deleted from the ARP cache, unless the dynamic renew option is enabled. If the dynamic renew option is enabled, the system sends an ARP request to renew the entry. When an entry is not renewed, it is removed from the hardware and subsequent data packets to the host trigger an ARP request. Traffic to the host may be lost until the router receives an ARP reply from the host. Gateway entries, entries for a neighbor router, are always renewed. The dynamic renew option applies only to host entries.

The disadvantage of enabling dynamic renew is that once an ARP cache entry is created, that cache entry continues to take space in the ARP cache as long as the neighbor continues to respond to ARP requests, even if no traffic is being forwarded to the neighbor. In a network where the number of potential neighbors is greater than the ARP cache capacity, enabling dynamic renew could prevent some neighbors from communicating because the ARP cache is full.

Default	disabled
Format	arp dynamicrenew
Mode	Privileged EXEC

no arp dynamicrenew

This command prevents dynamic ARP entries from renewing when they age out.

Format	no arp dynamicrenew
Mode	Privileged EXEC

arp purge

This command causes the specified IP address to be removed from the ARP cache. Only entries of type dynamic or gateway are affected by this command.

\

Format	arp purge *ipaddress* interface {*unit/slot/port* | vlan *id*}
Mode	Privileged EXEC

Parameter	**Description**
ipaddress	The IP address to remove from the ARP cache.
interface	The interface from which IP addresses will be removed.

arp resptime

This command configures the ARP request response timeout.

The value for `seconds` is a valid positive integer, which represents the IP ARP entry response timeout time in seconds. The range for `seconds` is between 1-10 seconds.

Default	1
Format	arp resptime *1-10*
Mode	Global Config

no arp resptime

This command configures the default ARP request response timeout.

Format	no arp resptime
Mode	Global Config

arp retries

This command configures the ARP count of maximum request for retries.

The value for `retries` is an integer, which represents the maximum number of request for retries. The range for `retries` is an integer between 0-10 retries.

Default	4
Format	arp retries *0-10*
Mode	Global Config

no arp retries

This command configures the default ARP count of maximum request for retries.

Format	no arp retries
Mode	Global Config

arp timeout

This command configures the ARP entry ageout time.

The value for `seconds` is a valid positive integer, which represents the IP ARP entry ageout time in seconds. The range for `seconds` is between 15-21600 seconds.

Default	1200
Format	arp timeout *15-21600*
Mode	Global Config

no arp timeout

This command configures the default ARP entry ageout time.

Format	no arp timeout
Mode	Global Config

clear arp-cache

This command causes all ARP entries of type dynamic to be removed from the ARP cache. If the *gateway* keyword is specified, the dynamic entries of type gateway are purged as well.

Format	clear arp-cache [gateway]
Mode	Privileged EXEC

clear arp-switch

Use this command to clear the contents of the switch's Address Resolution Protocol (ARP) table that contains entries learned through the Management port. To observe whether this command is successful, `ping` from the remote system to the DUT. Issue the `show arp switch` command to see the ARP entries. Then issue the `clear arp-switch` command and check the `show arp switch` entries. There will be no more arp entries.

Format	clear arp-switch
Mode	Privileged EXEC

show arp

This command displays the Address Resolution Protocol (ARP) cache. The displayed results are not the total ARP entries. To view the total ARP entries, the operator should view the `show arp` results in conjunction with the `show arp switch` results.

Format	show arp
Mode	Privileged EXEC

Parameter	Definition
Age Time (seconds)	The time it takes for an ARP entry to age out. This is configurable. Age time is measured in seconds.
Response Time (seconds)	The time it takes for an ARP request timeout. This value is configurable. Response time is measured in seconds.
Retries	The maximum number of times an ARP request is retried. This value is configurable.
Cache Size	The maximum number of entries in the ARP table. This value is configurable.
Dynamic Renew Mode	Displays whether the ARP component automatically attempts to renew dynamic ARP entries when they age out.

Parameter	Definition
Total Entry Count Current / Peak	The total entries in the ARP table and the peak entry count in the ARP table.
Static Entry Count Current / Max	The static entry count in the ARP table and maximum static entry count in the ARP table.

The following are displayed for each ARP entry:

Parameter	Definition
IP Address	The IP address of a device on a subnet attached to an existing routing interface.
MAC Address	The hardware MAC address of that device.
Interface	The routing *unit/slot/port* associated with the device ARP entry.
Type	The type that is configurable. The possible values are Local, Gateway, Dynamic and Static.
Age	The current age of the ARP entry since last refresh (in hh:mm:ss format)

show arp brief

This command displays the brief Address Resolution Protocol (ARP) table information.

Format	show arp brief
Mode	Privileged EXEC

Parameter	Definition
Age Time (seconds)	The time it takes for an ARP entry to age out. This value is configurable. Age time is measured in seconds.
Response Time (seconds)	The time it takes for an ARP request timeout. This value is configurable. Response time is measured in seconds.
Retries	The maximum number of times an ARP request is retried. This value is configurable.
Cache Size	The maximum number of entries in the ARP table. This value is configurable.
Dynamic Renew Mode	Displays whether the ARP component automatically attempts to renew dynamic ARP entries when they age out.
Total Entry Count Current / Peak	The total entries in the ARP table and the peak entry count in the ARP table.
Static Entry Count Current / Max	The static entry count in the ARP table and maximum static entry count in the ARP table.

show arp switch

This command displays the contents of the switch’s Address Resolution Protocol (ARP) table.

Format show arp switch

Mode Privileged EXEC

Parameter	Definition
IP Address	The IP address of a device on a subnet attached to the switch.
MAC Address	The hardware MAC address of that device.
Interface	The routing *unit/slot/port* associated with the device's ARP entry.

IP Routing Commands

This section describes the commands you use to enable and configure IP routing on the switch.

routing

This command enables IPv4 and IPv6 routing for an interface or range of interfaces. You can view the current value for this function with the `show ip brief` command. The value is labeled as “Routing Mode.”

Default	disabled
Format	routing
Mode	Interface Config

no routing

This command disables routing for an interface.

You can view the current value for this function with the `show ip brief` command. The value is labeled as “Routing Mode.”

Format	no routing
Mode	Interface Config

ip routing

This command enables the IP Router Admin Mode for the master switch.

Format	ip routing
Mode	• Global Config • Virtual Router Config

no ip routing

This command disables the IP Router Admin Mode for the master switch.

Format	no ip routing
Mode	Global Config

ip address

This command configures an IP address on an interface or range of interfaces. You can also use this command to configure one or more secondary IP addresses on the interface. The command supports RFC 3021 and accepts using 31-bit prefixes on IPv4 point-to-point links. This command adds the label IP address in the “show ip interface” on page 609 command.

Note: The 31-bit subnet mask is only supported on routing interfaces. The feature is not supported on network port and service port interfaces because CE0128XB/CE0152XB acts as a host, not a router, on these management interfaces.

Format	ip address *ipaddr {subnetmask* | */masklen}* [secondary]
Mode	Interface Config

Parameter	Description
ipaddr	The IP address of the interface.
subnetmask	A 4-digit dotted-decimal number which represents the subnet mask of the interface.
masklen	Implements RFC 3021. Using the / notation of the subnet mask, this is an integer that indicates the length of the subnet mask. Range is 5 to 32 bits.

Example: The following example of the command shows the configuration of the subnet mask with an IP address in the dotted decimal format on interface 0/4/1.

```
(router1) #config

(router1) (Config)#interface 0/4/1

(router1) (Interface 0/4/1)#ip address 192.168.10.1 255.255.255.254
```

Example: The next example of the command shows the configuration of the subnet mask with an IP address in the / notation on interface 0/4/1.

```
(router1) #config

(router1) (Config)#interface 0/4/1

(router1) (Interface 0/4/1)#ip address 192.168.10.1 /31
```

no ip address

This command deletes an IP address from an interface. The value for *ipaddr* is the IP address of the interface in a.b.c.d format where the range for a, b, c, and d is 1-255. The value for *subnetmask* is a 4-digit dotted-decimal number which represents the Subnet Mask of the interface. To remove all of the IP addresses (primary and secondary) configured on the interface, enter the command `no ip address`.

Format	no ip address [{*ipaddr subnetmask* [secondary]}]
Mode	Interface Config

ip address dhcp

This command enables the DHCPv4 client on an in-band interface so that it can acquire network information, such as the IP address, subnet mask, and default gateway, from a network DHCP server. When DHCP is enabled on the interface, the system automatically deletes all manually configured IPv4 addresses on the interface.

To enable the DHCPv4 client on an in-band interface and send DHCP client messages with the client identifier option, use the `ip address dhcp client-id` configuration command in interface configuration mode.

Default	disabled
Format	ip address dhcp [client-id]
Mode	Interface Config

Example: In the following example, DHCPv4 is enabled on interface 0/4/1.

```
(router1) #config
(router1) (Config)#interface 0/4/1
(router1) (Interface 0/4/1)#ip address dhcp
```

no ip address dhcp

The `no ip address dhcp` command releases a leased address and disables DHCPv4 on an interface. The `no` form of the `ip address dhcp client-id` command removes the client-id option and also disables the DHCP client on the in-band interface.

Format	no ip address dhcp [client-id]
Mode	Interface Config

ip default-gateway

This command manually configures a default gateway for the switch. Only one default gateway can be configured. If you invoke this command multiple times, each command replaces the previous value.

When the system does not have a more specific route to a packet's destination, it sends the packet to the default gateway. The system installs a default IPv4 route with the gateway address as the next hop address. The route preference is 253. A default gateway configured with this command is more preferred than a default gateway learned from a DHCP server.

Format	ip default-gateway *ipaddr*
Mode	• Global Config • Virtual Router Config

Parameter	Description
ipaddr	The IPv4 address of an attached router.

Example: The following example sets the default gateway to 10.1.1.1.

```
(router1) #config
(router1) (Config)#ip default-gateway 10.1.1.1
```

no ip default-gateway

This command removes the default gateway address from the configuration.

Format	no ip default-gateway *ipaddr*
Mode	Interface Config

ip route

This command configures a static route. The *`ipaddr`* parameter is a valid IP address, and *`subnetmask`* is a valid subnet mask. The *`nexthopip`* parameter is a valid IP address of the next hop router. Specifying `Null0` as nexthop parameter adds a static reject route. The optional *`preference`* parameter is an integer (value from 1 to 255) that allows you to specify the preference value (sometimes called "administrative distance") of an individual static route. Among routes to the same destination, the route with the lowest preference value is the route entered into the forwarding database. By specifying the preference of a static route, you control whether a static route is more or less preferred than routes from dynamic routing protocols. The preference also controls whether a static route is more or less preferred than other static routes to the same destination. A route with a preference of 255 cannot be used to forward traffic.

The description parameter allows a description of the route to be entered.

Use the `track object-number` to specify that the static route is installed only if the configured track object is up. When the track object is down the static route is removed from the Route Table. Use the no form of this command to delete the tracked static route. The `object-number` parameter is the object number representing the object to be tracked. The range is from 1 to 128. Only one track object can be associated with a specific static route. If you configure a different track object, the previously configured track object is replaced by the newly configured track object. To display the IPv4 static routes that being tracked by track objects, use the `show ip route track-table` command.

For the static routes to be visible, you must perform the following steps:

- Enable IP routing globally.
- Enable IP routing for the interface.
- Confirm that the associated link is also up.

Default	preference—1
Format	ip route *ipaddr subnetmask* { *nexthopip* | Null0 | interface {*unit/slot/port*| *vlan-id*}} *[preference]* [description *description*] [track *object-number*]
Mode	Global Config

no ip route

This command deletes a single next hop to a destination static route. If you use the *`nexthopip`* parameter, the next hop is deleted.

Format	no ip route *ipaddr subnetmask {nexthopip | Null0 | interface {slot/port | vlan vlan-id}}*
Mode	Global Config

ip route default

This command configures the default route. The value for `nexthopip` is a valid IP address of the next hop router. The `preference` is an integer value from 1 to 255. A route with a preference of 255 cannot be used to forward traffic.

Default	preference—1
Format	ip route default *nexthopip [preference]*
Mode	Global Config

no ip route default

This command deletes all configured default routes. If the optional `nexthopip` parameter is designated, the specific next hop is deleted from the configured default route and if the optional preference value is designated, the preference of the configured default route is reset to its default.

Format	no ip route default *[{nexthopip | preference}]*
Mode	Global Config

ip route distance

This command sets the default distance (preference) for static routes. Lower route distance values are preferred when determining the best route. The `ip route` and `ip route default` commands allow you to optionally set the distance (preference) of an individual static route. The default distance is used when no distance is specified in these commands. Changing the default distance does not update the distance of existing static routes, even if they were assigned the original default distance. The new default distance will only be applied to static routes created after invoking the `ip route distance` command.

Default	1
Format	ip route distance *1-255*
Mode	Global Config

no ip route distance

This command sets the default static route preference value in the router. Lower route preference values are preferred when determining the best route.

Format	no ip route distance
Mode	Global Config

ip route net-prototype

This command adds net prototype IPv4 routes to the hardware.

Format	ip route net-prototype *prefix/prefix-length nexthopip num-routes*
Mode	Global Config

Parameter	Description
prefix/prefix-length	The destination network and mask for the route.
nexthopip	The next-hop ip address, It must belong to an active routing interface, but it does not need to be resolved.
num-routes	The number of routes need to added into hardware starting from the given prefix argument and within the given prefix-length.

no ip route net-prototype

This command deletes all the net prototype IPv4 routes added to the hardware.

Format	ip route net-prototype *prefix/prefix-length nexthopip num-routes*
Mode	Global Config

ip route static bfd interface

This command sets up a BFD session between two directly connected neighbors specified by the local interface and the neighbor's IP address. The BFD session parameters can be set on the interface by using the existing command.

bfd interval *milliseconds* min_rx *milliseconds* multiplier *interval-multiplier*

This command is supported in IPv4 networks. The maximum number of IP static BFD sessions that can be supported is limited by the maximum BFD sessions configurable per DUT.

Format	ip route static bfd interface *unit/slot/port* | vlan *id neighbor ip address*
Mode	Global Config

Parameter	Description
interface	Specify the local interface either in unit/slot/port format or as a VLAN ID.
neighbor IP address	Specify the other end of the BFD session, peer address.

Example:

```
(localhost) #configure
(localhost) (Config)#interface 0/29
(localhost) (Interface 0/29)#routing
(localhost) (Interface 0/29)#ip address 1.1.1.1 /24
(localhost) (Interface 0/29)#bfd interval 100 min_rx 100 multiplier 5
(localhost) (Interface 0/29)#exit

(localhost) (Config)#show running-config interface 0/29

!Current Configuration:
!
interface  0/29
no shutdown
routing
ip address 1.1.1.1 255.255.255.0
bfd interval 100 min_rx 100 multiplier 5
```

```
exit

(localhost) (Config)#ip route static bfd interface 0/29 1.1.1.2
```

ip netdirbcast

This command enables the forwarding of network-directed broadcasts on an interface or range of interfaces. When enabled, network directed broadcasts are forwarded. When disabled they are dropped.

Default	disabled
Format	ip netdirbcast
Mode	Interface Config

no ip netdirbcast

This command disables the forwarding of network-directed broadcasts. When disabled, network directed broadcasts are dropped.

Format	no ip netdirbcast
Mode	Interface Config

ip mtu

This command sets the IP Maximum Transmission Unit (MTU) on a routing interface or range of interfaces. The IP MTU is the size of the largest IP packet that can be transmitted on the interface without fragmentation. Forwarded packets are dropped if they exceed the IP MTU of the outgoing interface.

Packets originated on the router, such as OSPF packets, may be fragmented by the IP stack.

OSPF advertises the IP MTU in the Database Description packets it sends to its neighbors during database exchange. If two OSPF neighbors advertise different IP MTUs, they will not form an adjacency. (unless OSPF has been instructed to ignore differences in IP MTU with the `ip ospf mtu-ignore` command.)

Note: The IP MTU size refers to the maximum size of the IP packet (IP Header + IP payload). It does not include any extra bytes that may be required for Layer-2 headers. To receive and process packets, the Ethernet MTU (see "mtu" on page 339) must take into account the size of the Ethernet header.

Default	1500 bytes
Format	ip mtu *68-9198*
Mode	Interface Config

no ip mtu

This command resets the ip mtu to the default value.

Format	no ip mtu
Mode	Interface Config

release dhcp

Use this command to force the DHCPv4 client to release the leased address from the specified interface. The DHCP client sends a DHCP Release message telling the DHCP server that it no longer needs the IP address, and that the IP address can be reassigned to another.

Format	release dhcp {*unit/slot/port* | vlan *id*}
Mode	Privileged EXEC

renew dhcp

Use this command to force the DHCPv4 client to immediately renew an IPv4 address lease on the specified interface.

Note: This command can be used on in-band ports as well as the service or network (out-of-band) port.

Format	renew dhcp {*unit/slot/port* | network-port | service-port | vlan *id*}
Mode	Privileged EXEC

renew dhcp network-port

Use this command to renew an IP address on a network port.

Format	renew dhcp network-port
Mode	Privileged EXEC

renew dhcp service-port

Use this command to renew an IP address on a service port.

Format	renew dhcp service-port
Mode	Privileged EXEC

encapsulation

This command configures the link layer encapsulation type for the packet on an interface or range of interfaces. The encapsulation type can be `ethernet` or `snap`.

Default	ethernet
Format	encapsulation {ethernet | snap}
Mode	Interface Config

Note: Routed frames are always Ethernet encapsulated when a frame is routed to a VLAN.

show dhcp lease

This command displays a list of IPv4 addresses currently leased from a DHCP server on a specific in-band interface or all in-band interfaces. This command does not apply to service or network ports.

Format	show dhcp lease [interface {*unit/slot/port* | vlan *id*}]
Modes	Privileged EXEC

Parameter	Definition
IP address, Subnet mask	The IP address and network mask leased from the DHCP server
DHCP Lease server	The IPv4 address of the DHCP server that leased the address.
State	State of the DHCPv4 Client on this interface
DHCP transaction ID	The transaction ID of the DHCPv4 Client
Lease	The time (in seconds) that the IP address was leased by the server
Renewal	The time (in seconds) when the next DHCP renew Request is sent by DHCPv4 Client to renew the leased IP address
Rebind	The time (in seconds) when the DHCP Rebind process starts
Retry count	Number of times the DHCPv4 client sends a DHCP REQUEST message before the server responds

show ip brief

This command displays the summary information of the IP global configurations, including the ICMP rate limit configuration and the global ICMP Redirect configuration.

Format	show ip brief
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Default Time to Live	The computed TTL (Time to Live) of forwarding a packet from the local router to the final destination.
Routing Mode	Shows whether the routing mode is enabled or disabled.
Maximum Next Hops	The maximum number of next hops the packet can travel.
Maximum Routes	The maximum number of routes the packet can travel.
Maximum Static Routes	The maximum number of static routes that can be configured.
ICMP Rate Limit Interval	Shows how often the token bucket is initialized with burst-size tokens. *Burst-interval* is from 0 to 2147483647 milliseconds. The default *burst-interval* is 1000 msec.
ICMP Rate Limit Burst Size	Shows the number of ICMPv4 error messages that can be sent during one *burst-interval*. The range is from 1 to 200 messages. The default value is 100 messages.
ICMP Echo Replies	Shows whether ICMP Echo Replies are enabled or disabled.

Parameter	Definition
ICMP Redirects	Shows whether ICMP Redirects are enabled or disabled.
System uRPF Mode	Shows whether unicast Reverse Path Forwarding (uRPF) is enabled.

Example: The following shows example CLI display output for the command.

```
(Switch) #show ip brief

Default Time to Live........................... 64
Routing Mode.................................. Enabled
Maximum Next Hops............................. 1
Maximum Routes................................ 512
Maximum Static Routes......................... 512
ICMP Rate Limit Interval...................... 1000 msec
ICMP Rate Limit Burst Size.................... 100 messages
ICMP Echo Replies............................. Enabled
ICMP Redirects................................ Enabled
```

show ip interface

This command displays all pertinent information about the IP interface. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Format	show ip interface {*unit/slot/port*|*vlan 1-4093*|*loopback 0-7*}
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Routing Interface Status	Determine the operational status of IPv4 routing Interface. The possible values are Up or Down.
Primary IP Address	The primary IP address and subnet masks for the interface. This value appears only if you configure it.
Method	Shows whether the IP address was configured manually or acquired from a DHCP server.
Secondary IP Address	One or more secondary IP addresses and subnet masks for the interface. This value appears only if you configure it.
Helper IP Address	The helper IP addresses configured by the "ip helper-address (Interface Config)" on page 672 command.
Routing Mode	The administrative mode of router interface participation. The possible values are enable or disable. This value is configurable.
Administrative Mode	The administrative mode of the specified interface. The possible values of this field are enable or disable. This value is configurable.
Forward Net Directed Broadcasts	Displays whether forwarding of network-directed broadcasts is enabled or disabled. This value is configurable.
Proxy ARP	Displays whether Proxy ARP is enabled or disabled on the system.
Local Proxy ARP	Displays whether Local Proxy ARP is enabled or disabled on the interface.
Active State	Displays whether the interface is active or inactive. An interface is considered active if its link is up and it is in forwarding state.

Parameter	Definition
Link Speed Data Rate	An integer representing the physical link data rate of the specified interface. This is measured in Megabits per second (Mbps).
MAC Address	The burned in physical address of the specified interface. The format is 6 two-digit hexadecimal numbers that are separated by colons.
Encapsulation Type	The encapsulation type for the specified interface. The types are: Ethernet or SNAP.
IP MTU	The maximum transmission unit (MTU) size of a frame, in bytes.
Bandwidth	Shows the bandwidth of the interface.
Destination Unreachables	Displays whether ICMP Destination Unreachables may be sent (enabled or disabled).
ICMP Redirects	Displays whether ICMP Redirects may be sent (enabled or disabled).
DHCP Client Identifier	The client identifier is displayed in the output of the command only if DHCP is enabled with the **client-id** option on the in-band interface. See “ip address dhcp” on page 601.
Interface Suppress Status	Identifies whether the interface is suppressed.
Interface Name	The user-configured name of the interface.

Example: The following shows example CLI display output for the command..

```
(switch)#show ip interface 1/0/2

Routing Interface Status....................... Down
Primary IP Address............................ 1.2.3.4/255.255.255.0
Method......................................... Manual
Secondary IP Address(es)....................... 21.2.3.4/255.255.255.0
............................................... 22.2.3.4/255.255.255.0
Helper IP Address............................. 1.2.3.4
............................................... 1.2.3.5
Routing Mode.................................. Disable
Administrative Mode........................... Enable
Forward Net Directed Broadcasts................ Disable
Proxy ARP..................................... Enable
Local Proxy ARP............................... Disable
Active State.................................. Inactive
Link Speed Data Rate.......................... Inactive
MAC Address................................... 80:96:21:82:0C:68
Encapsulation Type............................ Ethernet
IP MTU......................................... 1500
Bandwidth..................................... 100000 kbps
Destination Unreachables...................... Enabled
ICMP Redirects................................ Enabled
Interface Suppress Status..................... Unsuppressed
```

Example: In the following example the DHCP client is enabled on a VLAN routing interface.

```
(Routing) #show ip interface vlan 10

Routing Interface Status................. Up
Method.................................. DHCP
Routing Mode............................ Enable
Administrative Mode..................... Enable
Forward Net Directed Broadcasts.......... Disable
Active State............................ Inactive
Link Speed Data Rate.................... 10 Half
```

```
MAC address.............................. 80:96:21:82:16:0E
Encapsulation Type....................... Ethernet
IP MTU.................................. 1500
Bandwidth................................ 10000 kbps
Destination Unreachables................. Enabled
ICMP Redirects........................... Enabled
Interface Suppress Status................ Unsuppressed
DHCP Client Identifier................... 8096.2182.160E-vl10
```

show ip interface brief

This command displays summary information about IP configuration settings for all ports in the router, and indicates how each IP address was assigned for a specified virtual router instance. If a virtual router is not specified, the IP configuration settings cache for the default router is displayed.

Format	show ip interface brief
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	Valid slot and port number separated by a forward slash.
State	Routing operational state of the interface.
IP Address	The IP address of the routing interface in 32-bit dotted decimal format.
IP Mask	The IP mask of the routing interface in 32-bit dotted decimal format.
Method	Indicates how each IP address was assigned. The field contains one of the following values: • **DHCP** - The address is leased from a DHCP server. • **Manual** - The address is manually configured.

Example: The following shows example CLI display output for the command.

```
(alpha1) #show ip interface brief

Interface   State  IP Address     IP Mask        Method
----------  -----  ---------------  --------------- --------
1/0/17      Up    192.168.75.1   255.255.255.0  DHCP
```

show ip protocols

This command lists a summary of the configuration and status for each unicast routing protocol running. The command lists routing protocols which are configured and enabled. If a protocol is selected on the command line, the display will be limited to that protocol.

Format	show ip protocols [ospf|rip]
Mode	Privileged EXEC

Parameter	Description
OSPFv2 Section:	
Routing Protocol	OSPFv2.
Router ID	The router ID configured for OSPFv2.

Parameter	Description
OSPF Admin Mode	Whether OSPF is enabled or disabled globally.
Maximum Paths	The maximum number of next hops in an OSPF route.
Routing for Networks	The address ranges configured with an OSPF network command.
Distance	The administrative distance (or “route preference”) for intra-area, inter-area, and external routes.
Default Route Advertise	Whether OSPF is configured to originate a default route.
Always	Whether default advertisement depends on having a default route in the common routing table.
Metric	The metric configured to be advertised with the default route.
Metric Type	The metric type for the default route.
Redist Source	A type of routes that OSPF is redistributing.
Metric	The metric to advertise for redistributed routes of this type.
Metric Type	The metric type to advertise for redistributed routes of this type.
Subnets	Whether OSPF redistributes subnets of classful addresses, or only classful prefixes.
Dist List	A distribute list used to filter routes of this type. Only routes that pass the distribute list are redistributed.
Number of Active Areas	The number of OSPF areas with at least one interface running on this router. Also broken down by area type.
ABR Status	Whether the router is currently an area border router. A router is an area border router if it has interfaces that are up in more than one area.
ASBR Status	Whether the router is an autonomous system boundary router. The router is an ASBR if it is redistributing any routes or originating a default route.
RIP Section	
RIP Admin Mode	Whether RIP is globally enabled.
Split Horizon Mode	Whether RIP advertises routes on the interface where they were received.
Default Metric	The metric assigned to redistributed routes.
Default Route Advertise	Whether this router is originating a default route.
Distance	The administrative distance for RIP routes.
Redistribution	A table showing information for each source protocol (connected, static, and ospf). For each of these source the **distribution list** and **metric** are shown. Fields which are not configured are left blank. For ospf, configured **ospf match** parameters are also shown.
Interface	The interfaces where RIP is enabled and the version sent and accepted on each interface.

Example: The following shows example CLI display output for the command.

```
(Router) #show ip protocols

Routing Protocol.......................... OSPFv2
Router ID................................. 6.6.6.6
OSPF Admin Mode........................... Enable
Maximum Paths............................. 32
Routing for Networks...................... 172.24.0.0 0.0.255.255 area 0
                                           10.0.0.0 0.255.255.255 area 1
                                           192.168.75.0 0.0.0.255 area 2
```

```
Distance................................. Intra 110 Inter 110 Ext 110

Default Route Advertise.................. Disabled
Always................................... FALSE
Metric................................... Not configured
Metric Type.............................. External Type 2

Redist
Source     Metric      Metric Type    Subnets    Dist List
---------  -------      -----------     -------    ---------
static     default              2        Yes        None
connected       10               2        Yes           1

Number of Active Areas................... 3 (3 normal, 0 stub, 0 nssa)
ABR Status............................... Yes
ASBR Status.............................. Yes


Routing Protocol......................... RIP
RIP Admin Mode........................... Enable
Split Horizon Mode....................... Simple
Default Metric........................... Not configured
Default Route Advertise.................. Disable
Distance................................. 120

Redistribution:
Source    Metric Dist List Match
--------- ------ --------- --------------------------------------
connected      6
static        10        15
ospf                    20 int ext1 ext2 nssa-ext1

Interface            Send       Recv
---------            ----       ----
0/25                 RIPv2      RIPv2
```

show ip route

This command displays the routing table. The *`ip-address`* specifies the network for which the route is to be displayed and displays the best matching best-route for the address. The *`mask`* specifies the subnet mask for the given *`ip-address`*. When you use the `longer-prefixes` keyword, the *`ip-address`* and *`mask`* pair becomes the prefix, and the command displays the routes to the addresses that match that prefix. Use the `protocol` parameter to specify the protocol that installed the routes. The value for *`protocol`* can be `connected`, `ospf`, `rip`, or `static`. Use the `all` parameter to display all routes including best and nonbest routes. If you do not use the `all` parameter, the command displays only the best route.

Note: Note the following:

- If you use the `connected` keyword for *`protocol`*, the `all` option is not available because there are no best or nonbest connected routes.
- If you use the `static` keyword for *`protocol`*, the `description` option is also available, for example: `show ip route ip-address static description`. This command shows the description configured with the specified static route(s).

Format   show ip route [{*ip-address* [*protocol*] | {*ip-address mask* [longer-prefixes] [*protocol*] | *protocol*} [all] | all}]

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Route Codes	The key for the routing protocol codes that might appear in the routing table output.

The `show ip route` command displays the routing tables in the following format:

Code   IP-Address/Mask [Preference/Metric] via Next-Hop, Route-Timestamp, Interface, Truncated

The columns for the routing table display the following information:

Parameter	Definition
Code	The codes for the routing protocols that created the routes.
Default Gateway	The IP address of the default gateway. When the system does not have a more specific route to a packet's destination, it sends the packet to the default gateway.
IP-Address/Mask	The IP-Address and mask of the destination network corresponding to this route.
Preference	The administrative distance associated with this route. Routes with low values are preferred over routes with higher values.
Metric	The cost associated with this route.
via Next-Hop	The outgoing router IP address to use when forwarding traffic to the next router (if any) in the path toward the destination.
Route-Timestamp	The last updated time for dynamic routes. The format of Route-Timestamp will be • Days:Hours:Minutes if days > = 1 • Hours:Minutes:Seconds if days < 1
Interface	The outgoing router interface to use when forwarding traffic to the next destination. For reject routes, the next hop interface would be Null0 interface.

To administratively control the traffic destined to a particular network and prevent it from being forwarded through the router, you can configure a static reject route on the router. Such traffic would be discarded and the ICMP destination unreachable message is sent back to the source. This is typically used for preventing routing loops. The reject route added in the RTO is of the type **OSPF Inter-Area**. Reject routes (routes of REJECT type installed by any protocol) are not redistributed by OSPF/RIP. Reject routes are supported in both OSPFv2 and OSPFv3.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip route
Route Codes: C - Connected, S - Static
      R - RIP Derived
      O - OSPF Derived, IA - OSPF Inter Area
      E1 - OSPF External Type 1, E2 - OSPF External Type 2
      N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
      S U - Unnumbered Peer
      K - Kernel, P - Net Prototype
C     1.1.1.0/30 [0/0] directly connected,   0/4/4
C     192.168.99.1/32 [0/0] directly connected,   loopback 0
```

show ip route hw-failure

Use this command to display the routes that failed to be added to the hardware due to hash errors or a table full condition.

Format	show ip route hw-failure
Mode	Privileged EXEC

Example: The following example displays the command output.

```
(Routing) (Config)#ip route net-prototype 66.6.6.0/24 9.0.0.2 4

(Routing) #show ip route connected

Route Codes: C - Connected, S - Static
      R - RIP Derived
      O - OSPF Derived, IA - OSPF Inter Area
      E1 - OSPF External Type 1, E2 - OSPF External Type 2
      N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
      S U - Unnumbered Peer
      K - Kernel, P - Net Prototype

C     9.0.0.0/24 [0/0] directly connected,   0/1
C     8.0.0.0/24 [0/0] directly connected,   0/2

(Routing) #show ip route hw-failure

Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
      IA - OSPF Inter Area
      E1 - OSPF External Type 1, E2 - OSPF External Type 2
      N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
      S U - Unnumbered Peer, L - Leaked Route, K – Kernel
                                                    P – Net Prototype

P     66.6.6.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1  hw-failure
P     66.6.7.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1  hw-failure
P     66.6.8.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1  hw-failure
P     66.6.9.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1  hw-failure
```

show ip route net-prototype

This command displays the net-prototype routes. The net-prototype routes are displayed with a P.

Format	show ip route net-prototype
Modes	Privileged EXEC

Example:

```
(Routing) #show ip route net-prototype

Route Codes: C - Connected, S - Static
      R - RIP Derived
      O - OSPF Derived, IA - OSPF Inter Area
      E1 - OSPF External Type 1, E2 - OSPF External Type 2
      N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
      S U - Unnumbered Peer
       K - Kernel, P - Net Prototype

P     56.6.6.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1
```

```
P      56.6.7.0/24 [1/1] via 9.0.0.2,   01d:22h:15m,  0/1
```

show ip route static bfd

This command displays information about the IPv4 static BFD configured parameters configured with the `ip route static bfd` command.

Format	show ip route static bfd
Modes	Privileged EXEC

Example:

```
(localhost)#show ip route static bfd

S   1.1.1.2    via   0/28  Up
```

show ip route summary

This command displays a summary of the state of the routing table. When the optional `all` keyword is given, some statistics, such as the number of routes from each source, include counts for alternate routes. An alternate route is a route that is not the most preferred route to its destination and therefore is not installed in the forwarding table. To include only the number of best routes, do not use the optional keyword.

Format	show ip route summary [all]
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Connected Routes	The total number of connected routes in the routing table.
Static Routes	Total number of static routes in the routing table.
RIP Routes	Total number of routes installed by RIP protocol.
OSPF Routes	Total number of routes installed by OSPF protocol.
Intra Area Routes	Total number of Intra Area routes installed by OSPF protocol.
Inter Area Routes	Total number of Inter Area routes installed by OSPF protocol.
External Type-1 Routes	Total number of External Type-1 routes installed by OSPF protocol.
External Type-2 Routes	Total number of External Type-2 routes installed by OSPF protocol.
Reject Routes	Total number of reject routes installed by all protocols.
Net Prototype Routes	The number of net-prototype routes.
Total Routes	Total number of routes in the routing table.
Best Routes (High)	The number of best routes currently in the routing table. This number only counts the best route to each destination. The value in parentheses indicates the highest count of unique best routes since counters were last cleared.
Alternate Routes	The number of alternate routes currently in the routing table. An alternate route is a route that was not selected as the best route to its destination.

Parameter	Definition
Route Adds	The number of routes that have been added to the routing table.
Route Modifies	The number of routes that have been changed after they were initially added to the routing table.
Route Deletes	The number of routes that have been deleted from the routing table.
Unresolved Route Adds	The number of route adds that failed because none of the route's next hops were on a local subnet. Note that static routes can fail to be added to the routing table at startup because the routing interfaces are not yet up. This counter gets incremented in this case. The static routes are added to the routing table when the routing interfaces come up.
Invalid Route Adds	The number of routes that failed to be added to the routing table because the route was invalid. A log message is written for each of these failures.
Failed Route Adds	The number of routes that failed to be added to the routing table because of a resource limitation in the routing table.
Hardware Failed Route Adds	The number of routes failed be inserted into the hardware due to hash error or a table full condition.
Reserved Locals	The number of routing table entries reserved for a local subnet on a routing interface that is down. Space for local routes is always reserved so that local routes can be installed when a routing interface bounces.
Unique Next Hops (High)	The number of distinct next hops used among all routes currently in the routing table. These include local interfaces for local routes and neighbors for indirect routes. The value in parentheses indicates the highest count of unique next hops since counters were last cleared.
Next Hop Groups (High)	The current number of next hop groups in use by one or more routes. Each next hop group includes one or more next hops. The value in parentheses indicates the highest count of next hop groups since counters were last cleared.
Routes with n Next Hops	The current number of routes with each number of next hops.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip route summary
Connected Routes............................... 7
Static Routes................................. 1
RIP Routes.................................... 20
OSPF Routes................................... 1004
  Intra Area Routes............................ 4
  Inter Area Routes............................ 1000
  External Type-1 Routes...................... 0
  External Type-2 Routes...................... 0
Reject Routes................................. 0
Net Prototype Routes.......................... 10004
Total routes.................................. 1032

Best Routes (High)............................ 1032 (1032)
Alternate Routes.............................. 0
Route Adds.................................... 1010
Route Modifies................................ 1
Route Deletes................................. 10
Unresolved Route Adds......................... 0
Invalid Route Adds............................ 0
Failed Route Adds............................. 0
Hardware Failed Route Adds.................... 4
Reserved Locals............................... 0

Unique Next Hops (High)....................... 13 (13)
Next Hop Groups (High)........................ 13 (14)
```

```
Routes with 1 Next Hop......................... 31
Routes with 2 Next Hops........................ 1
Routes with 4 Next Hops........................ 1000
```

clear ip route counters

The command resets to zero the IPv4 routing table counters reported in the "show ip route summary" on page 616 command. The command only resets event counters. Counters that report the current state of the routing table, such as the number of routes of each type, are not reset.

Format	clear ip route counters
Mode	Privileged EXEC

show ip route preferences

This command displays detailed information about the route preferences for each type of route. Route preferences are used in determining the best route. Lower router preference values are preferred over higher router preference values. A route with a preference of 255 cannot be used to forward traffic

.

Format	show ip route preferences
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Local	The local route preference value.
Static	The static route preference value.
OSPF Intra	The OSPF Intra route preference value.
OSPF Inter	The OSPF Inter route preference value.
OSPF External	The OSPF External route preference value.
RIP	The RIP route preference value.
Configured Default Gateway	The route preference value of the statically-configured default gateway
DHCP Default Gateway	The route preference value of the default gateway learned from the DHCP server.

Example: The following shows example CLI display output for the command.

```
(alpha-stack) #show ip route preferences

Local.......................................... 0
Static......................................... 1
OSPF Intra..................................... 110
OSPF Inter..................................... 110
OSPF External.................................. 110
RIP............................................ 120
Configured Default Gateway..................... 253
DHCP Default Gateway........................... 254
```

show ip stats

This command displays IP statistical information.

Format	show ip stats
Modes	• Privileged EXEC • User EXEC

show routing heap summary

This command displays a summary of the memory allocation from the routing heap. The routing heap is a chunk of memory set aside when the system boots for use by the routing applications.

Format	show routing heap summary
Mode	Privileged EXEC

Parameter	Description
Heap Size	The amount of memory, in bytes, allocated at startup for the routing heap.
Memory In Use	The number of bytes currently allocated.
Memory on Free List	The number of bytes currently on the free list. When a chunk of memory from the routing heap is freed, it is placed on a free list for future reuse.
Memory Available in Heap	The number of bytes in the original heap that have never been allocated.
In Use High Water Mark	The maximum memory in use since the system last rebooted.

Example: The following shows example CLI display output for the command.

```
(Router) #show routing heap summary

Heap Size ..................................... 8670368
Memory In Use ................................. 56854 ( 0% )
Memory on Free List ........................... 1100 ( 0% )
Memory Available in Heap ...................... 8613290 ( 99% )
In Use High Water Mark ........................ 57646 ( 0% )
```

Policy-Based Routing Commands

Use the commands in this section to configure and view policy-based routing for IPv4.

For the commands to configure and view IPv6 policy-based routing, see "IPv6 Policy-Based Routing Commands" on page 631

ip policy route-map

Use this command to identify a route map to use for policy-based routing on an interface specified by *route-map-name*. Policy-based routing is configured on the interface that *receives* the packets, not on the interface from which the packets are sent.

When a route-map applied on the interface is changed, that is, if new statements are added to the route-map or match/set terms are added to or removed from the route-map statement, and also if the route-map that is applied on an interface is removed, the route-map needs to be removed from the interface and added back again in order for the changed route-map configuration to take effect.

A route-map statement should contain eligible match/set conditions for policy-based routing in order to be applied to hardware.

- Valid match conditions: `match ip address acl`, `match mac-list`, `match length`
- Valid set conditions: `set ip next-hop`, `set ip default next-hop`, `set ip precedence`

A route-map statement should contain at least one match condition and one set condition as specified above for it to be eligible to be applied to hardware. If not, the route-map is not applied to hardware.

When a route-map is applied on a VLAN interface and a DiffServ policy is applied on a member port of the same VLAN interface, the port policy takes priority over the VLAN policy.

Note: Route-map and DiffServ cannot work on the same interface.

Format	ip policy *route-map-name*
Mode	Interface Config

Example: The following is an example of this command.

```
(Switching) (Config)#interface 1/0/1
(Switching) (Interface 1/0/1)#
(Switching) (Interface 1/0/1)# #ip policy route-map equal-access
```

To disable policy based routing from an interface, use the `no` form of this command

no ip policy route-map *route-map-name*

When a route-map has both IPv4 and IPv6 statements provisioned and the user applies the route-map using IP policy command, the IPv6 statements in the route-map will not take effect. A message will be displayed to the user to indicate this.

Example:

```
(Routing) (Interface vlan 40)#ip policy route-map rm4
```

IPv6 statements in this route-map will not be applied using IPv4 Policy Based Routing.

route-map

To create a route map and enter Route Map Configuration mode, use the `route-map` command in Global Configuration mode. One use of a route map is to limit the redistribution of routes to a specified range of route prefixes. The redistribution command specifies a route map which refers to a prefix list. The prefix list identifies the prefixes that may be redistributed. CE0128XB/CE0152XB accepts up to 64 route maps.

Default	No route maps are configured by default. If no permit or deny tag is given, *permit* is the default.
Format	route-map *map-tag* [permit | deny] [*sequence-number*]
Mode	Global Configuration

Parameter	Description
map-tag	Text name of the route map. Route maps with the same name are grouped together in order of their sequence numbers. A route map name may be up to 32 characters long.
permit	(Optional) Permit routes that match all of the match conditions in the route map.
deny	(Optional) Deny routes that match all of the match conditions in the route map.
sequence-number	(Optional) An integer used to order the set of route maps with the same name. Route maps are ordered from lowest to greatest sequence number, with lower sequence numbers being considered first. If no sequence number is specified, the system assigns a value ten greater than the last statement in the route map. The range is 0 to 65,535.

no route-map

To delete a route map or one of its statements, use the `no` form of this command.

Format	no route-map *map-tag* [permit | deny] [*sequence-number*]
Mode	Global Configuration

match ip address <access-list-number | access-list-name>

Use this command to configure a route map in order to match based on the match criteria configured in an IP access-list. Note that an IP ACL must be configured before it is linked to a route-map. Actions present in an IP ACL configuration are applied with other actions involved in route-map. If an IP ACL referenced by a route-map is removed or rules are added or deleted from that ACL, the configuration is rejected.

If there are a list of IP access-lists specified in this command and the packet matches at least one of these access-list match criteria, the corresponding set of actions in route-map are applied to packet.

If there are duplicate IP access-list numbers/names in this command, the duplicate configuration is ignored.

Default No match criteria are defined by default.

Format `match ip address` *`access-list-number | access-list-name`* `[...access-list-number`
| name]

Mode Route Map Configuration

Parameter	Description
Access-list-number	The access-list number that identifies an access-list configured through access-list CLI configuration commands. This number is 1 to 99 for standard access list number. This number is 100 to 199 for extended access list number.
Access-list-name	The access-list name that identifies named IP ACLs. Access-list name can be up to 31 characters in length. A maximum of 16 ACLs can be specified in this 'match' clause.

Example: The following sequence shows creating a route-map with "match" clause on ACL number and applying that route-map on an interface.

```
(Routing) (config)#access-list 1 permit ip 10.1.0.0 0.0.255.255
(Routing) (config)#access-list 2 permit ip 10.2.0.0 0.0.255.255
(Routing) (config)#route-map equal-access permit 10
(Routing) (config-route-map)#match ip address 1
(Routing) (config-route-map)#set ip default next-hop 192.168.6.6
(Routing) (config-route-map)#route-map equal-access permit 20
(Routing) (config-route-map)#match ip address 2
(Routing) (config-route-map)#set ip default next-hop 172.16.7.7
(Routing) (config)#interface 1/0/1
(Routing) (Interface 1/0/1)#ip address 10.1.1.1 255.255.255.0
(Routing) (Interface 1/0/1)#ip policy route-map equal-access
(Routing) (config)#interface 1/0/2
(Routing) (Interface 1/0/2)#ip address 192.168.6.5 255.255.255.0
(Routing) (config)#interface 1/0/3
(Routing) (Interface 1/0/3)#ip address 172.16.7.6 255.255.255.0
```

Theippolicyroute-mapequal-accesscommandisappliedtointerface1/0/1.Allpacketscominginside1/0/1are policy-routed.

Sequence number 10 in route map equal-access is used to match all packets sourced from any host in subnet 10.1.0.0. If there is a match, and if the router has no explicit route for the packet's destination, it is sent to next-hop address 192.168.6.6 .

Sequence number 20 in route map equal-access is used to match all packets sourced from any host in subnet 10.2.0.0. If there is a match, and if the router has no explicit route for the packet's destination, it is sent to next-hop address 172.16.7.7.

Rest all packets are forwarded as per normal L3 destination-based routing.

Example: This example illustrates the scenario where IP ACL referenced by a route-map is removed or rules are added or deleted from that ACL, this is how configuration is rejected:

```
(Routing) #show ip access-lists

ACL Counters: Enabled
Current number of ACLs: 9  Maximum number of ACLs: 100
```

```
ACL ID/Name                     Rules  Direction  Interface(s)     VLAN(s)
-------------------------------  -----  ---------  ----------------  ----------
1                         1
2                         1
3                         1
4                         1
5                         1
madan                       1

(Routing) #show mac access-lists

ACL Counters: Enabled
Current number of all ACLs: 9  Maximum number of all ACLs: 100

MAC ACL Name                  Rules  Direction  Interface(s)      VLAN(s)
-------------------------------  -----  ---------  ----------------  ----------
madan                       1
mohan                       1
goud                       1

(Routing) #
(Routing) #
(Routing) #configure

(Routing) (Config)#route-map madan
(Routing) (route-map)#match ip address 1 2 3 4 5 madan
(Routing) (route-map)#match mac-list madan mohan goud
(Routing) (route-map)#exit
(Routing) (Config)#exit
(Routing) #show route-map

route-map madan permit 10
    Match clauses:
      ip address (access-lists) : 1 2 3 4 5 madan
      mac-list (access-lists) : madan mohan goud
    Set clauses:

(Routing) (Config)#access-list 2 permit every

Request denied. Another application using this ACL restricts the number of rules allowed.

(Routing) (Config)#ip access-list madan
(Routing) (Config-ipv4-acl)#permit udp any any

Request denied. Another application using this ACL restricts the number of rules allowed.
```

no match ip address

To delete a match statement from a route map, use the `no` form of this command.

Format	no match ip address [*access-list-number* | *access-list-name*]
Mode	Route Map Configuration

match length

Use this command to configure a route map to match based on the Layer 3 packet length between specified minimum and maximum values. *min* specifies the packet’s minimum Layer 3 length, inclusive, allowed for a match. *max* specifies the packet’s maximum Layer 3 length, inclusive, allowed for a match. Each route-map statement can contain one ‘match’ statement on packet length range.

Default	No match criteria are defined by default.
Format	match length *min max*
Mode	Route Map Configuration

Example: The following shows an example of the command.

```
(Routing) (config-route-map)# match length 64 1500
```

no match length

Use this command to delete a match statement from a route map.

Format	no match length
Mode	Route Map Configuration

match mac-list

Use this command to configure a route map in order to match based on the match criteria configured in an MAC access-list.

A MAC ACL is configured before it is linked to a route-map. Actions present in MAC ACL configuration are applied with other actions involved in route-map. When a MAC ACL referenced by a route-map is removed, the route-map rule is also removed and the corresponding rule is not effective. When a MAC ACL referenced by a route-map is removed or rules are added or deleted from that ACL, the configuration is rejected.

Default	No match criteria are defined by default.
Format	match mac-list *mac-list-name* [*mac-list-name*]
Mode	Route Map Configuration

Parameter	Description
mac-list-name	The mac-list name that identifies MAC ACLs. MAC Access-list name can be up to 31 characters in length.

Example: The following is an example of the command.

```
(Routing) (config-route-map)# match mac-list MacList1
```

Example 2:
ThisexampleillustratesthescenariowhereMACACLreferencedbyaroute-mapisremovedorrulesareadded or deleted from that ACL, this is how configuration is rejected:

```
(Routing) #show mac access-lists

ACL Counters: Enabled
Current number of all ACLs: 9  Maximum number of all ACLs: 100

MAC ACL Name                   Rules  Direction  Interface(s)     VLAN(s)
-------------------------------  -----  ---------  ----------------  ----------
madan                             1
mohan                             1
goud                              1
```

```
(Routing) #
(Routing) #
(Routing) #configure

(Routing) (Config)#route-map madan

(Routing) (route-map)#match mac-list madan mohan goud

(Routing) (route-map)#exit

(Routing) (Config)#exit

(Routing) #show route-map

route-map madan permit 10
    Match clauses:
      mac-list (access-lists) : madan mohan goud
    Set clauses:

(Routing) (Config)#mac access-list extended madan

(Routing) (Config-mac-access-list)#permit 00:00:00:00:00:01 ff:ff:ff:ff:ff:ff any

Request denied. Another application using this ACL restricts the number of rules allowed.
```

no match mac-list

To delete a match statement from a route map, use the `no` form of this command.

Format	no match mac-list [*…mac-list-name*]
Mode	Route Map Configuration

set interface

If network administrator does not want to revert to normal forwarding but instead want to drop a packet that does not match the specified criteria, a set statement needs to be configured to route the packets to interface null 0 as the last entry in the route-map. `set interface null0` needs to be configured in a separate statement. It should not be added along with any other statement having other match/set terms.

A route-map statement that is used for PBR is configured as permit or deny. If the statement is marked as deny, traditional destination-based routing is performed on the packet meeting the match criteria. If the statement is marked as permit, and if the packet meets all the match criteria, then set commands in the route-map statement are applied. If no match is found in the route-map, the packet is not dropped, instead the packet is forwarded using the routing decision taken by performing destination-based routing.

Format	set interface null0
Mode	Route Map Configuration

set ip next-hop

Use this command to specify the adjacent next-hop router in the path toward the destination to which the packets should be forwarded. If more than one IP address is specified, the first IP address associated with a currently up-connected interface is used to route the packets.

This command affects all incoming packet types and is always used if configured. If configured next-hop is not present in the routing table, an ARP request is sent from the router.

In a route-map statement, 'set ip next-hop' and 'set ip default next-hop' terms are mutually exclusive. However, a 'set ip default next-hop' can be configured in a separate route-map statement.

Format	set ip next-hop ip-address [...*ip-address*]
Mode	Route Map Configuration

Parameter	Description
ip-address	The IP address of the next hop to which packets are output. It must be the address of an adjacent router. A maximum of 16 next-hop IP addresses can be specified in this 'set' clause.

no set ip next-hop

Use this command to remove a set command from a route map.

Format	no set ip next-hop ip-address [...*ip-address*]
Mode	Route Map Configuration

set ip default next-hop

Use this command to set a list of default next-hop IP addresses. If more than one IP address is specified, the first next hop specified that appears to be adjacent to the router is used. The optional specified IP addresses are tried in turn.

A packet is routed to the next hop specified by this command only if there is *no* explicit route for the packet's destination address in the routing table. A default route in the routing table is not considered an explicit route for an unknown destination address.

In a route-map statement, 'set ip next-hop' and 'set ip default next-hop' terms are mutually exclusive.However, a 'set ip next-hop' can be configured in a separate route-map statement

Format	set ip default next-hop ip-address [...*ip-address*]
Mode	Route Map Configuration

Parameter	Description
ip-address	The IP address of the next hop to which packets are output. It must be the address of an adjacent router. A maximum of 16 next-hop IP addresses can be specified in this ‘set’ clause.

no set ip default next-hop

Use this command to remove a set command from a route map.

Format	no set ip default next-hop ip-address [*...ip-address*]
Mode	Route Map Configuration

set ip precedence

Use this command to set the three IP precedence bits in the IP packet header. With three bits, you have eight possible values for the IP precedence; values 0 through 7 are defined. This command is used when implementing QoS and can be used by other QoS services, such as weighted fair queuing (WFQ) and weighted random early detection (WRED).

Format	set ip precedence *0-7*
Mode	Route Map Configuration

Parameter	Description
0	Sets the routine precedence
1	Sets the priority precedence
2	Sets the immediate precedence
3	Sets the Flash precedence
4	Sets the Flash override precedence
5	Sets the critical precedence
6	Sets the internetwork control precedence
7	Sets the network control precedence

no set ip precedence

Use this command to reset the three IP precedence bits in the IP packet header to the default.

Format	no set ip precedence
Mode	Route Map Configuration

show ip policy

This command lists the route map associated with each interface.

Format	show ip policy
Mode	Privileged EXEC

Parameter	Definition
Interface	The interface.
Route-map	The route map

show route-map

To display a route map, use the `show route-map` command in Privileged EXEC mode.

Format	show route-map [*map-name*]
Mode	Privileged EXEC

Parameter	Description
map-name	(Optional) Name of a specific route map.

Example: The following shows example CLI display output for the command.

```
(Routing) # show route-map test
route-map test, permit, sequence 10
   Match clauses:
    ip address prefix-lists: orange
                                                        Set clauses:
                                                         set metric 50
```

Example: The following example shows a route map, *test1,* that is configured with extended community attributes:

```
(R1) # show route-map test
route-map test1, permit, sequence 10
   Match clauses:
    extended community list1
                                                        Set clauses:
                                                         extended community RT:1:100 RT:2:200
```

Example: With the inclusion of policy-based routing, more *match* and *set* clauses are added. For each sequence number, match count is shown in terms of the number of packets and number of bytes. This counter displays match count in packets and bytes when the route-map is applied. When a route-map is created/removed from interface, this count is shown to be zero. The following example shows the behavior of counters along with how they are displayed when a route-map is applied and removed from an interface:

```
(Routing) #show route-map simplest

route-map simplest permit 10
  Match clauses:
   ip address (access-lists) : 1
  Set clauses:
   ip next-hop 3.3.3.3
   ip precedence 3
Policy routing matches: 0 packets, 0 bytes
route-map simplest permit 20
  Match clauses:
   ip address (access-lists) : 1
  Set clauses:
   ip default next-hop 4.4.4.4
   ip precedence 4
```

```
Policy routing matches: 0 packets, 0 bytes
route-map simplest permit 30
  Match clauses:
  Set clauses:
   interface null0
Policy routing matches: 0 packets, 0 bytes

(Routing) #
(Routing) #configure

(Routing) (Config)#interface 0/2

(Routing) (Interface 0/2)#ip policy simplest

(Routing) (Interface 0/2)#show route-map simplest

route-map simplest permit 10
  Match clauses:
   ip address (access-lists) : 1
  Set clauses:
   ip next-hop 3.3.3.3
   ip precedence 3
Policy routing matches: 5387983 packets, 344831232 bytes
route-map simplest permit 20
  Match clauses:
   ip address (access-lists) : 1
  Set clauses:
   ip default next-hop 4.4.4.4
   ip precedence 4
Policy routing matches: 0 packets, 0 bytes
route-map simplest permit 30
  Match clauses:
  Set clauses:
   interface null0
Policy routing matches: 0 packets, 0 bytes
(Routing) (Interface 0/2)#
(Routing) (Interface 0/2)#no ip policy simplest

(Routing) (Interface 0/2)#exit

(Routing) (Config)#exit

(Routing) #show route-map simplest

route-map simplest permit 10
  Match clauses:
   ip address (access-lists) : 1
  Set clauses:
   ip next-hop 3.3.3.3
   ip precedence 3
Policy routing matches: 0 packets, 0 bytes
route-map simplest permit 20
  Match clauses:
   ip address (access-lists) : 1
  Set clauses:
   ip default next-hop 4.4.4.4
   ip precedence 4
Policy routing matches: 0 packets, 0 bytes
route-map simplest permit 30
  Match clauses:
  Set clauses:
   interface null0
Policy routing matches: 0 packets, 0 bytes
```

Example: The following output shows an example of the command when the specified route map is IPv6-based.

```
(dhcp-10-130-84-138)#show route-map

route-map rm6 permit 10
    Match clauses:
      ipv6 address (access-lists) : acl6
    Set clauses:
      ipv6 next-hop 3001::2 2001::2 5001::2 6001::2
      ipv6 next-hop interface fe80::200:6bff:fee4:35a, via 3/3
Policy routing matches: 0 packets, 0 bytes

route-map rmdef permit 10
    Match clauses:
      ipv6 address (access-lists) : acl6
    Set clauses:
      ipv6 default next-hop 1001::2
      ipv6 default next-hop interface fe80::200:6bff:fee4:35a, via 3/3
Policy routing matches: 0 packets, 0 bytes
```

clear ip prefix-list

To reset IP prefix-list counters, use the `clear ip prefix-list` command in Privileged EXEC mode. This command is used to clear prefix-list hit counters. The hit count is a value indicating the number of matches to a specific prefix list entry.

Format	clear ip prefix-list [[*prefix-list-name*] [*network/length*]]
Mode	Privileged EXEC

Parameter	Description
prefix-list-name	(Optional) Name of the prefix list from which the hit count is to be cleared.
network/length	(Optional) Network number and length (in bits) of the network mask. If this option is specified, hit counters are only cleared for the matching statement.

Example: The following shows an example of the command.

```
(Routing) # clear ip prefix-list orange 20.0.0.0/8
```

IPv6 Policy-Based Routing Commands

The following commands in "Policy-Based Routing Commands" on page 620 section for IPv4 traffic can also be used with IPv6 traffic:

- "match length" on page 623
- "match mac-list" on page 624
- "set interface" on page 625

ipv6 policy

Use this command to identify a route map to use for policy-based IPv6 routing on an interface.

Format	ipv6 policy route-map *route-map-name*
Mode	Interface Config

Parameter	Description
route-map-name	The name of the route map to use for policy routing. It must match a map tag specified by a route-map command. If user tries to apply a route-map name that is not configured/created yet, an error is shown to user.

Usage Guidelines:

A route-map statement should contain eligible match/set conditions for policy-based routing in order to be applied to hardware.

- Valid match conditions: `match ipv6 address acl, match mac-list, match length`
- Valid set conditions: `set ipv6 next-hop`, `set ipv6 default next-hop`, `set ipv6 precedence`

A route-map statement should contain at least one match condition and one set condition as specified above for it to be eligible to be applied to hardware. If not, the route-map is not applied to hardware.

Note: Route-map and DiffServ cannot work on the same interface.

When a route-map is applied on a VLAN interface and a DiffServ policy is applied on a member port of the same VLAN interface, the port policy has priority over the VLAN policy.

The same route-map cannot be applied using both `ip policy` and `ipv6 policy` commands on an interface.

Example:

```
(Routing) (Interface vlan 40)#show ip policy

Interface        Route-Map
------------  -----------------------------------------
3/4           rm6

(Routing) (Interface vlan 40)#ipv6 policy route-map rm6
```

```
Route-map  is already in use for IPv6 based policy routing
```

When a route-map has both IPv4 and IPv6 statements provisioned and the user applies the route-map using the `ipv6 policy` command, then the IPv4 statements in the route-map will not take effect. A message will be displayed to the user to indicate this.

Example:

```
(Routing) (Interface vlan 40)#ipv6 policy route-map rm4
```

IPv4 statements in this route-map will not be applied using IPv6 Policy Based Routing

no ipv6 policy

Use this command to disable policy based routing from an interface.

Format	no ipv6 policy route-map *route-map-name*
Mode	Interface Config

ipv6 prefix-list

Use this command to create IPv6 prefix lists. An IPv6 prefix list can contain only ipv6 addresses. Prefix lists allow matching of route prefixes with those specified in the prefix list. Each prefix list includes of a sequence of prefix list entries ordered by their sequence numbers. A router sequentially examines each prefix list entry to determine if the route's prefix matches that of the entry. For IPv6 routes, only IPv6 prefix lists are matched. An empty or nonexistent prefix list permits all prefixes. An implicit deny is assumed if a given prefix does not match any entries of a prefix list. Once a match or deny occurs the router does not go through the rest of the list. An IPv6 prefix list may be used within a route map to match a route's prefix using the `match ipv6 address` command. A route map may contain both IPv4 and IPv4 prefix lists. If a route being matched is an IPv6 route, only the IPv6 prefix lists are matched.

Up to 128 prefix lists may be configured. The maximum number of statements allowed in prefix list is 64. These numbers indicate only IPv6 prefix lists. IPv4 prefix lists may be configured in appropriate numbers independently.

Default	No prefix lists are configured by default. When neither the `ge` nor the `le` option is configured, the destination prefix must match the network/length exactly. If the `ge` option is configured without the `le` option, any prefix with a network mask greater than or equal to the `ge` value is considered a match. Similarly, if the `le` option is configured without the `ge` option, a prefix with a network mask less than or equal to the `le` value is considered a match.
Format	ipv6 prefix-list *list-name* [seq *seq-number*] { {permit/deny} *ipv6-prefix/prefix-length* [ge *ge-value*] [le *le-value*] | description *text* | renumber *renumber-interval first-statement-number*}
Mode	Global Configuration

Parameter	Description
list-name	The text name of the prefix list. Up to 32 characters.

Parameter	Description
seq number	(Optional) The sequence number for this prefix list statement. Prefix list statements are ordered from lowest sequence number to highest and applied in that order. If you do not specify a sequence number, the system will automatically select a sequence number five larger than the last sequence number in the list. Two statements may not be configured with the same sequence number. The value ranges from 1 to 4,294,967,294.
permit	Permit routes whose destination prefix matches the statement.
deny	Deny routes whose destination prefix matches the statement.
ipv6-prefix/prefix-length	Specifies the match criteria for routes being compared to the prefix list statement. The ipv6-prefix can be any valid IPv6 prefix where the address is specified in hexadecimal using 16-bit values between colons. The prefix-length is the The length of the IPv6 prefix, given as a decimal value that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address). A slash mark must precede the decimal value.
ge length	(Optional) If this option is configured, specifies a prefix length greater than or equal to the ipv6-prefix/prefix-length. It is the lowest value of a range of the length.
le length	(Optional) If this option is configured, specifies a prefix length less than or equal to the **ipv6-**prefix/prefix-length. It is the highest value of a range of the length.
Description	A description of the prefix list. It can be up to 80 characters in length.
renumber	(Optional) Provides the option to renumber the sequence numbers of the IPv6 prefix list statements with a given interval starting from a particular sequence number.

Example: The following example configures a prefix list that allows routes with one of two specific destination prefixes, `2001::/64 and 5F00::/48`:

```
(R1)(config)# ipv6 prefix-list apple seq 10 permit 2001::/64
(R1)(config)# ipv6 prefix-list apple seq 20 permit 5F00::/48
```

no ipv6 prefix-list

Use this command to deletes either the entire prefix list or an individual statement from a prefix list.

Format	ipv6 prefix-list *list-name*
Mode	Global Configuration

Note: The description must be removed using the `no ip prefix-list description` before using this command to delete an IPv6 Prefix List.

match ipv6 address

Use this command to configure a route map to match based on the match criteria configured in an IPv6 access-list.

If you specify a non-configured IPv6 ACL name/number to match, the CLI displays an error message. Make sure the IPv6 ACL is configured before it is linked to a route-map. Actions present in IPv6 ACL configuration are applied with other actions involved in the route-map. When an IPv6 ACL referenced by a route-map is removed or rules are added or deleted from that ACL, configuration is rejected. Adding ACLs to or removing ACLs from a route-map that is attached to an interface is allowed.

When a list of IPv6 access-lists is specified in this command, if packet matches at least one of these access-list match criteria, then the corresponding set actions in route-map are applied to packet.

If there are duplicate IPv6 access-list numbers/names in this command, the duplicate configuration is ignored.

Default	No match criteria are defined by default.
Format	match ipv6 address {*access-list-number* | *access-list-name*} [...*access-list-number* | *access-list-name*]
Mode	Route Map Configuration

Parameter	Description
access-list-number	The IPv6 access-list number that identifies an access-list configured through access-list CLI configuration commands. This number is 1 to 99 for standard access list number. This number is 100 to 199 for extended access list number.
access-list-name	The IPv6 access-list name that identifies the named IPv6 ACL. The `access-list-name` can be up to 31 characters in length. A maximum of four ACLs can be specified in this match clause.

Example: Following sequence shows how to create a route-map with a match clause on an ACL number and apply that route-map on an interface.

```
(Routing) (Config)#ipv6 access-list acl2
(Routing) (Config-ipv6-acl)#permit ipv6 1001::1 any
(Routing) (Config-ipv6-acl)#exit
(Routing) (Config)#route-map rm1 permit 40
(Routing) (route-map)#match ipv6 address acl2
(Routing) (config-route-map)#set ipv6 default next-hop 2001::2
(Routing) (config)#interface 0/1
(Routing) (Interface 0/1)#ip address 10.1.1.1 255.255.255.0
(Routing) (Interface 0/1)#ipv6  policy route-map rm1
```

The `ipv6 policy route-map rm1` command is applied to interface 0/1. All packets ingressing on 0/1 are policy-routed if a match is made as per the IPv6 access-list.

Sequence number 40 in route map rm1 is used to match all packets sourced from host 1001::1 If there is a match, and if the router has no explicit route for the packet's destination, it is sent to next-hop address 2001::2

The rest of the packets are forwarded as per normal L3 destination-based routing.

no match ipv6 address

Use this command to delete a match statement from a route map.

Format no match ipv6 address [...*a*ccess-list-number | *access-list-name*]

Mode Route Map Configuration

set ipv6 next-hop

Use this command to specify the adjacent next-hop router in the path toward the destination to which the packets should be forwarded. If more than one IPv6 address is specified, the first IPv6 address associated with a currently up connected interface is used to route the packets.

Format set ipv6 next-hop [interface *slot/port* | *vlan link-local address*] ipv6-address [...ipv6-address]

Mode Route Map Configuration

Parameter	Description
ipv6-address	The global IPv6 address of the next hop to which packets are output. It must be the address of an adjacent router
interface	Use the `interface` keyword to specify an IPv6 next hop using the link local address. You can then specify the link-local address along with the interface. A maximum of four next-hop global IPv6 addresses and a link-local address can be specified in this `set` clause. The link-local next hop is prioritized over the global next-hops.

Usage Guidelines

The `set ipv6 next-hop` command affects all incoming packet types and is always used if configured.. A check is made in the NDP table to see if the next hop is resolved, if so packets are forwarded to the next-hop.

In a route-map statement, `set ipv6 next-hop` and `set ipv6 default next-hop` terms are mutually exclusive. However, a `set ipv6 default next-hop` can be configured in a separate route-map statement.

Example:

```
(Routing) (route-map)#set ipv6 next-hop 3333::2
```

no set ipv6 next-hop

Use this command to remove a set command from a route map.

Format no set ipv6 next-hop [interface *slot/port* | *vlan link-local address*] ipv6-address [...ipv6-address]

Mode Route Map Configuration

set ipv6 default next-hop

Use this command to set a list of default next-hop IPv6 addresses. If more than one IPv6 address is specified, the first next hop specified that appears to be adjacent to the router is used. The other specified IPv6 addresses are tried in turn.

Format set ipv6 default next-hop [interface *slot/port | vlan link-local address*] ipv6-address [...ipv6-address]

Mode Route Map Configuration

Parameter	Description
ipv6-address	The Global IPv6 address of the next hop to which packets are output. It must be the address of an adjacent router.
Interface	When the user wants to specify an IPv6 next hop using the link local address - then the interface key word needs to be used. The user can then specify the link-local address along with the interface. A maximum of 4 next-hop global IPv6 addresses and a link-local address can be specified in this 'set' clause. The link-local next hop is prioritized over the global next-hops.

Usage Guidelines

A packet is routed to the next hop specified by the `set ipv6 default next-hop` command only if there is no explicit route for the packet's destination address in the routing table. A default route in the routing table is not considered an explicit route for an unknown destination address.

In a route-map statement, `set ipv6 next-hop` and `set ipv6 default next-hop` terms are mutually exclusive.However, a `set ipv6 next-hop` can be configured in a separate route-map statement

When a `set ipv6 default next-hop` is configured in a route-map and applied on an interface, if a default route is present in the system, it is expected that packets matching route-map rules are still policy route. This is because a default route is not considered explicit route to destination.

Example:

```
(Routing)(config-route-map)# set ipv6 default next-hop 2002::2
```

no set ipv6 default next-hop

Use this command to remove a set command from a route map.

Format no set ipv6 default next-hop ip-address [*...ip-address*]

Mode Route Map Configuration

set ipv6 precedence

Similar to IPv4, use this command to set the precedence in the IPv6 packet header. With 3 bits, there are 8 possible values for the IP precedence; values 0 through 7 are defined. This gives the administrator the ability to enable differentiated classes of service.

Format set ipv6 precedence *0-7*

Mode Route Map Configuration

Parameter	Description
0	Sets the routine precedence
1	Sets the priority precedence
2	Sets the immediate precedence
3	Sets the Flash precedence
4	Sets the Flash override precedence
5	Sets the critical precedence
6	Sets the internetwork control precedence
7	Sets the network control precedence

no set ipv6 precedence

Use this command to reset the three IPv6 precedence bits in the IP packet header to the default.

Format	no set ipv6 precedence
Mode	Route Map Configuration

show ipv6 policy

Use this command to display the route maps used for policy routing on the router’s interfaces.

Format	show ipv6 policy
Mode	Privileged EXEC

Example:

```
(Routing) #show ipv6 policy

Interface      Route-Map

-- -- -- -- -- --   -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -

0/24                                               rmapv6
```

Router Discovery Protocol Commands

This section describes the commands you use to view and configure Router Discovery Protocol settings on the switch. The Router Discovery Protocol enables a host to discover the IP address of routers on the subnet.

ip irdp

This command enables Router Discovery on an interface or range of interfaces.

Default	disabled
Format	ip irdp
Mode	Interface Config

no ip irdp

This command disables Router Discovery on an interface.

Format	no ip irdp
Mode	Interface Config

ip irdp address

This command configures the address that the interface uses to send the router discovery advertisements. The valid values for *ipaddr* are 224.0.0.1, which is the all-hosts IP multicast address, and 255.255.255.255, which is the limited broadcast address.

Default	224.0.0.1
Format	ip irdp address *ipaddr*
Mode	Interface Config

no ip irdp address

This command configures the default address used to advertise the router for the interface.

Format	no ip irdp address
Mode	Interface Config

ip irdp holdtime

This command configures the value, in seconds, of the holdtime field of the router advertisement sent from this interface. The holdtime range is the value of 4 to 9000 seconds.

Default	3 * maxinterval
Format	ip irdp holdtime *4-9000*

Mode	Interface Config

no ip irdp holdtime

This command configures the default value, in seconds, of the holdtime field of the router advertisement sent from this interface.

Format	no ip irdp holdtime
Mode	Interface Config

ip irdp maxadvertinterval

This command configures the maximum time, in seconds, allowed between sending router advertisements from the interface. The range for maxadvertinterval is 4 to 1800 seconds.

Default	600
Format	ip irdp maxadvertinterval *4-1800*
Mode	Interface Config

no ip irdp maxadvertinterval

This command configures the default maximum time, in seconds.

Format	no ip irdp maxadvertinterval
Mode	Interface Config

ip irdp minadvertinterval

This command configures the minimum time, in seconds, allowed between sending router advertisements from the interface. The range for minadvertinterval is 3–1800.

Default	0.75 * maxadvertinterval
Format	ip irdp minadvertinterval *3-1800*
Mode	Interface Config

no ip irdp minadvertinterval

This command sets the default minimum time to the default.

Format	no ip irdp minadvertinterval
Mode	Interface Config

ip irdp multicast

This command configures the destination IP address for router advertisements as 224.0.0.1, which is the default address. The *no* form of the command configures the IP address as 255.255.255.255 to instead send router advertisements to the limited broadcast address.

Format	ip irdp multicast *ip address*
Mode	Interface Config

no ip irdp multicast

By default, router advertisements are sent to 224.0.0.1. To instead send router advertisements to the limited broadcast address, 255.255.255.255, use the no form of this command.

Format	no ip irdp multicast
Mode	Interface Config

ip irdp preference

This command configures the preferability of the address as a default router address, relative to other router addresses on the same subnet.

Default	0
Format	ip irdp preference *-2147483648 to 2147483647*
Mode	Interface Config

no ip irdp preference

This command configures the default preferability of the address as a default router address, relative to other router addresses on the same subnet.

Format	no ip irdp preference
Mode	Interface Config

show ip irdp

This command displays the router discovery information for all interfaces, a specified interface, or specified VLAN. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword **vlan** is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Format	show ip irdp {*unit/slot/port*|vlan *1-4093*|all}
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	The *unit/slot/port* that corresponds to a physical routing interface or vlan routing interface.
vlan	Use this keyword to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.
Ad Mode	The advertise mode, which indicates whether router discovery is enabled or disabled on this interface.
Dest Address	The destination IP address for router advertisements.
Max Int	The maximum advertise interval, which is the maximum time, in seconds, allowed between sending router advertisements from the interface.
Min Int	The minimum advertise interval, which is the minimum time, in seconds, allowed between sending router advertisements from the interface.
Hold Time	The amount of time, in seconds, that a system should keep the router advertisement before discarding it.
Preference	The preference of the address as a default router address, relative to other router addresses on the same subnet.

Virtual LAN Routing Commands

This section describes the commands you use to view and configure VLAN routing and to view VLAN routing status information.

vlan routing

This command enables routing on a VLAN. The `vlanid` value has a range from 1 to 4093. The `[interface ID]` value has a range from 1 to 128. Typically, you will not supply the interface ID argument, and the system automatically selects the interface ID. However, if you specify an interface ID, the interface ID becomes the port number in the `unit/slot/port` for the VLAN routing interface. If you select an interface ID that is already in use, the CLI displays an error message and does not create the VLAN interface. For products that use text-based configuration, including the interface ID in the vlan routing command for the text configuration ensures that the `unit/slot/port` for the VLAN interface stays the same across a restart. Keeping the `unit/slot/port` the same ensures that the correct interface configuration is applied to each interface when the system restarts.

Format	vlan routing *vlanid* [*interface ID*]
Mode	VLAN Database

no vlan routing

This command deletes routing on a VLAN.

Format	no vlan routing *vlanid*
Mode	VLAN Database

Example: Example 1 shows the command specifying a vlanid value. The interface ID argument is not used.

```
(Switch)(Vlan)#vlan 14
(Switch)(Vlan)#vlan routing 14 ?
<cr>                Press enter to execute the command.
<1-24>              Enter interface ID
```

Typically, you press <**Enter**> without supplying the Interface ID value; the system automatically selects the interface ID.

Example: In Example 2, the command specifies interface ID 51 for VLAN 14 interface. The interface ID becomes the port number in the `unit/slot/port` for the VLAN routing interface. In this example, `unit/slot/port` is 4/51 for VLAN 14 interface.

```
(Switch)(Vlan)#vlan 14 51
(Switch)(Vlan)#
(Switch)#show ip vlan
MAC Address used by Routing VLANs:   80:96:21:59:47:36

        Logical
VLAN ID   Interface       IP Address      Subnet Mask
------- -------------- --------------- ---------------
10      4/1            172.16.10.1     255.255.255.0
11      4/50           172.16.11.1     255.255.255.0
12      4/3            172.16.12.1     255.255.255.0
```

```
13      4/4          172.16.13.1     255.255.255.0
14      4/51          0.0.0.0         0.0.0.0                      <--u/s/p is 4/51 for VLAN 14 interface
```

Example: In Example 3, you select an interface ID that is already in use. In this case, the CLI displays an error message and does not create the VLAN interface.

```
(Switch) #show ip vlan

MAC Address used by Routing VLANs:   80:96:21:59:47:36

        Logical
VLAN ID   Interface       IP Address      Subnet Mask
-------  --------------  ---------------  ---------------
10      4/1          172.16.10.1     255.255.255.0
11      4/50          172.16.11.1     255.255.255.0
12      4/3          172.16.12.1     255.255.255.0
13      4/4          172.16.13.1     255.255.255.0
14      4/51          0.0.0.0         0.0.0.0

(Switch)#config

(Switch)(Config)#exit

(Switch)#vlan database

(Switch)(Vlan)#vlan 15

(Switch)(Vlan)#vlan routing 15 1

Interface ID 1 is already assigned to another interface
```

Example: The show running configuration command always lists the interface ID for each routing VLAN, as shown in Example 4 below.

```
(Switch) #show running-config
!Current Configuration:
!
!System Description "Lenovo CE0128PB Switch, 8.4.3.1, Linux 4.4.145, U-Boot 2012.10-0"
!System Software Version "8.4.3.1"
!System Up Time         "0 days 15 hrs 52 mins 26 secs"
!Additional Packages     QOS, Multicast, IPv6, IPv6 Management, Stacking, Routing
!Current SNTP Synchronized Time: SNTP Client Mode Is Disabled
!
hostname "dhcp-10-27-7-158"
vlan database
exit
ip http secure-session soft-timeout 60
configure
stack
member 1 2
exit
slot 1/0 2
set slot power 1/0
no set slot disable 1/0
router rip
exit
router ospf
exit
ipv6 router ospf
exit
exit
```

interface vlan

Use this command to enter Interface configuration mode for the specified VLAN. The vlan-id range is 1 to 4093.

Format	interface vlan vlan-id
Mode	Global Config

show ip vlan

This command displays the VLAN routing information for all VLANs with routing enabled.

Format	show ip vlan
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
MAC Address used by Routing VLANs	The MAC Address associated with the internal bridge-router interface (IBRI). The same MAC Address is used by all VLAN routing interfaces. It will be displayed above the per-VLAN information.
VLAN ID	The identifier of the VLAN.
Logical Interface	The logical *unit/slot/port* associated with the VLAN routing interface.
IP Address	The IP address associated with this VLAN.
Subnet Mask	The subnet mask that is associated with this VLAN.

Virtual Router Redundancy Protocol Commands

This section describes the commands you use to view and configure Virtual Router Redundancy Protocol (VRRP) and to view VRRP status information. VRRP helps provide failover and load balancing when you configure two devices as a VRRP pair.

ip vrrp (Global Config)

Use this command in Global Config mode to enable the administrative mode of VRRP on the router. This command enables VRRP (v2 or v3, whichever version is the configured version) and makes it operational.

Default	none
Format	ip vrrp
Mode	Global Config

no ip vrrp

Use this command in Global Config mode to disable the default administrative mode of VRRP on the router.

Format	no ip vrrp
Mode	Global Config

ip vrrp (Interface Config)

Use this command in Interface Config mode to create a virtual router associated with the interface or range of interfaces. The parameter `vrid` is the virtual router ID, which has an integer value range from 1 to 255.

Format	ip vrrp *vrid*
Mode	Interface Config

no ip vrrp

Use this command in Interface Config mode to delete the virtual router associated with the interface. The virtual Router ID, `vrid`, is an integer value that ranges from 1 to 255.

Format	no ip vrrp *vrid*
Mode	Interface Config

ip vrrp mode

This command enables the virtual router configured on the specified interface. Enabling the status field starts a virtual router. The parameter `vrid` is the virtual router ID which has an integer value ranging from 1 to 255.

Default	disabled
Format	ip vrrp *vrid* mode

Mode	Interface Config

no ip vrrp mode

This command disables the virtual router configured on the specified interface. Disabling the status field stops a virtual router.

Format	no ip vrrp *vrid* mode
Mode	Interface Config

ip vrrp ip

This command sets the virtual router IP address value for an interface or range of interfaces. The value for `ipaddr` is the IP address which is to be configured on that interface for VRRP. The parameter `vrid` is the virtual router ID which has an integer value range from 1 to 255. You can use the optional `[secondary]` parameter to designate the IP address as a secondary IP address.

Default	none
Format	ip vrrp *vrid* ip *ipaddr* [secondary]
Mode	Interface Config

no ip vrrp ip

Use this command in Interface Config mode to delete a secondary IP address value from the interface. To delete the primary IP address, you must delete the virtual router on the interface.

Format	no ip vrrp *vrid ipaddress* secondary
Mode	Interface Config

ip vrrp accept-mode

Use this command to allow the VRRP Master to accept ping packets sent to one of the virtual router's IP addresses.

Note: VRRP accept-mode allows only ICMP Echo Request packets. No other type of packet is allowed to be delivered to a VRRP address.

Default	disabled
Format	ip vrrp *vrid* accept-mode
Mode	Interface Config

no ip vrrp accept-mode

Use this command to prevent the VRRP Master from accepting ping packets sent to one of the virtual router's IP addresses.

Format	no ip vrrp *vrid accept-mode*
Mode	Interface Config

ip vrrp authentication

This command sets the authorization details value for the virtual router configured on a specified interface or range of interfaces. The parameter `{none | simple}` specifies the authorization type for virtual router configured on the specified interface. The parameter `[key]` is optional, it is only required when authorization type is simple text password. The parameter `vrid` is the virtual router ID which has an integer value ranges from 1 to 255.

Default	no authorization
Format	ip vrrp *vrid* authentication {none | simple *key*}
Mode	Interface Config

no ip vrrp authentication

This command sets the default authorization details value for the virtual router configured on a specified interface or range of interfaces.

Format	no ip vrrp *vrid* authentication
Mode	Interface Config

ip vrrp preempt

This command sets the preemption mode value for the virtual router configured on a specified interface or range of interfaces. The parameter `vrid` is the virtual router ID, which is an integer from 1 to 255.

Default	enabled
Format	ip vrrp *vrid* preempt
Mode	Interface Config

no ip vrrp preempt

This command sets the default preemption mode value for the virtual router configured on a specified interface or range of interfaces.

Format	no ip vrrp *vrid* preempt
Mode	Interface Config

ip vrrp priority

This command sets the priority of a router within a VRRP group. It can be used to configure an interface or a range of interfaces. Higher values equal higher priority. The range is from 1 to 254. The parameter `vrid` is the virtual router ID, whose range is from 1 to 255.

The router with the highest priority is elected master. If a router is configured with the address used as the address of the virtual router, the router is called the “address owner.” The priority of the address owner is always 255 so that the address owner is always master. If the master has a priority less than 255 (it is not the address owner) and you configure the priority of another router in the group higher than the master's priority, the router will take over as master only if preempt mode is enabled.

Default	100 unless the router is the address owner, in which case its priority is automatically set to 255.
Format	ip vrrp *vrid* priority *1-254*
Mode	Interface Config

no ip vrrp priority

This command sets the default priority value for the virtual router configured on a specified interface or range of interfaces.

Format	no ip vrrp *vrid* priority
Mode	Interface Config

ip vrrp timers advertise

This command sets the frequency, in seconds, that an interface or range of interfaces on the specified virtual router sends a virtual router advertisement.

Default	1
Format	ip vrrp *vrid* timers advertise *1-255*
Mode	Interface Config

no ip vrrp timers advertise

This command sets the default virtual router advertisement value for an interface or range of interfaces.

Format	no ip vrrp *vrid* timers advertise
Mode	Interface Config

ip vrrp track interface

Use this command to alter the priority of the VRRP router based on the availability of its interfaces. This command is useful for tracking interfaces that are not configured for VRRP. Only IP interfaces are tracked. A tracked interface is up if the IP on that interface is up. Otherwise, the tracked interface is down. You can use this command to configure a single interface or range of interfaces. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

When the tracked interface is down or the interface has been removed from the router, the priority of the VRRP router will be decremented by the value specified in the ***`priority`*** argument. When the interface is up for IP protocol, the priority will be incremented by the ***`priority`*** value.

A VRRP configured interface can track more than one interface. When a tracked interface goes down, then the priority of the router will be decreased by 10 (the default priority decrement) for each downed interface. The default priority decrement is changed using the `priority` argument. The default priority of the virtual router is 100, and the default decrement priority is 10. By default, no interfaces are tracked. If you specify just the interface to be tracked, without giving the optional priority, then the default priority will be set. The default priority decrement is 10.

Default	priority: 10
Format	ip vrrp *vrid* track interface {*unit/slot/port* | *vlan 1-4093}* [decrement *priority]*
Mode	Interface Config

no ip vrrp track interface

Use this command to remove the interface or range of interfaces from the tracked list or to restore the priority decrement to its default.

Format	no ip vrrp *vrid* track interface {*unit/slot/port* | *vlan 1-4093}* [decrement]
Mode	Interface Config

ip vrrp track ip route

Use this command to track the route reachability on an interface or range of interfaces. When the tracked route is deleted, the priority of the VRRP router will be decremented by the value specified in the `priority` argument. When the tracked route is added, the priority will be incremented by the same.

A VRRP configured interface can track more than one route. When a tracked route goes down, then the priority of the router will be decreased by 10 (the default priority decrement) for each downed route. By default no routes are tracked. If you specify just the route to be tracked, without giving the optional priority, then the default priority will be set. The default priority decrement is 10. The default priority decrement is changed using the `priority` argument.

Default	priority: 10
Format	ip vrrp *vrid* track ip route *ip-address/prefix-length* [decrement *priority*]
Mode	Interface Config

no ip vrrp track ip route

Use this command to remove the route from the tracked list or to restore the priority decrement to its default. When removing a tracked IP route from the tracked list, the priority should be incremented by the decrement value if the route is not reachable.

Format	no ip vrrp *vrid* track interface *unit/slot/port* [decrement]
Mode	Interface Config

show ip vrrp interface stats

This command displays the statistical information about each virtual router configured on the switch. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword **vlan** is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format.

Format	show ip vrrp interface stats {*unit/slot/port|vlan 1-4093*} *vrid*
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Uptime	The time that the virtual router has been up, in days, hours, minutes and seconds.
Protocol	The protocol configured on the interface.
State Transitioned to Master	The total number of times virtual router state has changed to MASTER.
Advertisement Received	The total number of VRRP advertisements received by this virtual router.
Advertisement Interval Errors	The total number of VRRP advertisements received for which advertisement interval is different than the configured value for this virtual router.
Authentication Failure	The total number of VRRP packets received that don't pass the authentication check.
IP TTL errors	The total number of VRRP packets received by the virtual router with IP TTL (time to live) not equal to 255.
Zero Priority Packets Received	The total number of VRRP packets received by virtual router with a priority of '0'.
Zero Priority Packets Sent	The total number of VRRP packets sent by the virtual router with a priority of '0'.
Invalid Type Packets Received	The total number of VRRP packets received by the virtual router with invalid 'type' field.
Address List Errors	The total number of VRRP packets received for which address list does not match the locally configured list for the virtual router.
Invalid Authentication Type	The total number of VRRP packets received with unknown authentication type.
Authentication Type Mismatch	The total number of VRRP advertisements received for which 'auth type' not equal to locally configured one for this virtual router.
Packet Length Errors	The total number of VRRP packets received with packet length less than length of VRRP header.

show ip vrrp

This command displays whether VRRP functionality is enabled or disabled on the switch. It also displays some global parameters which are required for monitoring. This command takes no options.

Format	show ip vrrp

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
VRRP Admin Mode	The administrative mode for VRRP functionality on the switch.
Router Checksum Errors	The total number of VRRP packets received with an invalid VRRP checksum value.
Router Version Errors	The total number of VRRP packets received with Unknown or unsupported version number.
Router VRID Errors	The total number of VRRP packets received with invalid VRID for this virtual router.

show ip vrrp interface

This command displays all configuration information and VRRP router statistics of a virtual router configured on a specific interface. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is the VLAN ID of the routing VLAN instead of in a *unit/slot/port* format. Use the output of the command to verify the track interface and track IP route configurations.

Format show ip vrrp interface {*unit/slot/port|vlan 1-4093} vrid*

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
IP Address	The configured IP address for the Virtual router.
VMAC address	The VMAC address of the specified router.
Authentication type	The authentication type for the specific virtual router.
Priority	The priority value for the specific virtual router, taking into account any priority decrements for tracked interfaces or routes.
Configured Priority	The priority configured through the `ip vrrp` *`vrid`* `priority` *`1-254`* command.
Advertisement interval	The advertisement interval in seconds for the specific virtual router.
Pre-Empt Mode	The preemption mode configured on the specified virtual router.
Administrative Mode	The status (Enable or Disable) of the specific router.
Accept Mode	When enabled, the VRRP Master can accept ping packets sent to one of the virtual router’s IP addresses.
State	The state (Master/backup) of the virtual router.

Example: The following shows example CLI display output for the command.

```
show ip vrrp interface <u/s/p> vrid

Primary IP Address............................ 1.1.1.5
VMAC Address.................................. 00:00:5e:00:01:01
Authentication Type........................... None
Priority...................................... 80
  Configured priority......................... 100
Advertisement Interval (secs)................. 1
Pre-empt Mode................................. Enable
Administrative Mode........................... Enable
Accept Mode................................... Enable
State......................................... Initialized
Track Interface        State        DecrementPriority
---------------        ------       ------------------


<1/0/1>              down             10
TrackRoute  (pfx/len)  StateDecrementPriority
------------------------   ------        ------------------
10.10.10.1/255.255.255.0    down             10
```

show ip vrrp interface brief

This command displays information about each virtual router configured on the switch. This command takes no options. It displays information about each virtual router.

Format	show ip vrrp interface brief
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	*unit/slot/port*
VRID	The router ID of the virtual router.
IP Address	The virtual router IP address.
Mode	Indicates whether the virtual router is enabled or disabled.
State	The state (Master/backup) of the virtual router.

VRRPv3 Commands

VRRPv3 provides address redundancy for both IPv4 and IPv6 router addresses. VRRPv3 support in Lenovo is similar to VRRP support. The following table provides a summary of the differences.

VRRPv2	VRRPv3
Supports redundancy to IPv4 addresses	Supports redundancy to IPv4 and IPv6 addresses
Supports authentication	Does not support authentication
No concept of link-local address in IPv4 address space	For IPv6 addresses, VRRP IP contains the link-local IPv6 address too.
The interval time used for sending VRRP Advertisement packets is in seconds.	The interval time is in the order of centiseconds.
VRRP MAC address format is 00-00-5E-00-01-{VRID}	VRRP MAC address format for IPv6 VR IP is 00-00-5E-00-02-{VRID}
SNMP MIB RFC according to 2787. The counters are 32-bit ones.	SNMP MIB RFC as per RFC 6527. The counters are 64-bit ones.

Note: Note the following:

- To enable VRRP on the device, use the `ip vrrp` command. See "ip vrrp (Global Config)" on page 645). This command enables VRRP (v2 or v3, whichever version is the configured version) and makes it operational.
- A command is available to configure debugging for VRRP packets. For information, see "debug lacp packet" on page 281.

fhrp version vrrp v3

To enable Virtual Router Redundancy Protocol version 3 (VRRPv3) configuration on a device, use the `fhrp version vrrp v3` command in global configuration mode.

When VRRPv3 is in use, VRRP version 2 (VRRPv2) is unavailable. If you invoke `no fhrp version vrrp v3`, VRRPv3 is disabled and VRRPv2 is enabled. Also, operational data is reset, and the VRRPv2 configuration is applied. The same guidelines apply when VRRPv2 is in use and the `no ip vrrp` command is issued.

Defaults	disabled
Format	fhrp version vrrp v3
Mode	Global Config

no fhrp version vrrp v3

Use this command to disable the VRRPv3 and enable VRRPv2 on the device.

Format	no fhrp version vrrp v3
Mode	Global Config

snmp-server enable traps vrrp

Use this command to enable the two SNMP traps defined in the VRRPv2 and VRRPv3 MIB standards.

Defaults	enabled
Format	snmp-server enable traps vrrp
Mode	Global Config

no snmp-server enable traps vrrp

Use this command to disable the two SNMP traps defined in the VRRPv2 and VRRPv3 MIB standards.

Defaults	enabled
Format	no snmp-server enable traps vrrp
Mode	Global Config

vrrp

Use the `vrrp` command to create a VRRPv3 group and enter VRRPv3 group configuration mode.

Format	vrrp *group-id* address-family {ipv4 | ipv6}
Mode	Interface Config

Parameter	Description
group-id	Virtual router group number. The range is from 1 to 255.
address-family	Specifies the address-family for this VRRP group.
ipv4	(Optional) Specifies IPv4 address.
ipv6	(Optional) Specifies IPv6 address.

no vrrp

Use the `no vrrp` command to remove the specified VRRPv3 group. Before you can use this command, you must disable Virtual Router using the `shutdown` command in the appropriate VRRP Config mode.

Format	no vrrp *group-id* address-family {ipv4 | ipv6}
Mode	Interface Config

preempt

Use this command to configure the device to take over as master virtual router for a VRRP group if it has higher priority than the current master virtual route.

Default	Enabled with default delay value of 0.

Format	preempt [delay minimum *centiseconds*]
Mode	VRRPv3 Config

Parameter	Description
delay minimum	Number of seconds that the device will delay before issuing an advertisement claiming master ownership. The default delay is 0 centiseconds. The valid range is 0 to 3600 centiseconds.

no preempt

Use this command to prevent device from taking over as master virtual router for a VRRP group if it has higher priority than the current master virtual route.

Format	no preempt [delay minimum *centiseconds*]
Mode	VRRPv3 Config

accept-mode

Use this command to control whether a virtual router in master state will accept packets addressed to the address owner's virtual IP address as its own if it is not the virtual IP address owner.

Default	disabled
Format	accept-mode
Mode	VRRPv3 Config

no accept-mode

Use this command to reset the accept mode to the default value.

Format	no accept-mode
Mode	VRRPv3 Config

priority

Use this command to set the priority level of the device within a VRRPv3 group. The priority level controls which device becomes the master virtual router.

Default	100
Format	priority *level*
Mode	VRRPv3 Config

Parameter	Description
level	Priority of the device within the VRRP group. The range is from 1 to 254. The default is 100.

no priority

Use this command to reset the priority level of the device to the default value.

Format	priority
Mode	VRRPv3 Config

timers advertise

Use this command to configure the interval between successive advertisements by the master virtual router in a VRRP group. To restore the default value, use the `no` form of this command.

The advertisements being sent by the master virtual router communicate the advertisement interval, state, and priority of the current master virtual router. The VRRP `timers advertise` command configures the time between successive advertisement packets and the time before other routers declare the master router to be down. VRRP backup routers learn timer values from the master router advertisements. The timers configured on the master router always override any other timer settings that are used for calculating the master down time interval on VRRP backup routers.

Default	100
Format	timers advertise *centiseconds*
Mode	VRRPv3 Config

Parameter	Description
centiseconds	Time interval between successive advertisements by the master virtual router. The unit of the interval is in centiseconds. The valid range is 1 to 4095 centiseconds.

no timers advertise

Use this command to reset the advertisement interval of the device to the default value.

Format	no timers advertise
Mode	VRRPv3 Config

shutdown

Use the `shutdown` command to disable the VRRP group configuration.

Format	shutdown
Mode	VRRPv3 Config

no shutdown

Enter the `no shutdown` command to update the virtual router state after completing configuration.

Format	no shutdown
Mode	VRRPv3 Config

address

Use this command to set the primary or secondary IP address of the device within a VRRPv3 group. To remove the secondary address, use the `no` form of this command.

If the primary or secondary option is not specified, the specified IP address is set as the primary. The Virtual IPv6 primary address should be a link-local address only. When a global IPv6 address is given as a primary address for the VRRP IP then the config fails with the following error message – “`Error! Primary virtual IPv6 address should be a link-local address only.`” Also the removing of the primary virtual IP (IPv4 or IPv6) is not allowed. The primary virtual IP of a virtual router can only be modified. The secondary virtual IP can be removed using the `no` form of the this command. Also, VRRPv3 for IPv6 requires that a primary virtual link-local IPv6 address is configured to allow the group to operate. After the primary link-local IPv6 address is established on the group, you can add the secondary global addresses.

Format	address *ip-address* [primary | secondary]
Mode	VRRPv3 Config

Parameter	Description
ip-address	IPv4 or IPv6 address, it can be specified in one of the following format: `ipv4-address`, `ipv6-link-local-address`, `ipv6-address>/<prefix-len`.
primary	(Optional) Set primary IP address of the VRRPv3 group.
secondary	(Optional) Set additional IP address of the VRRPv3 group.

no address

Use this command to remove the configured secondary IP or IPv6 address. The primary address can only be modified, not removed.

Format	no address *ip-address* secondary
Mode	VRRPv3 Config

track interface

Use this command to configure tracking of the interface for the device within a VRRPv3 group. Use the `bfdneighbor` option to track the reachability to the uplink next hop address. Once interface tracking is configured, the VRRPv3 feature receives notifications when the interface changes state. If BFD tracking is enabled with bfdneighbor config, then a BFD session is created with the BFD destination IP as that of the given BFD neighbor IP address, VRRPv3 receives notification when the BFD session state changes. The `decrement` option can be set to decrease the priority of the device within a VRRPv3 group by the specified value when the interface goes down, or the associated BFD session goes down. Similarly, the priority is increased by the same specified value when the interface comes up or the associated BFD session comes up. If the `decrement` value is not set, then the default decrement value used is 10. The overall state of a track interface object is considered as up only when both of the events (interface up event and BFD session up event) are received. The decrement or increment of priority is done based on the overall state of the track interface object.

Default	enabled
Format	track interface {*unit/slot/port* | vlan *vlan-id*} [bfdneighbor *IP-address*][decrement *number*]
Mode	VRRPv3 Config

Parameter	Description
unit/slot/port	The interface to track.
vlan-id	The VLAN to track.
bfdneighbor	(Optional) BFD neighbor tracking.
IP-address	(Optional) IPv4 or IPv6 address of BFD neighbor to be tracked for reachability using a BFD session.
decrement number	(Optional) Specify the VRRP priority decrement for the tracked object. The number is the amount by which priority is decremented. The range is 1 to 254.

no track interface

Use this command to disable tracking of the interface for the device within a VRRPv3 group.

Default	enabled
Format	track interface {*unit/slot/port* | vlan *vlan-id*} [bfdneighbor *IP-address*] [decrement *number*]
Mode	VRRPv3 Config

track ip route

Use this command to configure tracking of the IP route for the device within a Virtual Router Redundancy Protocol (VRRPv3) group. Once IP route tracking is configured, the VRRPv3 feature receives notifications when IP route changes state. The decrement option can be set to decrease the priority of the device within a VRRPv3 group by the specified value when the route becomes unavailable.

Default	disabled
Format	track ip route *ip-address/prefix-len* [decrement *number*]
Mode	VRRPv3 Config

Parameter	Description
ip-address/prefix-len	Prefix and prefix length of the route to be tracked.

Parameter	Description
decrement number	(Optional) Specify the VRRP priority decrement for the tracked route. The number is the amount by which priority is decremented. The range is 1 to 254.

no track ip route

Use this command to disable object tracking.

Format	no track ip route *ip-address/prefix-len* [decrement *number*]
Mode	VRRPv3 Config

clear vrrp statistics

Use this command to clear VRRP statistical information for given interface of the device within a VRRPv3 group and IP address family. If this command is issued without the optional arguments then the global statistics and all virtual routers (both IPv4 and IPv6) are reset.

If the optional arguments are specified, the statistics are reset for the virtual router corresponding to the given (IP address family, interface and VR-id) combination.

Format	clear vrrp statistics [{ipv4| ipv6} {*unit/slot/port* | vlan *vlan-id*} *vrid*]
Mode	Privileged Exec

Parameter	Description
ipv4	(Optional) indicates the Virtual router group belongs to IPv4 address family.
ipv6	(Optional) indicates the Virtual router group belongs to IPv6 address family.
unit/slot/port	(Optional) indicates the interface number to which the Virtual router belongs.
vlan-id	(Optional) indicates the VLAN number to which the Virtual router belongs.
vr-id	(Optional) Virtual router group number. The range is from 1 to 255.

show vrrp

This command displays information for all active VRRPv3 groups (no optional parameters), all active VRRPv3 groups configured in an IPv4 or IPv6 address family, or the active VRRPv3 groups configured in an IPv4 or IPv6 address family for the specified interface.

Format	show vrrp [{ipv4 | ipv6}] [{*unit/slot/port* | vlan *vlan-id*} *vr-id*]
Mode	Privileged Exec

Parameter	Description
ipv4	(Optional) indicates the Virtual router group belongs to IPv4 address family.
ipv6	(Optional) indicates the Virtual router group belongs to IPv6 address family.
unit/slot/port	(Optional) indicates the interface number to which the Virtual router belongs.
vlan-id	(Optional) indicates the VLAN number to which the Virtual router belongs.
vr-id	(Optional) Virtual router group number. The range is from 1 to 255.

Example: This example shows command output when no parameters are specified.

```
(Routing)#show vrrp

Admin Mode..................................... Enable


1/0/2 - VRID 1 - Address-Family IPv4

Virtual IP address............................. 1.1.1.9
Secondary IP Address(es)....................... 1.1.1.4
............................................... 1.1.1.5
............................................... 1.1.1.6
Virtual MAC Address............................ 00:00:5e:00:01:01
Priority....................................... 0
Configured Priority............................ 111
Advertisement Interval......................... 120 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Master Router IP / Priority.................... 1.1.1.3 (local) / 100
Master Advertisement interval.................. 120 centisec
Master Down interval........................... 360 centisec

Track Interface State DecrementPriority                    BFD-Neighbor
--------------- ----- ------------------ ------------
1/0/9          Down  222                                      23.10.8.6

Track Route(pfx/len)   Reachable  DecrementPriority
--------------------  ---------  ------------------
14.14.14.0/24         True       14


1/0/3 - VRID 2 - Address-Family IPv4

Virtual IP address............................. 3.3.2.9
Secondary IP Address(es)....................... 3.3.2.4
............................................... 3.3.2.5
............................................... 3.3.2.6
Virtual MAC Address............................ 00:00:5e:00:01:06
Priority....................................... 0
Configured Priority............................ 130
Advertisement Interval......................... 120 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
```

```
Master Router IP / Priority.................... 1.1.1.3 (local) / 100
Master Advertisement interval.................. 120 centisec
Master Down interval........................... 360 centisec

Track Interface State DecrementPriority                    BFD-Neighbor
--------------- ----- ------------------                   ------------
1/0/7          Down  125                                         55.16.27.8

Track Route(pfx/len)   Reachable  DecrementPriority
--------------------  ---------  ------------------
14.14.14.0/24          True       30


1/0/12 - VRID 3 - Address-Family IPv6

Virtual IP address............................. 4001::2
Secondary IP Address(es)....................... 4001::5
............................................... 4001::6
............................................... 4001::7
Virtual MAC Address............................ 00:00:5e:00:01:06
Priority....................................... 0
Configured Priority............................ 130
Advertisement Interval......................... 120 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Master Router IP / Priority.................... 4001::3 (local) / 100
Master Advertisement interval.................. 120 centisec
Master Down interval........................... 360 centisec

Track Interface State DecrementPriority                    BFD-Neighbor
--------------- ----- ------------------                   ------------
1/0/2          Down  250                                         5001::3

Track Route(pfx/len)   Reachable  DecrementPriority
--------------------  ---------  ------------------
4004::3/32            True       20
```

Example: This example shows command output when the IPv4 parameter is specified.

```
(Routing)#show vrrp ipv4

Admin Mode..................................... Enable

1/0/2 - VRID 1 - Address-Family IPv4

Virtual IP address............................. 1.1.1.9
Secondary IP Address(es)....................... 1.1.1.4
............................................... 1.1.1.5
............................................... 1.1.1.6
Virtual MAC Address............................ 00:00:5e:00:01:01
Priority....................................... 0
Configured Priority............................ 111
Advertisement Interval......................... 120 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Master Router IP / Priority.................... 1.1.1.3 (local) / 100
Master Advertisement interval.................. 120 centisec
Master Down interval........................... 360 centisec
```

```
Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/9           Down  222

Track Route(pfx/len)   Reachable  DecrementPriority
--------------------  ---------  ------------------
14.14.14.0/24         True       14


1/0/3 - VRID 2 - Address-Family IPv4

Virtual IP address............................. 3.3.2.9
Secondary IP Address(es)....................... 3.3.2.4
............................................... 3.3.2.5
............................................... 3.3.2.6
Virtual MAC Address............................ 00:00:5e:00:01:06
Priority....................................... 0
Configured Priority............................ 130
Advertisement Interval......................... 120 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Master Router IP / Priority.................... 1.1.1.3 (local) / 100
Master Advertisement interval.................. 120 centisecsec
Master Down interval........................... 360

Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/7           Down  125

Track Route(pfx/len)   Reachable  DecrementPriority
--------------------  ---------  ------------------
14.14.14.0/24         True       30
```

Example: This example shows command output when the IPv6 parameter is specified.

```
(Routing)#show vrrp ipv6

Admin Mode..................................... Enable


1/0/2 - VRID 1 - Address-Family IPv6

Virtual IP address............................. 1001::8
Secondary IP Address(es)....................... 1001::5
............................................... 1001::6
............................................... 1001::7
Virtual MAC Address............................ 00:00:5e:00:01:01
Priority....................................... 0
Configured Priority............................ 100
Advertisement Interval......................... 100 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Master Router IP / Priority.................... 1001::1 (local) / 100
Master Advertisement interval.................. 100 centisec
Master Down interval........................... 300 centisec

Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/9           Down  222
```

```
Track Route(pfx/len)   Reachable  DecrementPriority
--------------------  ---------  ------------------
2001::2/32            True       14


1/0/12 - VRID 3 - Address-Family IPv6

Virtual IP address............................ 4001::2
Secondary IP Address(es)...................... 4001::5
.............................................. 4001::6
.............................................. 4001::7
Virtual MAC Address........................... 00:00:5e:00:01:06
Priority...................................... 130
Configured Priority........................... 130
Advertisement Interval........................ 120 centisec
Pre-empt Mode................................. Enable
Accept Mode................................... Enable
Administrative Mode........................... Enable
State......................................... Master
Master Router IP / Priority................... 4001::3 (local) / 130
Master Advertisement interval................. 120 centisec
Master Down interval.......................... 360 centisec

Track Interface State DecrementPriority
--------------- ----- ------------------
1/0/24          Down  320

Track Route(pfx/len)   Reachable  DecrementPriority
--------------------  ---------  ------------------
7003::4/32            True       50
```

Example:

```
(Routing)#show vrrp ipv4 1/0/3 1

Virtual IP address............................ 1.1.1.9
Secondary IP Address(es)...................... 1.1.1.4
.............................................. 1.1.1.5
.............................................. 1.1.1.6
Virtual MAC Address........................... 00:00:5e:00:01:01
Priority...................................... 0
Configured Priority........................... 111
Advertisement Interval........................ 222 centisec
Pre-empt Mode................................. Enable
Accept Mode................................... Enable
Administrative Mode........................... Enable
State......................................... Initialized
Master Router IP / Priority................... 1.1.1.3 (local) / 100
Master Advertisement interval................. 1000 centisec
Master Down interval.......................... 3000 centisec


Track Interface State Decrement-Priority
--------------- ----- ------------------
0/9             Down  222

Track Route(pfx/len)   Reachable  Decrement-Priority
--------------------  ---------  ------------------
14.14.14.0/24         True       14
```

show vrrp brief

This command displays brief information for all active VRRPv3 groups.

Format	show vrrp brief
Mode	Privileged Exec

Field	Description
Interface	Interface on which VRRP is configured.
VR	ID of the virtual router.
A-F	IP address family type (IPv4 or Ipv6) this Virtual Router belongs to.
Pri	Priority range of the virtual router.
AdvIntvl	Advertisement interval configured for this virtual router.
Pre	Preemption state of the virtual router.
Acc	Accept Mode of the virtual router.
State	VRRP group state. The state can be one of the following: Init, Backup, Master
VR IP address	Virtual IP address for a VRRP group.

Example:

```
(Routing)#show vrrp brief

Interface   VRID A-F  Pri AdvIntvl Pre Acc State  VR IP Address
----------- ---- ---- --- -------- --- --- ------ -------------
0/1        1    IPv4 100 200s     Y   Y  Init   192.0.1.10
0/3        2    IPv4 200 200s     Y   Y  Init   124.0.3.17
0/1        7    IPv6 100 200s     Y   Y  Backup 5002::1
0/5        2    IPV6 20  200s     Y   Y  Master 2001::2
```

show vrrp statistics

This command displays statistical information for a given VRRPv3 group or displays the global statistics. If this command is issued without the optional arguments then the global statistics are displayed.

If the optional arguments are specified, the statistics are displayed for the virtual router corresponding to the given (IP address family, interface and VR-id) combination.

Format	show vrrp statistics [{ipv4| ipv6} {*unit/slot/port* | vlan *vlan-id*} *vrid*]
Mode	Privileged Exec

Parameter	Description
ipv4	(Optional) indicates the Virtual router group belongs to IPv4 address family.
ipv6	(Optional) indicates the Virtual router group belongs to IPv6 address family.

Parameter	Description
unit/slot/port	(Optional) indicates the interface number to which the Virtual router belongs.
vlan-id	(Optional) indicates the VLAN number to which the Virtual router belongs.
vr-id	(Optional) Virtual router group number. The range is from 1 to 255.

Example:

```
(Routing)#show vrrp statistics ipv6 1/0/1 2

Master Transitions............................ 2
New Master Reason............................. Priority
Advertisements Received........................ 64
Advertisements Sent........................... 12
Advertisement Interval Errors................. 0
IP TTL Errors................................. 1
Last Protocol Error Reason.................... Version Error
Zero Priority Packets Received................ 0
Zero Priority Packets Sent.................... 1
Invalid Type Packets Received................. 0
Address List Errors........................... 2
Packet Length Errors.......................... 4
Row Discontinuity Time........................ 0 days 0 hrs 0 mins 0 secs
Refresh Rate (in milliseconds)................ 0


(Routing)#show vrrp statistics

Router Checksum Errors........................ 2
Router Version Errors......................... 3
Router VRID Errors............................ 4
Global Statistics Discontinuity Time.......... 0 days 0 hrs 0 mins 0 secs
```

DHCP and BOOTP Relay Commands

This section describes the commands you use to configure BootP/DHCP Relay on the switch. A DHCP relay agent operates at Layer 3 and forwards DHCP requests and replies between clients and servers when they are not on the same physical subnet.

bootpdhcprelay cidoptmode

This command enables the circuit ID option mode for BootP/DHCP Relay on the system.

Default	disabled
Format	bootpdhcprelay cidoptmode
Mode	• Global Config • Virtual Router Config

no bootpdhcprelay cidoptmode

This command disables the circuit ID option mode for BootP/DHCP Relay on the system.

Format	no bootpdhcprelay cidoptmode
Mode	• Global Config • Virtual Router Config

bootpdhcprelay maxhopcount

This command configures the maximum allowable relay agent hops for BootP/DHCP Relay on the system. The *hops* parameter has a range of 1 to 16.

Default	4
Format	bootpdhcprelay maxhopcount *1-16*
Mode	• Global Config • Virtual Router Config

no bootpdhcprelay maxhopcount

This command configures the default maximum allowable relay agent hops for BootP/DHCP Relay on the system.

Format	no bootpdhcprelay maxhopcount
Mode	• Global Config • Virtual Router Config

bootpdhcprelay minwaittime

This command configures the minimum wait time in seconds for BootP/DHCP Relay on the system. When the BOOTP relay agent receives a BOOTREQUEST message, it MAY use the seconds-since-client-began-booting field of the request as a factor in deciding whether to relay the request or not. The parameter has a range of 0 to 100 seconds.

Default	0
Format	bootpdhcprelay minwaittime *0-100*
Mode	• Global Config • Virtual Router Config

no bootpdhcprelay minwaittime

This command configures the default minimum wait time in seconds for BootP/DHCP Relay on the system.

Format	no bootpdhcprelay minwaittime
Mode	• Global Config • Virtual Router Config

bootpdhcprelay serverip

This command configures the server IP address of the BootP/DHCP Relay on the system. The *ipaddr* parameter is the IP address of the server.

Default	0.0.0.0
Format	bootpdhcprelay serverip *ipaddr*
Mode	Global Config

no bootpdhcprelay serverip

This command returns the server IP address of the BootP/DHCP Relay on the system to the default value of 0.0.0.0.

Format	no bootpdhcprelay serverip
Mode	Global Config

bootpdhcprelay enable

Use this command to enable the relay of DHCP packets.

Default	disabled
Format	bootpdhcprelay enable
Mode	Global Config

no bootpdhcprelay enable

Use this command to disable the relay of DHCP packets.

Default	disabled
Format	no bootpdhcprelay enable
Mode	Global Config

show bootpdhcprelay

This command displays the BootP/DHCP Relay information.

Format	show bootpdhcprelay
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Maximum Hop Count	The maximum allowable relay agent hops.
Minimum Wait Time (Seconds)	The minimum wait time.
Admin Mode	Indicates whether relaying of requests is enabled or disabled.
Circuit Id Option Mode	The DHCP circuit Id option which may be enabled or disabled.

show ip bootpdhcprelay

This command displays BootP/DHCP Relay information.

Format	show ip bootpdhcprelay
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Maximum Hop Count	The maximum allowable relay agent hops.
Minimum Wait Time (Seconds)	The minimum wait time.
Admin Mode	Indicates whether relaying of requests is enabled or disabled.
Circuit Id Option Mode	The DHCP circuit Id option which may be enabled or disabled.

Example: The following shows an example of the command.

```
(Routing) >show ip bootpdhcprelay
Maximum Hop Count.............................. 4
Minimum Wait Time(Seconds)..................... 0
Admin Mode..................................... Disable
Circuit Id Option Mode......................... Enable
```

IP Helper Commands

This section describes the commands to configure and monitor the IP Helper agent. IP Helper relays DHCP and other broadcast UDP packets from a local client to one or more servers which are not on the same network at the client.

The IP Helper feature provides a mechanism that allows a router to forward certain configured UDP broadcast packets to a particular IP address. This allows various applications to reach servers on nonlocal subnets, even if the application was designed to assume a server is always on a local subnet and uses broadcast packets (with either the limited broadcast address 255.255.255.255, or a network directed broadcast address) to reach the server.

The network administrator can configure relay entries both globally and on routing interfaces. Each relay entry maps an ingress interface and destination UDP port number to a single IPv4 address (the helper address). The network administrator may configure multiple relay entries for the same interface and UDP port, in which case the relay agent relays matching packets to each server address. Interface configuration takes priority over global configuration. That is, if a packet's destination UDP port matches any entry on the ingress interface, the packet is handled according to the interface configuration. If the packet does not match any entry on the ingress interface, the packet is handled according to the global IP helper configuration.

The network administrator can configure discard relay entries, which direct the system to discard matching packets. Discard entries are used to discard packets received on a specific interface when those packets would otherwise be relayed according to a global relay entry. Discard relay entries may be configured on interfaces, but are not configured globally.

In addition to configuring the server addresses, the network administrator also configures which UDP ports are forwarded. Certain UDP port numbers can be specified by name in the UI as a convenience, but the network administrator can configure a relay entry with any UDP port number. The network administrator may configure relay entries that do not specify a destination UDP port. The relay agent relays assume these entries match packets with the UDP destination ports listed in Table 11. This is the list of default ports.

Table 11. *Default Ports - UDP Port Numbers Implied by Wildcard*

Protocol	UDP Port Number
IEN-116 Name Service	42
DNS	53
NetBIOS Name Server	137
NetBIOS Datagram Server	138
TACACS Server	49
Time Service	37
DHCP	67
Trivial File Transfer Protocol (TFTP)	69

The system limits the number of relay entries to four times the maximum number of routing interfaces. The network administrator can allocate the relay entries as he likes. There is no limit to the number of relay entries on an individual interface, and no limit to the number of servers for a given {interface, UDP port} pair.

The relay agent relays DHCP packets in both directions. It relays broadcast packets from the client to one or more DHCP servers, and relays to the client packets that the DHCP server unicasts back to the relay agent. For other protocols, the relay agent only relays broadcast packets from the client to the server. Packets from the server back to the client are assumed to be unicast directly to the client. Because there is no relay in the return direction for protocols other than DHCP, the relay agent retains the source IP address from the original client packet. The relay agent uses a local IP address as the source IP address of relayed DHCP client packets.

When a switch receives a broadcast UDP packet on a routing interface, the relay agent checks if the interface is configured to relay the destination UDP port. If so, the relay agent unicasts the packet to the configured server IP addresses. Otherwise, the relay agent checks if there is a global configuration for the destination UDP port. If so, the relay agent unicasts the packet to the configured server IP addresses. Otherwise the packet is not relayed. Note that if the packet matches a discard relay entry on the ingress interface, then the packet is not forwarded, regardless of the global configuration.

The relay agent only relays packets that meet the following conditions:

- The destination MAC address must be the all-ones broadcast address (FF:FF:FF:FF:FF:FF)
- The destination IP address must be the limited broadcast address (255.255.255.255) or a directed broadcast address for the receive interface.
- The IP time-to-live (TTL) must be greater than 1.
- The protocol field in the IP header must be UDP (17).
- The destination UDP port must match a configured relay entry.

clear ip helper statistics

Use this command to reset to zero the statistics displayed in the `show ip helper statistics` command.

Format	clear ip helper statistics
Mode	Privileged EXEC

Example: The following shows an example of the command.

```
(switch) #clear ip helper statistics
```

ip helper-address (Global Config)

Use this command to configure the relay of certain UDP broadcast packets received on any interface. This command can be invoked multiple times, either to specify multiple server addresses for a given UDP port number or to specify multiple UDP port numbers handled by a specific server.

Default	No helper addresses are configured.

Format ip helper-address server-address [dest-udp-port | dhcp | domain | isakmp | mobile-ip | nameserver | netbios-dgm | netbios-ns | ntp | pim-auto-rp | rip | tacacs | tftp | time]

Mode
- Global Config
- Virtual Router Config

Parameter	Description
server-address	The IPv4 unicast or directed broadcast address to which relayed UDP broadcast packets are sent. The server address cannot be an IP address configured on any interface of the local router.
dest-udp-port	A destination UDP port number from 0 to 65535.
port-name	The destination UDP port may be optionally specified by its name. Whether a port is specified by its number or its name has no effect on behavior. The names recognized are as follows: • dhcp (port 67) • domain (port 53) • isakmp (port 500) • mobile-ip (port 434) • nameserver (port 42) • netbios-dgm (port 138) • netbios-ns (port 137) • ntp (port 123) • pim-auto-rp (port 496) • rip (port 520) • tacacs (port 49) • tftp (port 69) • time (port 37) Other ports must be specified by number.

Example: To relay DHCP packets received on any interface to two DHCP servers, 10.1.1.1 and 10.1.2.1, use the following commands:

```
(switch)#config
(switch)(config)#ip helper-address 10.1.1.1 dhcp
(switch)(config)#ip helper-address 10.1.2.1 dhcp
```

Example: To relay UDP packets received on any interface for all default ports to the server at 20.1.1.1, use the following commands:

```
(switch)#config
(switch)(config)#ip helper-address 20.1.1.1
```

no ip helper-address (Global Config)

Use the `no` form of the command to delete an IP helper entry. The command `no ip helper-address` with no arguments clears all global IP helper addresses.

Format no ip helper-address [server-address [dest-udp-port | dhcp | domain | isakmp | mobile-ip | nameserver | netbios-dgm | netbios-ns | ntp | pim-auto-rp | rip | tacacs | tftp | time]

Mode Global Config

ip helper-address (Interface Config)

Use this command to configure the relay of certain UDP broadcast packets received on a specific interface or range of interfaces. This command can be invoked multiple times on a routing interface, either to specify multiple server addresses for a given port number or to specify multiple port numbers handled by a specific server.

Default No helper addresses are configured.

Format iphelper-address{server-address|discard}[dest-udp-port|dhcp|domain|isakmp|mobileip| nameserver | netbios-dgm | netbios-ns | ntp | pim-auto-rp | rip | tacacs | tftp | time]

Mode Interface Config

Parameter	Description
server-address	The IPv4 unicast or directed broadcast address to which relayed UDP broadcast packets are sent. The server address cannot be in a subnet on the interface where the relay entry is configured, and cannot be an IP address configured on any interface of the local router.
discard	Matching packets should be discarded rather than relayed, even if a global ip helper-address configuration matches the packet.
dest-udp-port	A destination UDP port number from 0 to 65535.
port-name	The destination UDP port may be optionally specified by its name. Whether a port is specified by its number or its name has no effect on behavior. The names recognized are as follows: • dhcp (port 67) • domain (port 53) • isakmp (port 500) • mobile-ip (port 434) • nameserver (port 42) • netbios-dgm (port 138) • netbios-ns (port 137) • ntp (port 123) • pim-auto-rp (port 496) • rip (port 520) • tacacs (port 49) • tftp (port 69) • time (port 37) Other ports must be specified by number.

Example: To relay DHCP packets received on interface 1/0/2 to two DHCP servers, 192.168.10.1 and 192.168.20.1, use the following commands:

```
(switch)#config
(switch)(config)#interface 1/0/2
(switch)(interface 1/0/2)#ip helper-address 192.168.10.1 dhcp
(switch)(interface 1/0/2)#ip helper-address 192.168.20.1 dhcp
```

Example: To relay both DHCP and DNS packets to 192.168.30.1, use the following commands:

```
(switch)#config
(switch)(config)#interface 1/0/2
(switch)(interface 1/0/2)#ip helper-address 192.168.30.1 dhcp
(switch)(interface 1/0/2)#ip helper-address 192.168.30.1 dns
```

Example: This command takes precedence over an `ip helper-address` command given in global configuration mode. With the following configuration, the relay agent relays DHCP packets received on any interface other than 1/0/2 and 1/0/17 to 192.168.40.1, relays DHCP and DNS packets received on 1/0/2 to 192.168.40.2, relays SNMP traps (port 162) received on interface 1/0/17 to 192.168.23.1, and drops DHCP packets received on 1/0/17:

```
(switch)#config
(switch)(config)#ip helper-address 192.168.40.1 dhcp
(switch)(config)#interface 1/0/2
(switch)(interface 1/0/2)#ip helper-address 192.168.40.2 dhcp
(switch)(interface 1/0/2)#ip helper-address 192.168.40.2 domain
(switch)(interface 1/0/2)#exit
(switch)(config)#interface 1/0/17
(switch)(interface 1/0/17)#ip helper-address 192.168.23.1 162
(switch)(interface 1/0/17)#ip helper-address discard dhcp
```

no ip helper-address (Interface Config)

Use this command to delete a relay entry on an interface. The `no` command with no arguments clears all helper addresses on the interface.

Format	noiphelper-address[server-address|discard][dest-udp-port|dhcp|domain|isakmp|mobile ip | nameserver | netbios-dgm | netbios-ns | ntp | pim-auto-rp | rip | tacacs | tftp | time]
Mode	Interface Config

ip helper enable

Use this command to enable relay of UDP packets. This command can be used to temporarily disable IP helper without deleting all IP helper addresses. This command replaces the `bootpdhcprelay enable` command, but affects not only relay of DHCP packets, but also relay of any other protocols for which an IP helper address has been configured.

Default	disabled
Format	ip helper enable
Mode	• Global Config • Virtual Router Config

Example: The following shows an example of the command.

```
(switch)(config)#ip helper enable
```

no ip helper enable

Use the `no` form of this command to disable relay of all UDP packets.

Format	no ip helper enable
Mode	Global Config

show ip helper-address

Use this command to display the IP helper address configuration.The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format.

Format	show ip helper-address [{*unit/slot/port*|*vlan 1-4093*}]
Mode	Privileged EXEC

Parameter	Description
interface	The relay configuration is applied to packets that arrive on this interface. This field is set to `any` for global IP helper entries.
UDP Port	The relay configuration is applied to packets whose destination UDP port is this port. Entries whose UDP port is identified as any are applied to packets with the destination UDP ports listed in Table 4.
Discard	If Yes, packets arriving on the given interface with the given destination UDP port are discarded rather than relayed. Discard entries are used to override global IP helper address entries which otherwise might apply to a packet.
Hit Count	The number of times the IP helper entry has been used to relay or discard a packet.
Server Address	The IPv4 address of the server to which packets are relayed.

Example: The following shows example CLI display output for the command.

```
(switch) #show ip helper-address

IP helper is enabled

                                          Interface   UDP Port    Discard   Hit Count   Server
Address
---------------  -----------  --------  ----------  ---------------
                                          1/0/1dhcp       No         10 10.100.1.254
                                          10.100.2.254
                                          1/0/17 any      Yes         2
                                          anydhcp       No         0 10.200.1.254
```

show ip helper statistics

Use this command to display the number of DHCP and other UDP packets processed and relayed by the UDP relay agent.

Format	show ip helper statistics
Mode	Privileged EXEC

Parameter	Description
DHCP client messages received	The number of valid messages received from a DHCP client. The count is only incremented if IP helper is enabled globally, the ingress routing interface is up, and the packet passes a number of validity checks, such as having a TTL>1 and having valid source and destination IP addresses.

Parameter	Description
DHCP client messages relayed	The number of DHCP client messages relayed to a server. If a message is relayed to multiple servers, the count is incremented once for each server.
DHCP server messages received	The number of DHCP responses received from the DHCP server. This count only includes messages that the DHCP server unicasts to the relay agent for relay to the client.
DHCP server messages relayed	The number of DHCP server messages relayed to a client.
UDP clients messages received	The number of valid UDP packets received. This count includes DHCP messages and all other protocols relayed. Conditions are similar to those for the first statistic in this table.
UDP clients messages relayed	The number of UDP packets relayed. This count includes DHCP messages relayed as well as all other protocols. The count is incremented for each server to which a packet is sent.
DHCP message hop count exceeded max	The number of DHCP client messages received whose hop count is larger than the maximum allowed. The maximum hop count is a configurable value listed in show bootpdhcprelay. A log message is written for each such failure. The DHCP relay agent does not relay these packets.
DHCP message with secs field below min	The number of DHCP client messages received whose secs field is less than the minimum value. The minimum secs value is a configurable value and is displayed in show bootpdhcprelay. A log message is written for each such failure. The DHCP relay agent does not relay these packets.
DHCP message with giaddr set to local address	The number of DHCP client messages received whose gateway address, giaddr, is already set to an IP address configured on one of the relay agent's own IP addresses. In this case, another device is attempting to spoof the relay agent's address. The relay agent does not relay such packets. A log message gives details for each occurrence.
Packets with expired TTL	The number of packets received with TTL of 0 or 1 that might otherwise have been relayed.
Packets that matched a discard entry	The number of packets ignored by the relay agent because they match a discard relay entry.

Example: The following shows example CLI display output for the command.

```
(switch)#show ip helper statistics

DHCP client messages received.................. 8
DHCP client messages relayed.................. 2
DHCP server messages received.................. 2
DHCP server messages relayed.................. 2
UDP client messages received.................. 8
UDP client messages relayed.................... 2
DHCP message hop count exceeded max............ 0
DHCP message with secs field below min......... 0
DHCP message with giaddr set to local address.. 0
Packets with expired TTL....................... 0
Packets that matched a discard entry........... 0
```

Open Shortest Path First Commands

This section describes the commands you use to view and configure Open Shortest Path First (OSPF), which is a link-state routing protocol that you use to route traffic within a network.

General OSPF Commands

router ospf

Use this command to enable OSPF routing.

Format	router ospf
Mode	Global Config

enable (OSPF)

This command resets the default administrative mode of OSPF in the router (active).

Default	enabled
Format	enable
Mode	Router OSPF Config

no enable (OSPF)

This command sets the administrative mode of OSPF in the router to inactive.

Format	no enable
Mode	Router OSPF Config

network area (OSPF)

Use this command to enable OSPFv2 on an interface and set its area ID if the IP address of an interface is covered by this network command.

Default	disabled
Format	network *ip-address wildcard-mask* area *area-id*
Mode	Router OSPF Config

no network area (OSPF)

Use this command to disable the OSPFv2 on a interface if the IP address of an interface was earlier covered by this network command.

Format	no network *ip-address wildcard-mask* area *area-id*
Mode	Router OSPF Config

1583compatibility

This command enables OSPF 1583 compatibility.

Note: 1583 compatibility mode is enabled by default. If all OSPF routers in the routing domain are capable of operating according to RFC 2328, OSPF 1583 compatibility mode should be disabled.

Default	enabled
Format	1583compatibility
Mode	Router OSPF Config

no 1583compatibility

This command disables OSPF 1583 compatibility.

Format	no 1583compatibility
Mode	Router OSPF Config

area default-cost (OSPF)

This command configures the default cost for the stub area. You must specify the area ID and an integer value between 1-16777215.

Format	area *areaid* default-cost *1-16777215*
Mode	Router OSPF Config

area nssa (OSPF)

This command configures the specified areaID to function as an NSSA.

Format	area *areaid* nssa
Mode	Router OSPF Config

no area nssa

This command disables nssa from the specified area id.

Format	no area *areaid* nssa
Mode	Router OSPF Config

area nssa default-info-originate (OSPF)

This command configures the metric value and type for the default route advertised into the NSSA. The optional metric parameter specifies the metric of the default route and is to be in a range of 1-16777214. If no metric is specified, the default value is ****. The metric type can be comparable (nssa-external 1) or non-comparable (nssa-external 2).

Format	area *areaid* nssa default-info-originate [*metric*] [{comparable | non-comparable}]
Mode	Router OSPF Config

no area nssa default-info-originate (OSPF)

This command disables the default route advertised into the NSSA.

Format	no area *areaid* nssa default-info-originate [*metric*] [{comparable | non-comparable}]
Mode	Router OSPF Config

area nssa no-redistribute (OSPF)

This command configures the NSSA Area Border router (ABR) so that learned external routes will not be redistributed to the NSSA.

Format	area *areaid* nssa no-redistribute
Mode	Router OSPF Config

no area nssa no-redistribute (OSPF)

This command disables the NSSA ABR so that learned external routes are redistributed to the NSSA.

Format	no area *areaid* nssa no-redistribute
Mode	Router OSPF Config

area nssa no-summary (OSPF)

This command configures the NSSA so that summary LSAs are not advertised into the NSSA.

Format	area *areaid* nssa no-summary
Mode	Router OSPF Config

no area nssa no-summary (OSPF)

This command disables nssa from the summary LSAs.

Format	no area *areaid* nssa no-summary
Mode	Router OSPF Config

area nssa translator-role (OSPF)

This command configures the translator role of the NSSA. A value of `always` causes the router to assume the role of the translator the instant it becomes a border router and a value of *`candidate`* causes the router to participate in the translator election process when it attains border router status.

Format	area *areaid* nssa translator-role {always | candidate}
Mode	Router OSPF Config

no area nssa translator-role (OSPF)

This command disables the nssa translator role from the specified area id.

Format	no area *areaid* nssa translator-role {always | candidate}

Mode	Router OSPF Config

area nssa translator-stab-intv (OSPF)

This command configures the translator `stabilityinterval` of the NSSA. The `stabilityinterval` is the period of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router.

Format	area *areaid* nssa translator-stab-intv *stabilityinterval*
Mode	Router OSPF Config

no area nssa translator-stab-intv (OSPF)

This command disables the nssa translator's `stabilityinterval` from the specified area id.

Format	no area *areaid* nssa translator-stab-intv *stabilityinterval*
Mode	Router OSPF Config

area range (OSPF)

Use the area range command in Router Configuration mode to configure a summary prefix that an area border router advertises for a specific area.

Default	No area ranges are configured by default. No cost is configured by default.
Format	area *areaid* range *ip-address netmask* {summarylink | nssaexternallink} [advertise | not-advertise] [cost *cost*]
Mode	OSPFv2 Router Configuration

Parameter	Description
area-id	The area identifier for the area whose networks are to be summarized.
prefix netmask	The summary prefix to be advertised when the ABR computes a route to one or more networks within this prefix in this area.
summarylink	When this keyword is given, the area range is used when summarizing prefixes advertised in type 3 summary LSAs.
nssaexternallink	When this keyword is given, the area range is used when translating type 7 LSAs to type 5 LSAs.
advertise	[Optional] When this keyword is given, the summary prefix is advertised when the area range is active. This is the default.
not-advertise	[Optional] When this keyword is given, neither the summary prefix nor the contained prefixes are advertised when the area range is active. When the not-advertise option is given, any static cost previously configured is removed from the system configuration.

Parameter	Description
cost	[Optional] If an optional cost is given, OSPF sets the metric field in the summary LSA to the configured value rather than setting the metric to the largest cost among the networks covered by the area range. A static cost may only be configured if the area range is configured to advertise the summary. The range is 0 to 16,777,215. If the cost is set to 16,777,215 for type 3 summarization, a type 3 summary LSA is not advertised, but contained networks are suppressed. This behavior is equivalent to specifying the **not-advertise** option. If the range is configured for type 7 to type 5 translation, a type 5 LSA is sent if the metric is set to 16,777,215; however, other routers will not compute a route from a type 5 LSA with this metric.

no area range

The `no` form of this command deletes a specified area range or reverts an option to its default.

Format	noarea*areaid*range*prefixnetmask*{summarylink|nssaexternallink}[advertise|not-advertise] [cost]
Mode	OSPFv2 Router Configuration

Example: The following shows an example of the command.

```
!! Create area range
(Router) (Config-router)#area 1 range 10.0.0.0 255.0.0.0 summarylink
!! Delete area range
(Router) (Config-router)#no area 1 range 10.0.0.0 255.0.0.0 summarylink
```

The `no` form may be used to revert the `[advertise | not-advertise]` option to its default without deleting the area range. Deleting and recreating the area range would cause OSPF to temporarily advertise the prefixes contained within the range. Note that using either the `advertise` or `not-advertise` keyword reverts the configuration to the default. For example:

```
!! Create area range. Suppress summary.
(Router) (Config-router)#area 1 range 10.0.0.0 255.0.0.0 summarylink not-advertise
!! Advertise summary.
(Router) (Config-router)#no area 1 range 10.0.0.0 255.0.0.0 summarylink not-advertise
```

The `no` form may be use to remove a static area range cost, so that OSPF sets the cost to the largest cost among the contained routes.

```
!! Create area range with static cost.
(Router) (Config-router)#area 1 range 10.0.0.0 255.0.0.0 summarylink cost 1000
!! Remove static cost.
(Router) (Config-router)#no area 1 range 10.0.0.0 255.0.0.0 summarylink cost
```

area stub (OSPF)

This command creates a stub area for the specified area ID. A stub area is characterized by the fact that AS External LSAs are not propagated into the area. Removing AS External LSAs and Summary LSAs can significantly reduce the link state database of routers within the stub area.

Format	area *areaid* stub
Mode	Router OSPF Config

no area stub

This command deletes a stub area for the specified area ID.

Format	no area *areaid* stub
Mode	Router OSPF Config

area stub no-summary (OSPF)

This command configures the Summary LSA mode for the stub area identified by ***areaid***. Use this command to prevent LSA Summaries from being sent.

Default	disabled
Format	area *areaid* stub no-summary
Mode	Router OSPF Config

no area stub no-summary

This command configures the default Summary LSA mode for the stub area identified by ***areaid***.

Format	no area *areaid* stub no-summary
Mode	Router OSPF Config

area virtual-link (OSPF)

This command creates the OSPF virtual interface for the specified ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	area *areaid* virtual-link *neighbor*
Mode	Router OSPF Config

no area virtual-link

This command deletes the OSPF virtual interface from the given interface, identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	no area *areaid* virtual-link *neighbor*
Mode	Router OSPF Config

area virtual-link authentication

This command configures the authentication type and key for the OSPF virtual interface identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor. The value for `type` is either none, simple, or encrypt. The `key` is composed of standard displayable, non-control keystrokes from a Standard 101/102-key keyboard. The authentication key must be 8 bytes or less if the authentication type is simple. If the type is encrypt, the key may be up to 16 bytes. Unauthenticated interfaces do not need an authentication key. If the type is encrypt, a key id in the range of 0 and 255 must be specified.The default value for authentication type is none. Neither the default password key nor the default key id are configured.

Default	none
Format	area *areaid* virtual-link *neighbor* authentication {none | {simple *key*} | {encrypt *key keyid*}}
Mode	Router OSPF Config

no area virtual-link authentication

This command configures the default authentication type for the OSPF virtual interface identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor.

Format	no area *areaid* virtual-link *neighbor* authentication
Mode	Router OSPF Config

area virtual-link dead-interval (OSPF)

This command configures the dead interval for the OSPF virtual interface on the virtual interface identified by `areaid` and `neighbor.` The `neighbor` parameter is the Router ID of the neighbor. The range for seconds is 1 to 65535.

Default	40
Format	area *areaid* virtual-link *neighbor* dead-interval *seconds*
Mode	Router OSPF Config

no area virtual-link dead-interval

This command configures the default dead interval for the OSPF virtual interface on the virtual interface identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor.

Format	no area *areaid* virtual-link *neighbor* dead-interval
Mode	Router OSPF Config

area virtual-link hello-interval (OSPF)

This command configures the hello interval for the OSPF virtual interface on the virtual interface identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor. The range for `seconds` is 1 to 65535.

Default	10
Format	area *areaid* virtual-link *neighbor* hello-interval *1-65535*
Mode	Router OSPF Config

no area virtual-link hello-interval

This command configures the default hello interval for the OSPF virtual interface on the virtual interface identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor.

Format	no area *areaid* virtual-link *neighbor* hello-interval
Mode	Router OSPF Config

area virtual-link retransmit-interval (OSPF)

This command configures the retransmit interval for the OSPF virtual interface on the virtual interface identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor. The range for seconds is 0 to 3600.

Default	5
Format	area *areaid* virtual-link *neighbor* retransmit-interval *seconds*
Mode	Router OSPF Config

no area virtual-link retransmit-interval

This command configures the default retransmit interval for the OSPF virtual interface on the virtual interface identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor.

Format	no area *areaid* virtual-link *neighbor* retransmit-interval
Mode	Router OSPF Config

area virtual-link transmit-delay (OSPF)

This command configures the transmit delay for the OSPF virtual interface on the virtual interface identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor. The range for seconds is 0 to 3600 (1 hour).

Default	1
Format	area *areaid* virtual-link *neighbor* transmit-delay *seconds*
Mode	Router OSPF Config

no area virtual-link transmit-delay

This command resets the default transmit delay for the OSPF virtual interface to the default value.

Format	no area *areaid* virtual-link *neighbor* transmit-delay
Mode	Router OSPF Config

auto-cost (OSPF)

By default, OSPF computes the link cost of each interface from the interface bandwidth. Faster links have lower metrics, making them more attractive in route selection. The configuration parameters in the `auto-cost reference bandwidth` and `bandwidth` commands give you control over the default link cost. You can configure for OSPF an interface bandwidth that is independent of the actual link speed. A second configuration parameter allows you to control the ratio of interface bandwidth to link cost. The link cost is computed as the ratio of a reference bandwidth to the interface bandwidth (ref_bw / interface bandwidth), where interface bandwidth is defined by the `bandwidth` command. Because the default reference bandwidth is 100 Mbps, OSPF uses the same default link cost for all interfaces whose bandwidth is 100 Mbps or greater. Use the `auto-cost` command to change the reference bandwidth, specifying the reference bandwidth in megabits per second (Mbps). The reference bandwidth range is 1-4294967 Mbps.

Default	100 Mbps
Format	auto-cost reference-bandwidth *1-4294967*
Mode	Router OSPF Config

no auto-cost reference-bandwidth (OSPF)

Use this command to set the reference bandwidth to the default value.

Format	no auto-cost reference-bandwidth
Mode	Router OSPF Config

capability opaque

Use this command to enable Opaque Capability on the Router. The information contained in Opaque LSAs may be used directly by OSPF or indirectly by an application wishing to distribute information throughout the OSPF domain. CE0128XB/CE0152XB supports the storing and flooding of Opaque LSAs of different scopes. The default value of `enabled` means that OSPF will forward opaque LSAs by default. If you want to upgrade from a previous release, where the default was disabled, opaque LSA forwarding will be enabled. If you want to disable opaque LSA forwarding, then you should enter the command `no capability opaque` in OSPF router configuration mode after the software upgrade.

Default	enabled
Format	capability opaque
Mode	Router Config

no capability opaque

Use this command to disable opaque capability on the router.

Format	no capability opaque
Mode	Router Config

clear ip ospf

Use this command to disable and re-enable OSPF.

Format	clear ip ospf
Mode	Privileged EXEC

clear ip ospf configuration

Use this command to reset the OSPF configuration to factory defaults.

Format	clear ip ospf configuration
Mode	Privileged EXEC

clear ip ospf counters

Use this command to reset global and interface statistics for the specified virtual router. If no virtual router is specified, the global and interface statistics are reset for the default router.

Format	clear ip ospf counters
Mode	Privileged EXEC

clear ip ospf neighbor

Use this command to drop the adjacency with all OSPF neighbors. On each neighbor's interface, send a one-way hello. Adjacencies may then be re-established. If no router is specified, adjacency with all OSPF neighbors is dropped for the default router. To drop all adjacencies with a specific router ID, specify the neighbor's Router ID using the optional parameter [*neighbor-id*].

Format	clear ip ospf neighbor [*neighbor-id*]
Mode	Privileged EXEC

clear ip ospf neighbor interface

To drop adjacency with all neighbors on a specific interface, use the optional parameter [`unit/slot/port`]. To drop adjacency with a specific router ID on a specific interface, use the optional parameter [`neighbor-id`].

Format	clear ip ospf neighbor interface *[unit/slot/port]* [neighbor-id*]*
Mode	Privileged EXEC

clear ip ospf redistribution

Use this command to flush all self-originated external LSAs. Reapply the redistribution configuration and re-originate prefixes as necessary.

Format	clear ip ospf redistribution
Mode	Privileged EXEC

default-information originate (OSPF)

This command is used to control the advertisement of default routes.

Default	- metric—unspecified - type—2
Format	default-information originate [always] [metric *0-16777214*] [metric-type {1 | 2}]
Mode	Router OSPF Config

no default-information originate (OSPF)

This command is used to control the advertisement of default routes.

Format	no default-information originate *[metric] [metric-type]*
Mode	Router OSPF Config

default-metric (OSPF)

This command is used to set a default for the metric of distributed routes.

Format	default-metric *1-16777214*
Mode	Router OSPF Config

no default-metric (OSPF)

This command is used to set a default for the metric of distributed routes.

Format	no default-metric
Mode	Router OSPF Config

distance ospf (OSPF)

This command sets the route preference value of OSPF in the router. Lower route preference values are preferred when determining the best route. The type of OSPF route can be `intra, inter`, or `external`. All the external type routes are given the same preference value. The range of `preference` value is 1 to 255.

Default	110
Format	distance ospf {intra-area *1-255* | inter-area *1-255* | external *1-255*}
Mode	Router OSPF Config

no distance ospf

This command sets the default route preference value of OSPF routes in the router. The type of OSPF can be intra, inter, or external. All the external type routes are given the same preference value.

Format	no distance ospf {*intra-area* | *inter-area* | *external*}
Mode	Router OSPF Config

distribute-list out (OSPF)

Use this command to specify the access list to filter routes received from the source protocol.

Format	distribute-list *1-199* out {rip | static | connected}
Mode	Router OSPF Config

no distribute-list out

Use this command to specify the access list to filter routes received from the source protocol.

Format	no distribute-list *1-199* out {rip | static | connected}
Mode	Router OSPF Config

exit-overflow-interval (OSPF)

This command configures the exit overflow interval for OSPF. It describes the number of seconds after entering overflow state that a router will wait before attempting to leave the overflow state. This allows the router to again originate nondefault AS-external-LSAs. When set to 0, the router will not leave overflow state until restarted. The range for seconds is 0 to 2,147,483,647 seconds.

Default	0
Format	exit-overflow-interval *seconds*
Mode	Router OSPF Config

no exit-overflow-interval

This command configures the default exit overflow interval for OSPF.

Format	no exit-overflow-interval
Mode	Router OSPF Config

external-lsdb-limit (OSPF)

This command configures the external LSDB limit for OSPF. If the value is -1, then there is no limit. When the number of nondefault AS-external-LSAs in a router's link-state database reaches the external LSDB limit, the router enters overflow state. The router never holds more than the external LSDB limit nondefault AS-external-LSAs in it database. The external LSDB limit MUST be set identically in all routers attached to the OSPF backbone and/or any regular OSPF area. The range for limit is -1 to 2147483647.

Default	-1
Format	external-lsdb-limit *limit*
Mode	Router OSPF Config

no external-lsdb-limit

This command configures the default external LSDB limit for OSPF.

Format	no external-lsdb-limit
Mode	Router OSPF Config

log-adjacency-changes

To enable logging of OSPFv2 neighbor state changes, use the `log-adjacency-changes` command in router configuration mode. State changes are logged with INFORMATIONAL severity.

Default	Adjacency state changes are logged, but without the detail option.
Format	log-adjacency-changes [detail]
Mode	OSPFv2 Router Configuration

Parameter	Description
detail	(Optional) When this keyword is specified, all adjacency state changes are logged. Otherwise, OSPF only logs transitions to FULL state and when a backwards transition occurs.

no log-adjacency-changes

Use the `no` form of the command to disable state change logging.

Format	no log-adjacency-changes [detail]
Mode	OSPFv2 Router Configuration

prefix-suppression (Router OSPF Config)

This command suppresses the advertisement of all the IPv4 prefixes except for prefixes that are associated with secondary IPv4 addresses, loopbacks, and passive interfaces from the OSPFv2 router advertisements.

To suppress a loopback or passive interface, use the "ip ospf prefix-suppression " on page 697command in interface configuration mode. Prefixes associated with secondary IPv4 addresses can never be suppressed.

Default	Prefix suppression is disabled.
Format	prefix-suppression
Mode	Router OSPF Config

no prefix-suppression

This command disables prefix-suppression. No prefixes are suppressed from getting advertised.

Format	no prefix-suppression
Mode	Router OSPF Config

prefix-suppression (Router OSPFv3 Config)

This command suppresses the advertisement of all the IPv6 prefixes except for prefixes that are associated with secondary IPv6 addresses, loopbacks, and passive interfaces from the OSPFv3 router advertisements.

To suppress a loopback or passive interface, use the `ipv ospf prefix-suppression` command in interface configuration mode. Prefixes associated with secondary IPv6 addresses can never be suppressed.

Default	Prefix suppression is disabled.
Format	prefix-suppression
Mode	Router OSPFv3 Config

no prefix-suppression

This command disables prefix-suppression. No prefixes are suppressed from getting advertised.

Format	no prefix-suppression
Mode	Router OSPFv3 Config

router-id (OSPF)

This command sets a 4-digit dotted-decimal number uniquely identifying the router ospf id. The ***`ipaddress`*** is a configured value.

Format	router-id *ipaddress*
Mode	Router OSPF Config

redistribute (OSPF)

This command configures OSPF protocol to allow redistribution of routes from the specified source protocol/routers.

Default	• metric—unspecified • type—2 • tag—0
Format	redistribute {rip | static | connected} [metric *0-16777214*] [metric-type {1 | 2}] [tag *0-4294967295*] [subnets]
Mode	Router OSPF Config

no redistribute

This command configures OSPF protocol to prohibit redistribution of routes from the specified source protocol/routers.

Format	no redistribute {rip | static | connected} [metric] [metric-type] [tag] [subnets]
Mode	Router OSPF Config

maximum-paths (OSPF)

This command sets the number of paths that OSPF can report for a given destination where `maxpaths` is platform dependent.

Default	4
Format	maximum-paths *maxpaths*
Mode	Router OSPF Config

no maximum-paths

This command resets the number of paths that OSPF can report for a given destination back to its default value.

Format	no maximum-paths
Mode	Router OSPF Config

passive-interface default (OSPF)

Use this command to enable global passive mode by default for all interfaces. It overrides any interface level passive mode. OSPF will not form adjacencies over a passive interface.

Default	disabled
Format	passive-interface default
Mode	Router OSPF Config

no passive-interface default

Use this command to disable the global passive mode by default for all interfaces. Any interface previously configured to be passive reverts to non-passive mode.

Format	no passive-interface default
Mode	Router OSPF Config

passive-interface (OSPF)

Use this command to set the interface as passive. It overrides the global passive mode that is currently effective on the interface. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword **vlan** is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format.

Default	disabled
Format	passive-interface {*unit/slot/port*|*vlan 1-4093}*
Mode	Router OSPF Config

no passive-interface

Use this command to set the interface as non-passive. It overrides the global passive mode that is currently effective on the interface.

Format	no passive-interface {*unit/slot/port|vlan 1-4093}*
Mode	Router OSPF Config

timers pacing flood

To adjust the rate at which OSPFv2 sends LS Update packets, use the `timers pacing flood` command in router OSPFv2 global configuration mode. OSPF distributes routing information in Link State Advertisements (LSAs), which are bundled into Link State Update (LS Update) packets. To reduce the likelihood of sending a neighbor more packets than it can buffer, OSPF rate limits the transmission of LS Update packets. By default, OSPF sends up to 30 updates per second on each interface (1/the pacing interval). Use this command to adjust this packet rate.

Default	33 milliseconds
Format	timers pacing flood *milliseconds*
Mode	OSPFv2 Router Configuration

Parameter	Description
milliseconds	The average time between transmission of LS Update packets. The range is from 5 ms to 100 ms. The default is 33 ms.

no timers pacing flood

To revert LSA transmit pacing to the default rate, use the `no timers pacing flood` command.

Format	no timers pacing flood
Mode	OSPFv2 Router Configuration

timers pacing lsa-group

To adjust how OSPF groups LSAs for periodic refresh, use the `timers pacing lsa-group` command in OSPFv2 Router Configuration mode. OSPF refreshes self-originated LSAs approximately once every 30 minutes. When OSPF refreshes LSAs, it considers all self-originated LSAs whose age is from 1800 to 1800 plus the pacing group size. Grouping LSAs for refresh allows OSPF to combine refreshed LSAs into a minimal number of LS Update packets. Minimizing the number of Update packets makes LSA distribution more efficient.

When OSPF originates a new or changed LSA, it selects a random refresh delay for the LSA. When the refresh delay expires, OSPF refreshes the LSA. By selecting a random refresh delay, OSPF avoids refreshing a large number of LSAs at one time, even if a large number of LSAs are originated at one time.

Default	60 seconds
Format	timers pacing lsa-group *seconds*
Mode	OSPFv2 Router Configuration

Parameter	Description
seconds	Width of the window in which LSAs are refreshed. The range for the pacing group window is from 10 to 1800 seconds.

timers spf

Use this command to configure the SPF delay time and hold time. The valid range for both parameters is 0-65535 seconds.

Default	• delay-time—5 • hold-time—10
Format	timers spf *delay-time hold-time*
Mode	Router OSPF Config

trapflags (OSPF)

Use this command to enable individual OSPF traps, enable a group of trap flags at a time, or enable all the trap flags at a time. The different groups of trapflags, and each group's specific trapflags to enable or disable, are listed in Table 12.

Table 12. *Trapflags Groups*

Group	Flags
errors	• authentication-failure • bad-packet • config-error • virt-authentication-failure • virt-bad-packet • virt-config-error
lsa	• lsa-maxage • lsa-originate
overflow	• lsdb-overflow • lsdb-approaching-overflow
retransmit	• packets • virt-packets
state-change	• if-state-change • neighbor-state-change • virtif-state-change • virtneighbor-state-change

- To enable the individual flag, enter the `group name` followed by that particular flag.
- To enable all the flags in that group, give the group name followed by `all`.
- To enable all the flags, give the command as `trapflags all`.

Default disabled

Format trapflags {
all|errors{all|authentication-failure|bad-packet|config-error|virt-authentication-failure|
virt-bad-packet | virt-config-error} |
lsa {all | lsa-maxage | lsa-originate} |
overflow {all | lsdb-overflow | lsdb-approaching-overflow} |
retransmit {all | packets | virt-packets} |
state-change {all | if-state-change | neighbor-state-change | virtif-state-change |
virtneighbor-state-change}
}

Mode Router OSPF Config

no trapflags

Use this command to revert to the default reference bandwidth.

- To disable the individual flag, enter the `group name` followed by that particular flag.
- To disable all the flags in that group, give the group name followed by `all`.
- To disable all the flags, give the command as `trapflags all`.

Format no trapflags {
all |
errors {all | authentication-failure | bad-packet | config-error | virt-authentication-failure | virt-bad-packet | virt-config-error} |
lsa {all | lsa-maxage | lsa-originate} |
overflow {all | lsdb-overflow | lsdb-approaching-overflow} |
retransmit {all | packets | virt-packets} |
state-change {all | if-state-change | neighbor-state-change | virtif-state-change | virtneighbor-state-change}
}

Mode Router OSPF Config

OSPF Interface Commands

ip ospf area

Use this command to enable OSPFv2 and set the area ID of an interface or range of interfaces. The *`area-id`* is an IP address formatted as a 4-digit dotted-decimal number or a decimal value in the range of 0-4294967295. This command supersedes the effects of the `network area` command. It can also be used to configure the advertise-ability of the secondary addresses on this interface into the OSPFv2 domain.

Default disabled

Format ip ospf area *area-id* [secondaries none]

Mode Interface Config

no ip ospf area

Use this command to disable OSPF on an interface.

Format	no ip ospf area [secondaries none]
Mode	Interface Config

bandwidth

By default, OSPF computes the link cost of an interface as the ratio of the reference bandwidth to the interface bandwidth. Reference bandwidth is specified with the `auto-cost` command. For the purpose of the OSPF link cost calculation, use the `bandwidth` command to specify the interface bandwidth. The bandwidth is specified in kilobits per second (Kb/s). If no bandwidth is configured, the bandwidth defaults to the actual interface bandwidth for port-based routing interfaces and to 10 Mbps for VLAN routing interfaces. This command does not affect the actual speed of an interface. You can use this command to configure a single interface or a range of interfaces.

Default	actual interface bandwidth
Format	bandwidth *1-10000000*
Mode	Interface Config

no bandwidth

Use this command to set the interface bandwidth to its default value.

Format	no bandwidth
Mode	Interface Config

ip ospf authentication

This command sets the OSPF Authentication Type and Key for the specified interface or range of interfaces. The value of *`type`* is either none, simple or encrypt. The *`key`* is composed of standard displayable, non-control keystrokes from a Standard 101/102-key keyboard. The authentication key must be 8 bytes or less if the authentication type is simple. If the type is encrypt, the key may be up to 16 bytes. If the type is encrypt a *`keyid`* in the range of 0 and 255 must be specified. Unauthenticated interfaces do not need an authentication key or authentication key ID. There is no default value for this command.

Format	ip ospf authentication {none | {simple *key*} | {encrypt *key keyid*}}
Mode	Interface Config

no ip ospf authentication

This command sets the default OSPF Authentication Type for the specified interface.

Format	no ip ospf authentication
Mode	Interface Config

ip ospf cost

This command configures the cost on an OSPF interface or range of interfaces. The `cost` parameter has a range of 1 to 65535.

Default	10
Format	ip ospf cost *1-65535*
Mode	Interface Config

no ip ospf cost

This command configures the default cost on an OSPF interface.

Format	no ip ospf cost
Mode	Interface Config

ip ospf database-filter all out

Use the `ip ospf database-filter all out` command in Interface Configuration mode to disable OSPFv2 LSA flooding on an interface.

Default	disabled
Format	ip ospf database-filter all out
Mode	Interface Configuration

no ip ospf database-filter all out

Use the `no ip ospf database-filter all out` command in Interface Configuration mode to enable OSPFv2 LSA flooding on an interface.

Default	disabled
Format	ip ospf database-filter all out
Mode	Interface Configuration

ip ospf dead-interval

This command sets the OSPF dead interval for the specified interface or range of interfaces. The value for *`seconds`* (range: 1–65535) is a valid positive integer, which represents the length of time in seconds that a router's Hello packets have not been seen before its neighbor routers declare that the router is down. The value for the length of time must be the same for all routers attached to a common network. This value should be some multiple of the Hello Interval (i.e. 4). Valid values range in seconds from 1 to 65535.

Default	40
Format	ip ospf dead-interval *seconds*
Mode	Interface Config

no ip ospf dead-interval

This command sets the default OSPF dead interval for the specified interface.

Format	no ip ospf dead-interval
Mode	Interface Config

ip ospf hello-interval

This command sets the OSPF hello interval for the specified interface or range of interfaces. The value for seconds is a valid positive integer, which represents the length of time in seconds. The value for the length of time must be the same for all routers attached to a network. Valid values range from 1 to 65535.

Default	10
Format	ip ospf hello-interval *seconds*
Mode	Interface Config

no ip ospf hello-interval

This command sets the default OSPF hello interval for the specified interface.

Format	no ip ospf hello-interval
Mode	Interface Config

ip ospf network

Use this command to configure OSPF to treat an interface or range of interfaces as a point-to-point rather than broadcast interface. The `broadcast` option sets the OSPF network type to broadcast. The `point-to-point` option sets the OSPF network type to point-to-point. OSPF treats interfaces as broadcast interfaces by default. (Loopback interfaces have a special loopback network type, which cannot be changed.) When there are only two routers on the network, OSPF can operate more efficiently by treating the network as a point-to-point network. For point-to-point networks, OSPF does not elect a designated router or generate a network link state advertisement (LSA). Both endpoints of the link must be configured to operate in point-to-point mode.

Default	broadcast
Format	ip ospf network {broadcast | point-to-point}
Mode	Interface Config

no ip ospf network

Use this command to return the OSPF network type to the default.

Format	no ip ospf network
Mode	Interface Config

ip ospf prefix-suppression

This command suppresses the advertisement of the IPv4 prefixes that are associated with an interface, except for those associated with secondary IPv4 addresses. This command takes precedence over the global configuration. If this configuration is not specified, the global prefix-suppression configuration applies.

Prefix-suppression can be disabled at the interface level by using the `disable` option. The `disable` option is useful for excluding specific interfaces from performing prefix-suppression when the feature is enabled globally.

Note that the `disable` option disable is not equivalent to not configuring the interface specific prefix-suppression. If prefix-suppression is not configured at the interface level, the global prefix-suppression configuration is applicable for the IPv4 prefixes associated with the interface.

Default	Prefix-suppression is not configured.
Format	ip ospf prefix-suppression [disable]
Mode	Interface Config

no ip ospf prefix-suppression

This command removes prefix-suppression configurations at the interface level. When the `no ip ospf prefix-suppression` command is used, global prefix-suppression applies to the interface. Not configuring the command is not equal to disabling interface level prefix-suppression.

Format	no ip ospf prefix-suppression
Mode	Interface Config

ip ospf priority

This command sets the OSPF priority for the specified router interface or range of interfaces. The priority of the interface is a priority integer from 0 to 255. A value of 0 indicates that the router is not eligible to become the designated router on this network.

Default	1, which is the highest router priority
Format	ip ospf priority *0-255*
Mode	Interface Config

no ip ospf priority

This command sets the default OSPF priority for the specified router interface.

Format	no ip ospf priority
Mode	Interface Config

ip ospf retransmit-interval

This command sets the OSPF retransmit Interval for the specified interface or range of interfaces. The retransmit interval is specified in seconds. The value for `seconds` is the number of seconds between link-state advertisement retransmissions for adjacencies belonging to this router interface. This value is also used when retransmitting database description and link-state request packets. Valid values range from 0 to 3600 (1 hour).

Default	5
Format	ip ospf retransmit-interval *0-3600*
Mode	Interface Config

no ip ospf retransmit-interval

This command sets the default OSPF retransmit Interval for the specified interface.

Format	no ip ospf retransmit-interval
Mode	Interface Config

ip ospf transmit-delay

This command sets the OSPF Transit Delay for the specified interface or range of interfaces. The transmit delay is specified in seconds. In addition, it sets the estimated number of seconds it takes to transmit a link state update packet over this interface. Valid values for `seconds` range from 1 to 3600 (1 hour).

Default	1
Format	ip ospf transmit-delay *1-3600*
Mode	Interface Config

no ip ospf transmit-delay

This command sets the default OSPF Transit Delay for the specified interface.

Format	no ip ospf transmit-delay
Mode	Interface Config

ip ospf mtu-ignore

This command disables OSPF maximum transmission unit (MTU) mismatch detection on an interface or range of interfaces. OSPF Database Description packets specify the size of the largest IP packet that can be sent without fragmentation on the interface. When a router receives a Database Description packet, it examines the MTU advertised by the neighbor. By default, if the MTU is larger than the router can accept, the Database Description packet is rejected and the OSPF adjacency is not established.

Default	enabled
Format	ip ospf mtu-ignore

Mode Interface Config

no ip ospf mtu-ignore

This command enables the OSPF MTU mismatch detection.

Format no ip ospf mtu-ignore

Mode Interface Config

IP Event Dampening Commands

dampening

Use this command to enable IP event dampening on a routing interface.

Format dampening [*half-life period*] [*reuse-threshold suppress-threshold max-suppress-time* [restart *restart-penalty*]]

Mode Interface Config

Parameter	Description
Half-life period	The number of seconds it takes for the penalty to reduce by half. The configurable range is 1-30 seconds. Default value is 5 seconds.
Reuse Threshold	The value of the penalty at which the dampened interface is restored. The configurable range is 1-20,000. Default value is 1000.
Suppress Threshold	The value of the penalty at which the interface is dampened. The configurable range is 1-20,000. Default value is 2000.
Max Suppress Time	The maximum amount of time (in seconds) an interface can be in suppressed state after it stops flapping. The configurable range is 1-255 seconds. The default value is four times of half-life period. If half-period value is allowed to default, the maximum suppress time defaults to 20 seconds.
Restart Penalty	Penalty applied to the interface after the device reloads. The configurable range is 1-20,000. Default value is 2000.

no dampening

This command disables IP event dampening on a routing interface.

Format no dampening

Mode Interface Config

show dampening interface

This command summarizes the number of interfaces configured with dampening and the number of interfaces being suppressed.

Format show dampening interface

Mode Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Router)# show dampening interface
2 interfaces are configured with dampening.
1 interface is being suppressed.
```

show interface dampening

This command displays the status and configured parameters of the interfaces configured with dampening.

Format	show interface dampening
Mode	Privileged EXEC

Parameter	Description
Flaps	The number times the link state of an interface changed from UP to DOWN.
Penalty	Accumulated Penalty.
Supp	Indicates if the interface is suppressed or not.
ReuseTm	Number of seconds until the interface is allowed to come up again.
HalfL	Configured half-life period.
ReuseV	Configured reuse-threshold.
SuppV	Configured suppress threshold.
MaxSTm	Configured maximum suppress time in seconds.
MaxP	Maximum possible penalty.
Restart	Configured restart penalty.

NOTE:

1. The “clear counters” on page 218 CLI command resets the flap count to zero.
2. The “no shutdown” on page 340 interface CLI command resets the suppressed state to `False`.
3. Any change in the dampening configuration resets the current penalty, reuse time and suppressed state to their default values, meaning `0`, `0`, and `FALSE` respectively.

Example: The following shows example CLI display output for the command.

```
Router# show interface dampening

Interface 0/2
Flaps  Penalty  Supp  ReuseTm  HalfL  ReuseV  SuppV  MaxSTm  MaxP  Restart
  0        0    FALSE    0        5     1000    2000     20     16000    0
Interface 0/3
Flaps  Penalty  Supp  ReuseTm  HalfL  ReuseV  SuppV  MaxSTm  MaxP  Restart
  6      1865   TRUE     18       20    1000    2001     30      2828   1500
```

OSPF Graceful Restart Commands

The OSPF protocol can be configured to participate in the checkpointing service, so that these protocols can execute a *graceful restart* when the management unit fails. In a graceful restart, the hardware to continues forwarding IPv4 packets using OSPF routes while a backup switch takes over management unit responsibility

Graceful restart uses the concept of *helpful neighbors*. A fully adjacent router enters helper mode when it receives a link state announcement (LSA) from the restarting management unit indicating its intention of performing a graceful restart. In helper mode, a switch continues to advertise to the rest of the network that they have full adjacencies with the restarting router, thereby avoiding announcement of a topology change and the potential for flooding of LSAs and shortest-path-first (SPF) runs (which determine OSPF routes). Helpful neighbors continue to forward packets through the restarting router. The restarting router relearns the network topology from its helpful neighbors.

Graceful restart can be enabled for either planned or unplanned restarts, or both. A planned restart is initiated by the operator through the management command `initiate failover`. The operator may initiate a failover in order to take the management unit out of service (for example, to address a partial hardware failure), to correct faulty system behavior which cannot be corrected through less severe management actions, or other reasons. An unplanned restart is an unexpected failover caused by a fatal hardware failure of the management unit or a software hang or crash on the management unit.

nsf

Use this command to enable the OSPF graceful restart functionality on an interface. To disable graceful restart, use the `no` form of the command.

Default	disabled
Format	nsf [ietf] [planned-only]
Modes	OSPF Router Configuration

Parameter	Description
ietf	This keyword is accepted but not required.
planned-only	This optional keyword indicates that OSPF should only perform a graceful restart when the restart is planned (i.e., when the restart is a result of the `initiate failover` command).

no nsf

Use this command to disable graceful restart for all restarts.

nsf restart-interval

Use this command to configure the number of seconds that the restarting router asks its neighbors to wait before exiting helper mode. This is referred to as the grace period. The restarting router includes the grace period in its grace LSAs. For planned restarts (using the `initiate failover` command), the grace LSAs are sent prior to restarting the management unit, whereas for unplanned restarts, they are sent after reboot begins.

The grace period must be set long enough to allow the restarting router to reestablish all of its adjacencies and complete a full database exchange with each of those neighbors.

Default	120 seconds
Format	nsf [ietf] restart-interval *1-1800*
Modes	OSPF Router Configuration

Parameter	Description
ietf	This keyword is accepted but not required.

Parameter	Description
seconds	The number of seconds that the restarting router asks its neighbors to wait before exiting helper mode. The range is from 1 to 1800 seconds.

no nsfrestart-interval

Use this command to revert the grace period to its default value.

Format	no [ietf] nsf restart-interval
Modes	OSPF Router Configuration

nsf helper

Use this command to enable helpful neighbor functionality for the OSPF protocol. You can enable this functionality for planned or unplanned restarts, or both.

Default	OSPF may act as a helpful neighbor for both planned and unplanned restarts.
Format	nsf helper [planned-only]
Modes	OSPF Router Configuration

Parameter	Description
planned-only	This optional keyword indicates that OSPF should only help a restarting router performing a planned restart.

no nsf helper

Use this command to disable helpful neighbor functionality for OSPF.

Format	no nsf helper
Modes	OSPF Router Configuration

nsf ietf helper disable

Use this command to disable helpful neighbor functionality for OSPF.

Note: The commands `no nsf helper` and `nsf ietf helper disable` are functionally equivalent. The command `nsf ietf helper disable` is supported solely for compatibility with other network software CLI.

Format	nsf ietf helper disable
Modes	OSPF Router Configuration

nsf helper strict-lsa-checking

The restarting router is unable to react to topology changes. In particular, the restarting router will not immediately update its forwarding table; therefore, a topology change may introduce forwarding loops or black holes that persist until the graceful restart completes. By exiting the graceful restart on a topology change, a router tries to eliminate the loops or black holes as quickly as possible by routing around the restarting router. A helpful neighbor considers a link down with the restarting router to be a topology change, regardless of the strict LSA checking configuration.

Use this command to require that an OSPF helpful neighbor exit helper mode whenever a topology change occurs.

Default	enabled
Format	nsf [ietf] helper strict-lsa-checking
Modes	OSPF Router Configuration

Parameter	Description
ietf	This keyword is accepted but not required.

no nsf [ietf] helper strict-lsa-checking

Use this command to allow OSPF to continue as a helpful neighbor in spite of topology changes.

Default	enabled
Format	nsf [ietf] helper strict-lsa-checking
Modes	OSPF Router Configuration

OSPFv2 Stub Router Commands

max-metric router-lsa

To configure OSPF to enter stub router mode, use this command in Router OSPF Global Configuration mode. When OSPF is in stub router mode, as defined by RFC 3137, OSPF sets the metric in the non-stub links in its router LSA to LsInfinity. Other routers therefore compute very long paths through the stub router, and prefer any alternate path. Doing so eliminates all transit traffic through the stub router, when alternate routes are available. Stub router mode is useful when adding or removing a router from a network or to avoid transient routes when a router reloads.

You can administratively force OSPF into stub router mode. OSPF remains in stub router mode until you take OSPF out of stub router mode. Alternatively, you can configure OSPF to start in stub router mode for a configurable period of time after the router boots up.

If you set the summary LSA metric to 16,777,215, other routers will skip the summary LSA when they compute routes.

If you have configured the router to enter stub router mode on startup (`max-metric router-lsa on-startup`), and then enter max-metric router lsa, there is no change. If OSPF is administratively in stub router mode (the `max-metric router-lsa` command has been given), and you configure OSPF to enter stub router mode on startup (`max-metric router-lsa on-startup`), OSPF exits stub router mode (assuming the startup period has expired) and the configuration is updated.

Default	OSPF is not in stub router mode by default.
Format	max-metric router-lsa [on-startup seconds] [summary-lsa {metric}]
Mode	OSPFv2 Router Configuration

Parameter	Description
on-startup	(Optional) OSPF starts in stub router mode after a reboot.
seconds	(Required if on-startup) The number of seconds that OSPF remains in stub router mode after a reboot. The range is 5 to 86,400 seconds. There is no default value.
summary-lsa	(Optional) Set the metric in type 3 and type 4 summary LSAs to LsInfinity (0xFFFFFF).
metric	(Optional) Metric to send in summary LSAs when in stub router mode. The range is 1 to 16,777,215. The default is 16,711,680 (0xFF0000).

no max-metric router-lsa

Use this command in OSPFv2 Router Configuration mode to disable stub router mode. The command clears either type of stub router mode (always or on-startup) and resets the `summary-lsa` option. If OSPF is configured to enter global configuration mode on startup, and during normal operation you want to immediately place OSPF in stub router mode, issue the command `no max-metric router-lsa on-startup`. The command `no max-metric router-lsa summary-lsa` causes OSPF to send summary LSAs with metrics computed using normal procedures defined in RFC 2328.

Format	no max-metric router-lsa [on-startup] [summary-lsa]
Mode	OSPFv2 Router Configuration

clear ip ospf stub-router

Use the `clear ip ospf stub-router` command in Privileged EXEC mode to force OSPF to exit stub router mode when it has automatically entered stub router mode because of a resource limitation. OSPF only exits stub router mode if it entered stub router mode because of a resource limitation or it if is in stub router mode at startup. This command has no effect if OSPF is configured to be in stub router mode permanently.

Format	clear ip ospf stub-router
Mode	Privileged EXEC

OSPF Show Commands

show ip ospf

This command displays OSPF global configuration information.

Format	show ip ospf
Mode	Privileged EXEC

Note: Some of the information below displays only if you enable OSPF and configure certain features.

Parameter	Definition
Router ID	A 32-bit integer in dotted decimal format identifying the router, about which information is displayed. This is a configured value.
OSPF Admin Mode	Shows whether the administrative mode of OSPF in the router is enabled or disabled. This is a configured value.
RFC 1583 Compatibility	Indicates whether 1583 compatibility is enabled or disabled. This is a configured value.
External LSDB Limit	The maximum number of nondefault AS-external-LSA (link state advertisement) entries that can be stored in the link-state database.
Exit Overflow Interval	The number of seconds that, after entering overflow state, a router will attempt to leave overflow state.
Spf Delay Time	The number of seconds between two subsequent changes of LSAs, during which time the routing table calculation is delayed.
Spf Hold Time	The number of seconds between two consecutive spf calculations.
Flood Pacing Interval	The average time, in milliseconds, between LS Update packet transmissions on an interface. This is the value configured with the "timers pacing flood" on page 691 command.
LSA Refresh Group Pacing Time	The size in seconds of the LSA refresh group window. This is the value configured with the "timers pacing lsa-group" on page 691 command.
Opaque Capability	Shows whether the router is capable of sending Opaque LSAs. This is a configured value.
Autocost Ref BW	Shows the value of auto-cost reference bandwidth configured on the router.
Default Passive Setting	Shows whether the interfaces are passive by default.
Maximum Paths	The maximum number of paths that OSPF can report for a given destination.
Default Metric	Default value for redistributed routes.
Stub Router Configuration	When OSPF runs out of resources to store the entire link state database, or any other state information, OSPF goes into stub router mode. As a stub router, OSPF re-originates its own router LSAs, setting the cost of all non-stub interfaces to infinity. Use this field to set stub router configuration to one of **Always**, **Startup**, **None**.
Stub Router Startup Time	Configured value in seconds. This row is only listed if OSPF is configured to be a stub router at startup.
Summary LSA Metric Override	One of **Enabled (***met***)**, **Disabled**, where *met* is the metric to be sent in summary LSAs when in stub router mode.
BFD Enabled	Displays the BFD status.
Default Route Advertise	Indicates whether the default routes received from other source protocols are advertised or not.
Always	Shows whether default routes are always advertised.
Metric	The metric of the routes being redistributed. If the metric is not configured, this field is blank.
Metric Type	Shows whether the routes are External Type 1 or External Type 2.
Number of Active Areas	The number of active OSPF areas. An "active" OSPF area is an area with at least one interface up.
ABR Status	Shows whether the router is an OSPF Area Border Router.

Parameter	Definition
ASBR Status	Reflects whether the ASBR mode is enabled or disabled. Enable implies that the router is an autonomous system border router. The router automatically becomes an ASBR when it is configured to redistribute routes learned from other protocols. The possible values for the ASBR status is enabled (if the router is configured to redistribute routes learned by other protocols) or disabled (if the router is not configured for the same).
Stub Router Status	One of **Active**, **Inactive**.
Stub Router Reason	One of **Configured**, **Startup**, **Resource Limitation**. **NOTE:** The row is only listed if stub router is active.
Stub Router Startup Time Remaining	The remaining time, in seconds, until OSPF exits stub router mode. This row is only listed if OSPF is in startup stub router mode.
Stub Router Duration	The time elapsed since the router last entered the stub router mode. The row is only listed if stub router is active and the router entered stub mode because of a resource limitation. The duration is displayed in DD:HH:MM:SS format.
External LSDB Overflow	When the number of nondefault external LSAs exceeds the configured limit, External LSDB Limit, OSPF goes into LSDB overflow state. In this state, OSPF withdraws all of its self-originated nondefault external LSAs. After the Exit Overflow Interval, OSPF leaves the overflow state, if the number of external LSAs has been reduced.
External LSA Count	The number of external (LS type 5) link-state advertisements in the link-state database.
External LSA Checksum	The sum of the LS checksums of external link-state advertisements contained in the link-state database.
AS_OPAQUE LSA Count	Shows the number of AS Opaque LSAs in the link-state database.
AS_OPAQUE LSA Checksum	Shows the sum of the LS Checksums of AS Opaque LSAs contained in the link-state database.
New LSAs Originated	The number of new link-state advertisements that have been originated.
LSAs Received	The number of link-state advertisements received determined to be new instantiations.
LSA Count	The total number of link state advertisements currently in the link state database.
Maximum Number of LSAs	The maximum number of LSAs that OSPF can store.
LSA High Water Mark	The maximum size of the link state database since the system started.
AS Scope LSA Flood List Length	The number of LSAs currently in the global flood queue waiting to be flooded through the OSPF domain. LSAs with AS flooding scope, such as type 5 external LSAs and type 11 Opaque LSAs.
Retransmit List Entries	The total number of LSAs waiting to be acknowledged by all neighbors. An LSA may be pending acknowledgment from more than one neighbor.
Maximum Number of Retransmit Entries	The maximum number of LSAs that can be waiting for acknowledgment at any given time.
Retransmit Entries High Water Mark	The maximum number of LSAs on all neighbors’ retransmit lists at any given time.
NSF Support	Indicates whether nonstop forwarding (NSF) is enabled for the OSPF protocol for planned restarts, unplanned restarts or both (“Always”).

Parameter	Definition
NSF Restart Interval	The user-configurable grace period during which a neighboring router will be in the helper state after receiving notice that the management unit is performing a graceful restart.
NSF Restart Status	The current graceful restart status of the router. • Not Restarting • Planned Restart • Unplanned Restart
NSF Restart Age	Number of seconds until the graceful restart grace period expires.
NSF Restart Exit Reason	Indicates why the router last exited the last restart: • None — Graceful restart has not been attempted. • In Progress — Restart is in progress. • Completed — The previous graceful restart completed successfully. • Timed Out — The previous graceful restart timed out. • Topology Changed — The previous graceful restart terminated prematurely because of a topology change.
NSF Help Support	Indicates whether helpful neighbor functionality has been enabled for OSPF for planned restarts, unplanned restarts, or both (Always).
NSF help Strict LSA checking	Indicates whether strict LSA checking has been enabled. If enabled, then an OSPF helpful neighbor will exit helper mode whenever a topology change occurs. If disabled, an OSPF neighbor will continue as a helpful neighbor in spite of topology changes.
Prefix-suppression	Displays whether prefix-suppression is enabled or disabled.

Example: The following shows example CLI display output for the command.

```
(alpha3) #show ip ospf

Router ID...................................... 3.3.3.3
OSPF Admin Mode................................ Enable
RFC 1583 Compatibility......................... Enable
External LSDB Limit............................ No Limit
Exit Overflow Interval......................... 0
Spf Delay Time................................. 5
Spf Hold Time.................................. 10
Flood Pacing Interval.......................... 33 ms
LSA Refresh Group Pacing Time.................. 60 sec
Opaque Capability.............................. Enable
AutoCost Ref BW................................ 100 Mbps
Default Passive Setting........................ Disabled
Maximum Paths.................................. 4
Default Metric................................. Not configured
Stub Router Configuration...................... <val>
Stub Router Startup Time....................... <val> seconds
Summary LSA Metric Override.................... Enabled (<met>)

Default Route Advertise........................ Disabled
Always......................................... FALSE
Metric......................................... Not configured
Metric Type.................................... External Type 2


Number of Active Areas......................... 1 (1 normal, 0 stub, 0 nssa)
ABR Status..................................... Disable
ASBR Status.................................... Disable
```

```
Stub Router.................................... FALSE
Stub Router Status............................. Inactive
Stub Router Reason............................ <reason>
Stub Router Startup Time Remaining............. <duration> seconds
Stub Router Duration........................... <duration>
External LSDB Overflow......................... FALSE
External LSA Count............................. 0
External LSA Checksum.......................... 0
AS_OPAQUE LSA Count............................ 0
AS_OPAQUE LSA Checksum......................... 0
New LSAs Originated............................ 55
LSAs Received.................................. 82
LSA Count...................................... 1
Maximum Number of LSAs......................... 24200
LSA High Water Mark............................ 9
AS Scope LSA Flood List Length................. 0
Retransmit List Entries........................ 0
Maximum Number of Retransmit Entries........... 96800
Retransmit Entries High Water Mark............. 1
NSF Helper Support............................. Always
NSF Helper Strict LSA Checking................. Enabled
Prefix-suppression............................. Disabled
```

show ip ospf abr

This command displays the internal OSPF routing table entries to Area Border Routers (ABR).

Format	show ip ospf abr
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Type	The type of the route to the destination. It can be either: • intra — Intra-area route • inter — Inter-area route
Router ID	Router ID of the destination.
Cost	Cost of using this route.
Area ID	The area ID of the area from which this route is learned.
Next Hop	Next hop toward the destination.
Next Hop Intf	The outgoing router interface to use when forwarding traffic to the next hop.

show ip ospf area

This command displays information about the area. The `areaid` identifies the OSPF area that is being displayed.

Format	show ip ospf area *areaid*
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
AreaID	The area id of the requested OSPF area.
External Routing	A number representing the external routing capabilities for this area.
Spf Runs	The number of times that the intra-area route table has been calculated using this area's link-state database.
Area Border Router Count	The total number of area border routers reachable within this area.
Area LSA Count	Total number of link-state advertisements in this area's link-state database, excluding AS External LSA's.
Area LSA Checksum	A number representing the Area LSA Checksum for the specified AreaID excluding the external (LS type 5) link-state advertisements.
Flood List Length	The number of LSAs waiting to be flooded within the area.
Import Summary LSAs	Shows whether to import summary LSAs.
OSPF Stub Metric Value	The metric value of the stub area. This field displays only if the area is a configured as a stub area.

The following OSPF NSSA specific information displays only if the area is configured as an NSSA:

Parameter	Definition
Import Summary LSAs	Shows whether to import summary LSAs into the NSSA.
Redistribute into NSSA	Shows whether to redistribute information into the NSSA.
Default Information Originate	Shows whether to advertise a default route into the NSSA.
Default Metric	The metric value for the default route advertised into the NSSA.
Default Metric Type	The metric type for the default route advertised into the NSSA.
Translator Role	The NSSA translator role of the ABR, which is always or candidate.
Translator Stability Interval	The amount of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router.
Translator State	Shows whether the ABR translator state is disabled, always, or elected.

Example: The following shows example CLI display output for the command.

```
(R1) #show ip ospf area 1


AreaID........................................ 0.0.0.1
External Routing.............................. Import External LSAs
Spf Runs...................................... 10
Area Border Router Count...................... 0
Area LSA Count................................ 3004
Area LSA Checksum............................. 0x5e0abed
Flood List Length............................. 0
Import Summary LSAs........................... Enable
```

show ip ospf asbr

This command displays the internal OSPF routing table entries to Autonomous System Boundary Routers (ASBR).

Format show ip ospf asbr

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
Type	The type of the route to the destination. It can be one of the following values: intra — Intra-area route inter — Inter-area route
Router ID	Router ID of the destination.
Cost	Cost of using this route.
Area ID	The area ID of the area from which this route is learned.
Next Hop	Next hop toward the destination.
Next Hop Intf	The outgoing router interface to use when forwarding traffic to the next hop.

show ip ospf database

This command displays information about the link state database when OSPF is enabled. If you do not enter any parameters, the command displays the LSA headers for all areas. Use the optional *areaid* parameter to display database information about a specific area. Use the optional parameters to specify the type of link state advertisements to display.

Parameter	Description
asbr-summary	Use *asbr-summary* to show the autonomous system boundary router (ASBR) summary LSAs.
external	Use *external* to display the external LSAs.
network	Use *network* to display the network LSAs.
nssa-external	Use *nssa-external* to display NSSA external LSAs.
opaque-area	Use *opaque-area* to display area opaque LSAs.
opaque-as	Use *opaque-as* to display AS opaque LSAs.
opaque-link	Use *opaque-link* to display link opaque LSAs.
router	Use *router* to display router LSAs.
summary	Use *summary* to show the LSA database summary information.
lsid	Use *lsid* to specify the link state ID (LSID). The value of *lsid* can be an IP address or an integer in the range of 0-4294967295.
adv-router	Use *adv-router* to show the LSAs that are restricted by the advertising router.
self-originate	Use *self-originate* to display the LSAs in that are self originated. The information below is only displayed if OSPF is enabled

The information below is only displayed if OSPF is enabled.

Format show ip ospf [*areaid*] database [{database-summary | [{asbr-summary | external | network | nssa-external | opaque-area | opaque-as | opaque-link | router | summary}][*lsid*][{adv-router [*ipaddr*] | self-originate}]}]

Mode
- Privileged EXEC
- User EXEC

For each link-type and area, the following information is displayed:

Parameter	Definition
Link Id	A number that uniquely identifies an LSA that a router originates from all other self originated LSAs of the same LS type.
Adv Router	The Advertising Router. Is a 32-bit dotted decimal number representing the LSDB interface.
Age	A number representing the age of the link state advertisement in seconds.
Sequence	A number that represents which LSA is more recent.
Checksum	The total number LSA checksum.
Options	This is an integer. It indicates that the LSA receives special handling during routing calculations.
Rtr Opt	Router Options are valid for router links only.

show ip ospf database database-summary

Use this command to display the number of each type of LSA in the database for each area and for the router. The command also displays the total number of LSAs in the database.

Format show ip ospf database database-summary

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Router	Total number of router LSAs in the OSPF link state database.
Network	Total number of network LSAs in the OSPF link state database.
Summary Net	Total number of summary network LSAs in the database.
Summary ASBR	Number of summary ASBR LSAs in the database.
Type-7 Ext	Total number of Type-7 external LSAs in the database.
Self-Originated Type-7	Total number of self originated AS external LSAs in the OSPF link state database.
Opaque Link	Number of opaque link LSAs in the database.
Opaque Area	Number of opaque area LSAs in the database.
Subtotal	Number of entries for the identified area.
Opaque AS	Number of opaque AS LSAs in the database.
Total	Number of entries for all areas.

show ip ospf interface

This command displays the information for the IFO object or virtual interface tables. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format.

Format show ip ospf interface {*unit/slot/port*|*vlan 1-4093*| loopback *loopback-id*}

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
IP Address	The IP address for the specified interface.
Subnet Mask	A mask of the network and host portion of the IP address for the OSPF interface.
Secondary IP Address(es)	The secondary IP addresses if any are configured on the interface.
OSPF Admin Mode	States whether OSPF is enabled or disabled on a router interface.
OSPF Area ID	The OSPF Area ID for the specified interface.
OSPF Network Type	The type of network on this interface that the OSPF is running on.
Router Priority	A number representing the OSPF Priority for the specified interface.
Retransmit Interval	A number representing the OSPF Retransmit Interval for the specified interface.
Hello Interval	A number representing the OSPF Hello Interval for the specified interface.
Dead Interval	A number representing the OSPF Dead Interval for the specified interface.
LSA Ack Interval	A number representing the OSPF LSA Acknowledgment Interval for the specified interface.
Transmit Delay	A number representing the OSPF Transmit Delay Interval for the specified interface.
Authentication Type	The OSPF Authentication Type for the specified interface are: none, simple, and encrypt.
Metric Cost	The cost of the OSPF interface.
Passive Status	Shows whether the interface is passive or not.
OSPF MTU-ignore	Indicates whether to ignore MTU mismatches in database descriptor packets sent from neighboring routers.
Flood Blocking	Indicates whether flood blocking is enabled on the interface.

The information below will only be displayed if OSPF is enabled.

Parameter	Definition
OSPF Interface Type	Broadcast LANs, such as Ethernet and IEEE 802.5, take the value *broadcast*. The OSPF Interface Type will be 'broadcast'.
State	The OSPF Interface States are: down, loopback, waiting, point-to-point, designated router, and backup designated router.
Designated Router	The router ID representing the designated router.
Backup Designated Router	The router ID representing the backup designated router.
Number of Link Events	The number of link events.
Local Link LSAs	The number of Link Local Opaque LSAs in the link-state database.
Local Link LSA Checksum	The sum of LS Checksums of Link Local Opaque LSAs in the link-state database.
Prefix-suppression	Displays whether prefix-suppression is enabled, disabled, or unconfigured on the given interface.

Example: The following shows example CLI display output for the command when the OSPF Admin Mode is disabled.

```
(Routing) >show ip ospf interface 1/0/1
```

```
IP Address.................................... 0.0.0.0
Subnet Mask................................... 0.0.0.0
Secondary IP Address(es)......................
OSPF Admin Mode............................... Disable
OSPF Area ID.................................. 0.0.0.0
OSPF Network Type............................. Broadcast
Router Priority............................... 1
Retransmit Interval........................... 5
Hello Interval................................ 10
Dead Interval................................. 40
LSA Ack Interval.............................. 1
Transmit Delay................................ 1
Authentication Type........................... None
Metric Cost................................... 1  (computed)
Passive Status................................ Non-passive interface
OSPF Mtu-ignore............................... Disable
Flood Blocking................................ Disable

OSPF is not enabled on this interface.

(Routing) #
```

show ip ospf interface brief

This command displays brief information for the IFO object.

Format	show ip ospf interface brief
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	*unit/slot/port*
OSPF Admin Mode	States whether OSPF is enabled or disabled on a router interface.
OSPF Area ID	The OSPF Area Id for the specified interface.
Router Priority	A number representing the OSPF Priority for the specified interface.
Cost	The metric cost of the OSPF interface.
Hello Interval	A number representing the OSPF Hello Interval for the specified interface.
Dead Interval	A number representing the OSPF Dead Interval for the specified interface.
Retransmit Interval	A number representing the OSPF Retransmit Interval for the specified interface.
Interface Transmit Delay	A number representing the OSPF Transmit Delay for the specified interface.
LSA Ack Interval	A number representing the OSPF LSA Acknowledgment Interval for the specified interface.

show ip ospf interface stats

This command displays the statistics for a specific interface. The information below will only be displayed if OSPF is enabled. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format.

Format	show ip ospf interface stats *{unit/slot/port|vlan 1-4093}*
Modes	- Privileged EXEC - User EXEC

Parameter	Definition
OSPF Area ID	The area id of this OSPF interface.
Area Border Router Count	The total number of area border routers reachable within this area. This is initially zero, and is calculated in each SPF pass.
AS Border Router Count	The total number of Autonomous System border routers reachable within this area.
Area LSA Count	The total number of link-state advertisements in this area's link-state database, excluding AS External LSAs.
IP Address	The IP address associated with this OSPF interface.
OSPF Interface Events	The number of times the specified OSPF interface has changed its state, or an error has occurred.
Virtual Events	The number of state changes or errors that occurred on this virtual link.
Neighbor Events	The number of times this neighbor relationship has changed state, or an error has occurred.
Sent Packets	The number of OSPF packets transmitted on the interface.
Received Packets	The number of valid OSPF packets received on the interface.
Discards	The number of received OSPF packets discarded because of an error in the packet or an error in processing the packet.
Bad Version	The number of received OSPF packets whose version field in the OSPF header does not match the version of the OSPF process handling the packet.
Source Not On Local Subnet	The number of received packets discarded because the source IP address is not within a subnet configured on a local interface. **NOTE:** This field applies only to OSPFv2.
Virtual Link Not Found	The number of received OSPF packets discarded where the ingress interface is in a non-backbone area and the OSPF header identifies the packet as belonging to the backbone, but OSPF does not have a virtual link to the packet’s sender.
Area Mismatch	The number of OSPF packets discarded because the area ID in the OSPF header is not the area ID configured on the ingress interface.
Invalid Destination Address	The number of OSPF packets discarded because the packet’s destination IP address is not the address of the ingress interface and is not the All-DrRouters or AllSpfRouters multicast addresses.
Wrong Authentication Type	The number of packets discarded because the authentication type specified in the OSPF header does not match the authentication type configured on the ingress interface. **NOTE:** This field applies only to OSPFv2.
Authentication Failure	The number of OSPF packets dropped because the sender is not an existing neighbor or the sender’s IP address does not match the previously recorded IP address for that neighbor. **NOTE:** This field applies only to OSPFv2.
No Neighbor at Source Address	The number of OSPF packets dropped because the sender is not an existing neighbor or the sender’s IP address does not match the previously recorded IP address for that neighbor. **NOTE:** Does not apply to Hellos.
Invalid OSPF Packet Type	The number of OSPF packets discarded because the packet type field in the OSPF header is not a known type.

Parameter	Definition
Hellos Ignored	The number of received Hello packets that were ignored by this router from the new neighbors after the limit has been reached for the number of neighbors on an interface or on the system as a whole.

Table 13 lists the number of OSPF packets of each type sent and received on the interface.

Table 13. *Type of OSPF Packets Sent and Received on the Interface*

Packet Type	Sent	Received
Hello	6960	6960
Database Description	3	3
LS Request	1	1
LS Update	141	42
LS Acknowledgment	40	135

show ip ospf lsa-group

This command displays the number of self-originated LSAs within each LSA group.

Format	show ip ospf lsa-group
Modes	• Privileged EXEC • User EXEC

Field	Description
Total self-originated LSAs	The number of LSAs the router is currently originating.
Average LSAs per group	The number of self-originated LSAs divided by the number of LSA groups. The number of LSA groups is the refresh interval (1800 seconds) divided by the pacing interval (configured with timers pacing lsa-group) plus two.
Pacing group limit	The maximum number of self-originated LSAs in one LSA group. If the number of LSAs in a group exceeds this limit, OSPF redistributes LSAs throughout the refresh interval to achieve better balance.
Groups	For each LSA pacing group, the output shows the range of LSA ages in the group and the number of LSAs in the group.

show ip ospf neighbor

This command displays information about OSPF neighbors. If you do not specify a neighbor IP address, the output displays summary information in a table. If you specify an interface or tunnel, only the information for that interface or tunnel displays, if the interface is a physical routing interface and vlan format if the interface is a routing vlan. The `ip-address` is the IP address of the neighbor, and when you specify this, detailed information about the neighbor displays. The information below only displays if OSPF is enabled and the interface has a neighbor.

Format show ip ospf neighbor [interface {*unit/slot/port*|vlan *1-4093*}] [ip-address]

Modes
- Privileged EXEC
- User EXEC

If you do not specify an IP address, a table with the following columns displays for all neighbors or the neighbor associated with the interface that you specify:

Parameter	Definition
Router ID	The 4-digit dotted-decimal number of the neighbor router.
Priority	The OSPF priority for the specified interface. The priority of an interface is a priority integer from 0 to 255. A value of '0' indicates that the router is not eligible to become the designated router on this network.
IP Address	The IP address of the neighbor.
Interface	The interface of the local router in `unit/slot/port` format.
State	The state of the neighboring routers. Possible values are: • Down—Initial state of the neighbor conversation; no recent information has been received from the neighbor. • Attempt—No recent information has been received from the neighbor but a more concerted effort should be made to contact the neighbor. • Init—An Hello packet has recently been seen from the neighbor, but bidirectional communication has not yet been established. • 2 way—Communication between the two routers is bidirectional. • Exchange start—The first step in creating an adjacency between the two neighboring routers, the goal is to decide which router is the master and to decide upon the initial DD sequence number. • Exchange—The router is describing its entire link state database by sending Database Description packets to the neighbor. • Loading—Link State Request packets are sent to the neighbor asking for the more recent LSAs that have been discovered (but not yet received) in the Exchange state. • Full—The neighboring routers are fully adjacent and they will now appear in router-LSAs and network-LSAs.
Dead Time	The amount of time, in seconds, to wait before the router assumes the neighbor is unreachable.

If you specify an IP address for the neighbor router, the following fields display:

Parameter	Definition
Interface	*unit/slot/port*
Neighbor IP Address	The IP address of the neighbor router.
Interface Index	The interface ID of the neighbor router.
Area ID	The area ID of the OSPF area associated with the interface.
Options	An integer value that indicates the optional OSPF capabilities supported by the neighbor. The neighbor's optional OSPF capabilities are also listed in its Hello packets. This enables received Hello Packets to be rejected (i.e., neighbor relationships will not even start to form) if there is a mismatch in certain crucial OSPF capabilities.
Router Priority	The OSPF priority for the specified interface. The priority of an interface is a priority integer from 0 to 255. A value of '0' indicates that the router is not eligible to become the designated router on this network.

Parameter	Definition
Dead Timer Due	The amount of time, in seconds, to wait before the router assumes the neighbor is unreachable.
Up Time	Neighbor uptime; how long since the adjacency last reached the Full state.
State	The state of the neighboring routers.
Events	The number of times this neighbor relationship has changed state, or an error has occurred.
Retransmitted LSAs	The number of LSAs retransmitted to this neighbor.
Retransmission Queue Length	An integer representing the current length of the retransmission queue of the specified neighbor router Id of the specified interface.
Restart Helper Status	Indicates the status of this router as a helper during a graceful restart of the router specified in the command line: • Helping—This router is acting as a helpful neighbor to this neighbor. A helpful neighbor does not report an adjacency change during graceful restart, but continues to advertise the restarting router as a FULL adjacency. A helpful neighbor continues to forward data packets to the restarting router, trusting that the restarting router's forwarding table is maintained during the restart. • Not Helping—This router is not a helpful neighbor at this time.
Restart Reason	When this router is in helpful neighbor mode, this indicates the reason for the restart as provided by the restarting router: • Unknown (0) • Software restart (1) • Software reload/upgrade (2) • Switch to redundant control processor (3) • Unrecognized - a value not defined in RFC 3623 When CE0128XB/CE0152XB sends a grace LSA, it sets the Restart Reason to Software Restart on a planned warm restart (when the `initiate failover` command is invoked), and to Unknown on an unplanned warm restart.
Remaining Grace Time	The number of seconds remaining the in current graceful restart interval. This is displayed only when this router is currently acting as a helpful neighbor for the router specified in the command.
Restart Helper Exit Reason	Indicates the reason that the specified router last exited a graceful restart. • None—Graceful restart has not been attempted • In Progress—Restart is in progress • Completed—The previous graceful restart completed successfully • Timed Out—The previous graceful restart timed out • Topology Changed—The previous graceful restart terminated prematurely because of a topology change

Example: The following shows example CLI display output for the command.

```
(alpha1) #show ip ospf neighbor 170.1.1.50

Interface.....................................0/17
Neighbor IP Address...........................170.1.1.50
Interface Index...............................17
Area Id.......................................0.0.0.2
Options.......................................0x2
Router Priority...............................1
Dead timer due in (secs)......................15
Up Time.......................................0 days 2 hrs 8 mins 46 secs
```

```
State.........................................Full/BACKUP-DR
Events........................................4
Retransmitted LSAs............................32
Retransmission Queue Length...................0
Restart Helper Status........................ Helping
Restart Reason............................... Software Restart (1)
Remaining Grace Time......................... 10 sec
Restart Helper Exit Reason................... In Progress
```

show ip ospf range

This command displays the set of OSPFv2 area ranges configured for a given area.

Format	show ip ospf range *areaid*
Modes	Privileged EXEC

Parameter	Definition
Prefix	The summary prefix.
Subnet Mask	The subnetwork mask of the summary prefix.
Type	**S** (Summary Link) or **E** (External Link)
Action	**Advertise** or **Suppress**
Cost	Metric to be advertised when the range is active. If a static cost is not configured, the field displays **Auto**. If the action is **Suppress**, the field displays **N/A**.
Active	Whether the range is currently active. **Y** or **N**.

Example: The following shows example CLI display output for the command.

```
(R1) #show ip ospf range 0

     Prefix      Subnet Mask   Type     Action      Cost   Active
   10.1.0.0      255.255.0.0     S  Advertise       Auto      N
 172.20.0.0      255.255.0.0     S  Advertise        500      Y
```

show ip ospf statistics

This command displays information about recent Shortest Path First (SPF) calculations. The SPF is the OSPF routing table calculation. The output lists the number of times the SPF has run for each OSPF area. A table follows this information. For each of the 15 most recent SPF runs, the command shows statistics for how long ago the SPF ran, how long the SPF took, the reasons why the SPF was scheduled, the individual components of the routing table calculation time and to show the RIB update time. The most recent statistics are displayed at the end of the table.

Format	show ip ospf statistics
Modes	Privileged EXEC

Parameter	Definition
Delta T	The time since the routing table was computed. The time is in the format hours, minutes, and seconds (hh:mm:ss).
Intra	The time taken to compute intra-area routes, in milliseconds.

Parameter	Definition
Summ	The time taken to compute inter-area routes, in milliseconds.
Ext	The time taken to compute external routes, in milliseconds.
SPF Total	The total time to compute routes, in milliseconds. The total may exceed the sum of the Intra, Summ, and Ext times.
RIB Update	The time from the completion of the routing table calculation until all changes have been made in the common routing table [the Routing Information Base (RIB)], in milliseconds.
Reason	The event or events that triggered the SPF. Reason codes are as follows: • R - new router LSA • N - new network LSA • SN - new network summary LSA • SA - new ASBR summary LSA • X - new external LSA

Example: The following shows example CLI display output for the command.

```
(Router) #show ip ospf statistics

 Area 0.0.0.0: SPF algorithm executed 15 times

Delta T       Intra     Summ        Ext    SPF Total   RIB Update  Reason

00:05:33         0       0       0        0         0  R
00:05:30         0       0       0        0         0  R
00:05:19         0       0       0        0         0  N, SN
00:05:15         0      10       0       10         0  R, N, SN
00:05:11         0       0       0        0         0  R
00:04:50         0      60       0       60       460  R, N
00:04:46         0      90       0      100        60  R, N
00:03:42         0      70      10       90       160  R
00:03:39         0      70      40      120       240  X
00:03:36         0      60      60      130       160  X
00:01:28         0      60      50      130       240  X
00:01:25         0      30      50      110       310  SN
00:01:22         0       0      40       50       260  SN
00:01:19         0       0      20       20       190  X
00:01:16         0       0       0        0       110  R, X
```

show ip ospf stub table

This command displays the OSPF stub table. The information below will only be displayed if OSPF is initialized on the switch.

Format	show ip ospf stub table
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Area ID	A 32-bit identifier for the created stub area.
Type of Service	The type of service associated with the stub metric. CE0128XB/CE0152XB only supports Normal TOS.
Metric Val	The metric value is applied based on the TOS. It defaults to the least metric of the type of service among the interfaces to other areas. The OSPF cost for a route is a function of the metric value.

Parameter	Definition
Import Summary LSA	Controls the import of summary LSAs into stub areas.

show ip ospf traffic

This command displays OSPFv2 packet and LSA statistics and OSPFv2 message queue statistics. Packet statistics count packets and LSAs since OSPFv2 counters were last cleared (using the "clear ip ospf counters" on page 685 command).

Note: The "clear ip ospf counters" on page 685 command does not clear the message queue high water marks.

Format	show ip ospf traffic
Modes	Privileged EXEC

Parameter	Description
OSPFv2 Packet Statistics	The number of packets of each type sent and received since OSPF counters were last cleared.
LSAs Retransmitted	The number of LSAs retransmitted by this router since OSPF counters were last cleared.
LS Update Max Receive Rate	The maximum rate of LS Update packets received during any 5-second interval since OSPF counters were last cleared. The rate is in packets per second.
LS Update Max Send Rate	The maximum rate of LS Update packets transmitted during any 5-second interval since OSPF counters were last cleared. The rate is in packets per second.
Number of LSAs Received	The number of LSAs of each type received since OSPF counters were last cleared.
OSPFv2 Queue Statistics	For each OSPFv2 message queue, the current count, the high water mark, the number of packets that failed to be enqueued, and the queue limit. The high water marks are not cleared when OSPF counters are cleared.

Example: The following shows example CLI display output for the command.

```
(Router) #show ip ospf traffic

Time Since Counters Cleared:  4000 seconds

OSPFv2 Packet Statistics

      Hello   Database Desc   LS Request   LS Update    LS ACK   Total
Recd:     500             10          20          50       20    600
Sent:     400              8         16          40       16    480

LSAs Retransmitted................0
LS Update Max Receive Rate........20 pps
LS Update Max Send Rate...........10 pps

Number of LSAs Received

T1 (Router).......................10
T2 (Network)......................0
T3 (Net Summary)..................300
T4 (ASBR Summary).................15
T5 (External).....................20
```

```
T7 (NSSA External)................0
T9 (Link Opaque)..................0
T10 (Area Opaque).................0
T11 (AS Opaque)...................0
Total.............................345

OSPFv2 Queue Statistics

         Current    Max    Drops   Limit
Hello          0     10        0     500
ACK            2     12        0    1680
Data          24     47        0     500
Event          1      8        0    1000
```

show ip ospf virtual-link

This command displays the OSPF Virtual Interface information for a specific area and neighbor. The `areaid` parameter identifies the area and the `neighbor` parameter identifies the neighbor's Router ID.

Format	show ip ospf virtual-link *areaid neighbor*
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Area ID	The area id of the requested OSPF area.
Neighbor Router ID	The input neighbor Router ID.
Hello Interval	The configured hello interval for the OSPF virtual interface.
Dead Interval	The configured dead interval for the OSPF virtual interface.
Interface Transmit Delay	The configured transmit delay for the OSPF virtual interface.
Retransmit Interval	The configured retransmit interval for the OSPF virtual interface.
Authentication Type	The configured authentication type of the OSPF virtual interface.
State	The OSPF Interface States are: down, loopback, waiting, point-to-point, designated router, and backup designated router. This is the state of the OSPF interface.
Neighbor State	The neighbor state.

show ip ospf virtual-link brief

This command displays the OSPF Virtual Interface information for all areas in the system.

Format	show ip ospf virtual-link brief
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Area ID	The area id of the requested OSPF area.
Neighbor	The neighbor interface of the OSPF virtual interface.
Hello Interval	The configured hello interval for the OSPF virtual interface.
Dead Interval	The configured dead interval for the OSPF virtual interface.

Parameter	Definition
Retransmit Interval	The configured retransmit interval for the OSPF virtual interface.
Transmit Delay	The configured transmit delay for the OSPF virtual interface.

Routing Information Protocol Commands

This section describes the commands you use to view and configure Routing Information Protocol (RIP), which is a distance-vector routing protocol that you use to route traffic within a small network.

router rip

Use this command to enter Router RIP mode.

Format	router rip
Mode	Global Config

enable (RIP)

This command resets the default administrative mode of RIP in the router (active).

Default	enabled
Format	enable
Mode	Router RIP Config

no enable (RIP)

This command sets the administrative mode of RIP in the router to inactive.

Format	no enable
Mode	Router RIP Config

ip rip

This command enables RIP on a router interface or range of interfaces.

Default	disabled
Format	ip rip
Mode	Interface Config

no ip rip

This command disables RIP on a router interface.

Format	no ip rip
Mode	Interface Config

auto-summary

This command enables the RIP auto-summarization mode.

Default	disabled
Format	auto-summary
Mode	Router RIP Config

no auto-summary

This command disables the RIP auto-summarization mode.

Format	no auto-summary
Mode	Router RIP Config

default-information originate (RIP)

This command is used to control the advertisement of default routes.

Format	default-information originate
Mode	Router RIP Config

no default-information originate (RIP)

This command is used to control the advertisement of default routes.

Format	no default-information originate
Mode	Router RIP Config

default-metric (RIP)

This command is used to set a default for the metric of distributed routes.

Format	default-metric *0-15*
Mode	Router RIP Config

no default-metric (RIP)

This command is used to reset the default metric of distributed routes to its default value.

Format	no default-metric
Mode	Router RIP Config

distance rip

This command sets the route preference value of RIP in the router. Lower route preference values are preferred when determining the best route. A route with a preference of 255 cannot be used to forward traffic.

Default	15
Format	distance rip *1-255*
Mode	Router RIP Config

no distance rip

This command sets the default route preference value of RIP in the router.

Format	no distance rip
Mode	Router RIP Config

distribute-list out (RIP)

This command is used to specify the access list to filter routes received from the source protocol.

Default	0
Format	distribute-list *1-199* out {ospf | static | connected}
Mode	Router RIP Config

no distribute-list out

This command is used to specify the access list to filter routes received from the source protocol.

Format	no distribute-list *1-199* out {ospf | static | connected}
Mode	Router RIP Config

ip rip authentication

This command sets the RIP Version 2 Authentication Type and Key for the specified interface or range of interfaces. The value of *type* is either *none*, *simple*, or *encrypt*. The value for authentication key *[key]* must be 16 bytes or less. The *[key]* is composed of standard displayable, non-control keystrokes from a Standard 101/102-key keyboard. If the value of *type* is *encrypt*, a key ID in the range of 0 and 255 must be specified. Unauthenticated interfaces do not need an authentication key or authentication key ID.

Default	none
Format	ip rip authentication {none | {simple *key*} | {encrypt *key keyid*}}
Mode	Interface Config

no ip rip authentication

This command sets the default RIP Version 2 Authentication Type for an interface.

Format	no ip rip authentication
Mode	Interface Config

ip rip receive version

This command configures an interface or range of interfaces to allow RIP control packets of the specified version(s) to be received.

The value for *mode* is one of: *rip1* to receive only RIP version 1 formatted packets, *rip2* for RIP version 2, *both* to receive packets from either format, or *none* to not allow any RIP control packets to be received.

Default	both
Format	ip rip receive version {rip1 | rip2 | both | none}
Mode	Interface Config

no ip rip receive version

This command configures the interface to allow RIP control packets of the default version(s) to be received.

Format	no ip rip receive version
Mode	Interface Config

ip rip send version

This command configures an interface or range of interfaces to allow RIP control packets of the specified version to be sent. The value for *mode* is one of: *rip1* to broadcast RIP version 1 formatted packets, *rip1c* (RIP version 1 compatibility mode) which sends RIP version 2 formatted packets via broadcast, *rip2* for sending RIP version 2 using multicast, or *none* to not allow any RIP control packets to be sent.

Default	rip2
Format	ip rip send version {rip1 | rip1c | rip2 | none}
Mode	Interface Config

no ip rip send version

This command configures the interface to allow RIP control packets of the default version to be sent.

Format	no ip rip send version
Mode	Interface Config

hostroutesaccept

This command enables the RIP hostroutesaccept mode.

Default	enabled
Format	hostroutesaccept
Mode	Router RIP Config

no hostroutesaccept

This command disables the RIP hostroutesaccept mode.

Format	no hostroutesaccept
Mode	Router RIP Config

split-horizon

This command sets the RIP split horizon mode. Split horizon is a technique for avoiding problems caused by including routes in updates sent to the router from which the route was originally learned. The options are: None - no special processing for this case. Simple - a route will not be included in updates sent to the router from which it was learned. Poisoned reverse - a route will be included in updates sent to the router from which it was learned, but the metric will be set to infinity.

Default	simple
Format	split-horizon {none | simple | poison}
Mode	Router RIP Config

no split-horizon

This command sets the default RIP split horizon mode.

Format	no split-horizon
Mode	Router RIP Config

redistribute (RIP)

This command configures RIP protocol to redistribute routes from the specified source protocol/routers. There are five possible match options. When you submit the command redistribute ospf match *match-type* the match-type or types specified are added to any match types presently being redistributed. Internal routes are redistributed by default.

Default	• metric—not-configured • match—internal
Format for OSPF as source protocol	redistribute ospf [metric *0-15]* [match *[internal] [external 1] [external 2] [nssa-external 1] [nssa-external-2]*]
Format for other source protocol	redistribute {static | connected} [metric *0-15*]
Mode	Router RIP Config

no redistribute

This command de-configures RIP protocol to redistribute routes from the specified source protocol/routers.

Format	no redistribute {ospf | static | connected} [metric] [match *[internal] [external 1] [external 2] [nssa-external 1] [nssa-external-2]*]
Mode	Router RIP Config

show ip rip

This command displays information relevant to the RIP router.

Format	show ip rip

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
RIP Admin Mode	Enable or disable.
Split Horizon Mode	None, simple or poison reverse.
Auto Summary Mode	Enable or disable. If enabled, groups of adjacent routes are summarized into single entries, in order to reduce the total number of entries The default is enable.
Host Routes Accept Mode	Enable or disable. If enabled the router accepts host routes. The default is enable.
Global Route Changes	The number of route changes made to the IP Route Database by RIP. This does not include the refresh of a route's age.
Global queries	The number of responses sent to RIP queries from other systems.
Default Metric	The default metric of redistributed routes if one has already been set, or blank if not configured earlier. The valid values are 1 to 15.
Default Route Advertise	The default route.

show ip rip interface brief

This command displays general information for each RIP interface. For this command to display successful results routing must be enabled per interface (i.e., ip rip).

Format show ip rip interface brief

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Interface	*unit/slot/port*
IP Address	The IP source address used by the specified RIP interface.
Send Version	The RIP version(s) used when sending updates on the specified interface. The types are none, RIP-1, RIP-1c, RIP-2
Receive Version	The RIP version(s) allowed when receiving updates from the specified interface. The types are none, RIP-1, RIP-2, Both
RIP Mode	The administrative mode of router RIP operation (enabled or disabled).
Link State	The mode of the interface (up or down).

show ip rip interface

This command displays information related to a particular RIP interface. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format.

Format show ip rip interface {*unit/slot/port*|*vlan 1-4093*}

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Interface	`unit/slot/port` This is a configured value.
IP Address	The IP source address used by the specified RIP interface. This is a configured value.
Send Version	The RIP version(s) used when sending updates on the specified interface. The types are none, RIP-1, RIP-1c, RIP-2. This is a configured value.
Receive Version	The RIP version(s) allowed when receiving updates from the specified interface. The types are none, RIP-1, RIP-2, Both. This is a configured value.
RIP Admin Mode	RIP administrative mode of router RIP operation; enable activates, disable de-activates it. This is a configured value.
Link State	Indicates whether the RIP interface is up or down. This is a configured value.
Authentication Type	The RIP Authentication Type for the specified interface. The types are none, simple, and encrypt. This is a configured value.

The following information will be invalid if the link state is down.

Parameter	Definition
Bad Packets Received	The number of RIP response packets received by the RIP process which were subsequently discarded for any reason.
Bad Routes Received	The number of routes contained in valid RIP packets that were ignored for any reason.
Updates Sent	The number of triggered RIP updates actually sent on this interface.

ICMP Throttling Commands

This section describes the commands you use to configure options for the transmission of various types of ICMP messages.

ip unreachables

Use this command to enable the generation of ICMP Destination Unreachable messages on an interface or range of interfaces. By default, the generation of ICMP Destination Unreachable messages is enabled.

Default	enable
Format	ip unreachables
Mode	Interface Config

no ip unreachables

Use this command to prevent the generation of ICMP Destination Unreachable messages.

Format	no ip unreachables
Mode	Interface Config

ip redirects

Use this command to enable the generation of ICMP Redirect messages by the router. By default, the generation of ICMP Redirect messages is enabled. You can use this command to configure an interface, a range of interfaces, or all interfaces.

Default	enable
Format	ip redirects
Mode	• Global Config • Interface Config • Virtual Router Config

no ip redirects

Use this command to prevent the generation of ICMP Redirect messages by the router.

Format	no ip redirects
Mode	• Global Config • Interface Config

ipv6 redirects

Use this command to enable the generation of ICMPv6 Redirect messages by the router. By default, the generation of ICMP Redirect messages is enabled. You can use this command to configure an interface, a range of interfaces, or all interfaces.

Default	enable
Format	ipv6 redirects
Mode	Interface Config

no ipv6 redirects

Use this command to prevent the generation of ICMPv6 Redirect messages by the router.

Format	no ipv6 redirects
Mode	Interface Config

ip icmp echo-reply

Use this command to enable the generation of ICMP Echo Reply messages by the router. By default, the generation of ICMP Echo Reply messages is enabled.

Default	enable
Format	ip icmp echo-reply
Mode	• Global Config • Virtual Router Config

no ip icmp echo-reply

Use this command to prevent the generation of ICMP Echo Reply messages by the router.

Format	no ip icmp echo-reply
Mode	Global Config

ip icmp error-interval

Use this command to limit the rate at which IPv4 ICMP error messages are sent. The rate limit is configured as a token bucket, with two configurable parameters, *burst-size* and *burst-interval*.

The *burst-interval* specifies how often the token bucket is initialized with *burst-size* tokens. *burst-interval* is from 0 to 2147483647 milliseconds (msec). The *burst-size* is the number of ICMP error messages that can be sent during one *burst-interval*. The range is from 1 to 200 messages. To disable ICMP rate limiting, set *burst-interval* to zero (0).

Default	• *burst-interval* of 1000 msec. • *burst-size* of 100 messages
Format	ip icmp error-interval *burst-interval [burst-size]*
Mode	• Global Config • Virtual Router Config

no ip icmp error-interval

Use the `no` form of the command to return *burst-interval* and *burst-size* to their default values.

Format	no ip icmp error-interval
Mode	Global Config

Bidirectional Forwarding Detection Commands

Bidirectional Forwarding Detection (BFD) verifies bidirectional connectivity between forwarding engines, which can be a single or multi-hop away. The protocol works over any underlying transmission mechanism and protocol layer with a wide range of detection times, especially in scenarios where fast failure detection is required in data plane level for multiple concurrent sessions.

Use the following commands to configure Bidirectional Forwarding Detection commands (BFD).

feature bfd

This command enables BFD on the device. Note that BFD must be enabled in order to configure other protocol and interface parameters.

Default	disabled
Format	feature bfd
Mode	Global Config

no feature bfd

Disables BFD globally and removes runtime session data. Static configurations are retained.

Format	no feature bfd
Mode	Global Config

Example:

```
(Router)# configure
(Router) (Config)# feature bfd
(Router) (Config)# exit
```

bfd

This command enables BFD on all interfaces associated with the OSPF process. BFD must be enabled on the individual interface to trigger BFD on that interface.

Default	disabled
Format	bfd
Mode	Router OSPF Config

Example: Do the following to trigger BFD processing through OSPF globally on all the interfaces that are associated with it.

```
(Router) (Config)# router ospf
(Router) (Config-router)# bfd
(Router) (Config-router)# exit
```

no bfd

This command disables BFD globally on all interfaces associated with the OSPF process.

Format	no bfd
Mode	Router OSPF Config

bfd echo

This command enables BFD echo mode on an IP interface.

Default	disabled
Format	bfd echo
Mode	Interface Config

Example:

```
(Router) (Config)# interface 1/0/1
(Router) (Interface 1/0/1)# no bfd echo
(Router) (Interface 1/0/1)# exit
```

no bfd echo

This command disables BFD echo mode on an IP interface.

Format	no bfd echo
Mode	Interface Config

bfd interval

This command configures the BFD session parameters for all available interfaces on the device (Global Config mode) or IP interface (Interface Config mode). It overwrites any BFD configurations present on individual interfaces (Global Config mode) or globally configured BFD session parameters (Interface Config).

Default	none
Format	bfd interval *transmit-interval* min_rx *minimum-receive-interval* multiplier *detection-time-multiplier*
Mode	• Global Config • Interface Config

Parameters	Description
transmit-interval	The desired minimum transmit interval, which is the minimum interval that the user wants to use while transmitting BFD control packets. It is represented in milliseconds. Its range is 100 ms to 1000 ms (with a change granularity of 100) a with default value of 100 ms.

Parameters	Description
minimum-receive-interval	The required minimum receive interval, which is the minimum interval at which the system can receive BFD control packets. It is represented in milliseconds. Its range is 100 ms to 1000 ms (with a change granularity of 100) with a default value of 100 ms.
detection-time-multiplier	The number of BFD control packets that must be missed in a row to declare a session down. Its range is 1 to 50 with default value of 3.

Example: The following steps configure BFD session parameters on the device, in Privileged EXEC mode.

```
(Router)# configure
(Router) (Config)# bfd interval 100 min_rx 200 multiplier 5
(Router) (Config)# exit
```

Example: The following steps configure BFD session parameters on an interface (for example, 1/0/1).

```
(Router) (Config)# interface 1/0/1
(Router) (Interface 1/0/1)# bfd interval 100 min_rx 200 multiplier 5
(Router) (Interface 1/0/1)# exit
```

no bfd interval

In Global Config mode, this command resets the BFD session parameters for all available interfaces on the device to their default values. In Interface Config mode, this command resets the BFD session parameters for all sessions on an IP interface to their default values.

Format	no bfd interval
Mode	• Global Config • Interface Config

bfd slow-timer

This command sets up the required echo receive interval preference value. This value determines the interval the asynchronous sessions use for BFD control packets the when echo function is enabled. The slow-timer value is used as the new control packet interval, while the echo packets use the configured BFD intervals.

Default	2000
Format	bfd slow-timer *echo-receive-interval*
Mode	Global Config

Parameters	Description
echo-receive-interval	The value is represented in milliseconds. Its range is 1000 ms to 30000 ms (with a change granularity of 100) with default value of 2000 ms.

Example:

```
(Router)# configure
(Router) (Config)# bfd slow-timer 10000
```

```
(Router) (Config)# exit
```

no bfd slow-timer

This command resets the BFD slow-timer preference value to its default.

Format	no bfd slow-timer
Mode	Global Config

ip ospf bfd

This command enables BFD on interfaces associated with the OSPF process.

Default	disabled
Format	ip ospf bfd
Mode	Interface Config

ip ospf bfd

This command disables BFD on interfaces associated with the OSPF process.

Default	disabled
Format	no ip ospf bfd
Mode	Interface Config

show bfd neighbors

This command displays the BFD adjacency list showing the active BFD neighbors.

Format	show bfd neighbors [details]
Mode	Privileged EXEC

Parameters	Description
details	Provides additional details with the routing protocol BFD has registered and displays the Admin Mode status as Enabled or Disabled.

The following information is displayed.

Parameters	Description
Our IP address	The current IP address.
Neighbor IP address	The IP address of the active BFD neighbor.
State	The current state, either Up or Down.
Interface	The current interface.
Uptime	The amount of time the interface has been up.
Registered Protocol	The protocol from which the BFD session was initiated and that is registered to receive events from BFD. (for example, OSPF).

Parameters	Description
Local Diag	The diagnostic state specifying the reason for the most recent change in the local session state.
Demand mode	Indicates if the system wishes to use Demand mode. **NOTE:** Demand mode is not supported in the current CE0128XB/CE0152XB release.
Minimum transmit interval	The minimum interval to use when transmitting BFD control packets.
Actual TX Interval	The transmitting interval being used for control packets.
Actual TX Echo interval	The transmitting interval being used for echo packets.
Minimum receive interval	The minimum interval at which the system can receive BFD control packets.
Detection interval multiplier	The number of BFD control packets that must be missed in a row to declare a session down.
My discriminator	Unique Session Identifier for Local BFD Session.
Your discriminator	Unique Session Identifier for Remote BFD Session.
Tx Count	The number of transmitted BFD packets.
Rx Count	The number of received BFD packets.
Drop Count	The number of dropped packets.

Example:

```
(Router)# show bfd neighbors

Admin Mode: Enabled

OurAddr        NeighAddr      State      Interface   Uptime
--------------  ---------------  ----------  ----------  ----------
192.168.20.1   192.168.20.2    Up        1/0/77       0:0:21:30
2001::1        2001::2         Up        1/0/78       0:0:0:18
(Router)# show bfd neighbors details

Admin Mode: Enabled

Our IP address................................ 2.1.1.1
Neighbor IP address........................... 2.1.1.2
State......................................... Up
Interface..................................... 0/15
Uptime........................................ 0:0:0:10
Registered Protocol........................... OSPF
Local Diag.................................... None
Demand mode................................... FALSE
Minimum transmit interval..................... 100
Minimum receive interval...................... 100
Actual tx interval............................ 100
Actual tx echo interval....................... 0
Detection interval multiplier................. 3
My discriminator.............................. 1
Your discriminator............................ 1
Tx Count...................................... 105
Rx Count...................................... 107
Drop Count.................................... 0
```

debug bfd event

This command displays BFD state transition information.

Format	debug bfd event
Mode	Privileged EXEC

debug bfd packet

This command displays BFD control packet debugging information.

Format	debug bfd packet
Mode	Privileged EXEC

IP Service Level Agreement Commands

The IP service-level agreement (SLA) feature allows users to monitor network performance between routers or from a router to a remote IP device. CE0128XB/CE0152XB supports the following measurement capabilities:

- Remote IP reachability tracking.
- Round-trip-time threshold monitoring

These metrics are collected by measuring ICMP response time and connectivity. This feature is deployed mostly in Enterprise networks on multi-homed customer edge devices, where there is a need to automatically switch to the next priority ISP in case of reachability issues with the current ISP.

ip sla

Use this command to start configuring an IP Service Level Agreements (SLAs) operation and enter the IP SLA configuration mode.

Default	No IP SLA operation is configured.
Format	ip sla *operation-number*
Mode	Global Config

Parameters	Description
operation-number	Identifies the IP SLAs operation being configured. The range is from 1 to 128.

Usage Guidelines

Start configuring an IP SLA operation by using the `ip sla` command. This command specifies an identification number for the operation to being configured. Once this command is entered, the router enters IP SLA configuration mode.

This command is supported in IPv4 networks and also for IPv6 networks where IPv6 addresses are supported.

The maximum number of IP SLAs supported is 128 (IPv4 and IPv6 combined).

Once an operation is configured it needs to be scheduled to be started. Refer to the `ip sla schedule` global configuration command for more details on scheduling of an operation.

Note: The configuration of an operation cannot be modified after an operation has been scheduled to start. For modifying the configuration of the operation after it is scheduled, the operation must either be stopped or must be deleted first (using the `no ip sla` command) and then reconfigured with new operation parameters.

To display the current operational state of an IP SLA operation, use the `show ip sla configuration` command in user EXEC or privileged EXEC mode.

Example: The following example shows an operation 55 being configured as an ICMP Echo operation in an IPv4 network and being scheduled to start. In the below example the `ip sla` command being used in an IPv4 network is shown.

```
(Routing)(config)# ip sla 55
(Routing)(config-ip-sla)#icmp-echo 172.16.1.175
(Routing) (config-ip-sla-echo)#exit
(Routing)(config-ip-sla)#exit
(Routing)(config)# ip sla schedule 55
```

Note: In case the operation 55 is already configured and has not been scheduled, the command line interface will enter IP SLA configuration mode for operation 55. If the operation already exists and has been scheduled, this command will fail.

no ip sla

Use this command to remove all the configuration information of an IP SLA operation, which also includes removing the schedule of the operation.

Format	no ip sla *operation-number*
Mode	Global Config

ip sla schedule

After configuring an IP SLA operation, the IP SLA is in pending state and needs to be started using the `ip sla schedule` global configuration command. To stop the operation and place it in the default state (pending), use the `no` form of this command.

Default	By default the operation is put in a pending state. In the pending state the operation is enabled but does not actively probe and collect information.
Format	ip sla schedule *operation-number*
Mode	Global Config

Parameters	Description
operation-number	Identifies the IP SLAs operation being configured. The range is from 1 to 128.

Usage Guidelines

By default IP SLAs are not scheduled to start. Once an IP SLA object is created using the `ip sla` global configuration command it needs to be started (with a lifetime of forever) by using the `ip sla schedule` CLI configuration command. When an `ip sla schedule` command is issued the ip sla operation transitions from pending state to active and immediately begins probing and collecting information. The IP SLA probes can be stopped by unconfiguring the IP SLA schedule config by using the `no ip sla schedule` command.

This command is supported in IPv4 networks and also for IPv6 networks where IPv6 addresses are supported.

Note: After you schedule an operation, you cannot modify the configuration of the operation. To modify the configuration of the operation after it is scheduled, you must first stop the operation by using the `no ip schedule` command and then modify the configuration. Or else you must first delete the IP SLAs operation (using the `no ip sla` command) and then reconfigure the operation with the new operation parameters.

To display the current configuration settings of the operation, use the `show ip sla configuration` command in user EXEC or privileged EXEC mode.

Example: In the following example, operation 55 is configured as a ICMP Echo operation in an IPv4 network and is scheduled to start. The example shows the `ip sla schedule` command being used in an IPv4 network.

```
(Routing)(config)# ip sla 55
(Routing)(config-ip-sla)# icmp-echo 172.16.1.175
(Routing) (config-ip-sla-echo)#exit
(Routing)(config-ip-sla)#exit
(Routing)(config)# ip sla schedule 55
```

no ip sla schedule

Use this command to stop the operation and place it in the default state (pending).

Format	no ip sla schedule *operation-number*
Mode	Global Config

track ip sla

Use this command to track the state of an IP Service Level Agreements (SLAs) operation and to enter tracking configuration mode.

Default	disabled
Format	track object-number ip sla operation-number [reachability | state]
Mode	Global Config

Parameters	Description
object-number	Identifies the object to be tracked. The range is from 1 to 128.
operation-number	Identifies the IP SLAs operation to be tracked.
reachability	Tracks whether the route is reachable.
state	Tracks the operation return code.

Usage Guidelines

An operation return-code value is maintained by every IP SLAs operation. This return code is interpreted by the tracking process. The return code may return OK, OverThreshold, and Timeout.

Two facets of an IP SLAs operation can be tracked: reachability and state. The acceptance of the OverThreshold return code is the difference between these facets. Table 1 below shows the comparison between the reachability and state facets of IP SLAs operations that can be tracked.

Table 14. *Comparison of Reachability and State Operations*

Tracking	Return Code	Track State
Reachability	OK or OverThreshold Timeout	Up Down

Table 14. *Comparison of Reachability and State Operations*

Tracking	Return Code	Track State
State	OK	Up
	Timeout, OverThreshold	Down

Tracking of a maximum of 128 (IPv4 and IPv6 combined) track objects is supported. If neither of the optional keywords (`reachability` or `state`) is specified in a configured `track ip sla` CLI command, then the default tracking type value `reachability` gets configured.

Example:

In the following example, the tracking process is configured to track the *state* of IP SLAs operation 5:

```
(Routing)(config)# track 2 ip sla 5 state
```

In the following example, the tracking process is configured to track the *reachability* of IP SLAs operation 6:

```
(Routing)(config)# track 3 ip sla 6 reachability
```

no track ip sla

Use this command to remove the tracking.

Format	no track object-number
Mode	Global Config

Track Configuration Mode Commands

delay

To configure a delay for acting upon a track object reachability state changes, use the `delay` command in Track configuration mode.

Default	none
Format	delay {up *seconds* [down *seconds*] | [down *seconds*] up *seconds*}
Mode	Track Config

Parameters	Description
up *seconds*	Time to delay the notification of an up event. Delay value, in seconds. The range is from 0 to 180. The default is 0.
down *seconds*	Time to delay the notification of an down event. Delay value, in seconds. The range is from 0 to 180. The default is 0.

Usage Guidelines

To minimize flapping of the reachability state (Up/Down), use the `delay` command to introduce a non-zero delay in seconds between the UP and DOWN state transitions per Track object.

Delay time specifies the hold interval for an (UP/DOWN) state before taking action on the associated static routes.

Example:

In the following example, Track object 10 is created and is associated with the IP SLAs operation 11 and then an up delay of 5 seconds and a down delay of 3 seconds is configured:

```
(Routing)(config)#track 10 ip sla 11
(Routing)(config-track)#delay up 5 down 3
```

no delay

Use this command to reset the delay for acting upon a track object reachability state changes to the default value.

Format	no delay
Mode	Track Config

IP SLA Configuration Mode Commands

icmp-echo

Use this command in IP SLA configuration mode, to configure an IP Service Level Agreements (SLAs) Internet Control Message Protocol (ICMP) echo operation.

Default	No IP SLAs operation type is configured for the operation being configured.
Format	icmp-echo *destination-ip-address* [source-interface {*interface-name* | vlan *vlan-id*}]
Mode	IP SLA Config

Parameters	Description
destination-ip-address	Destination IPv4 or IPv6 address.
source-interface {interface-name | vlan vlan-id}	Used to specify the source interface for the operation.

Usage Guidelines

You must configure the type of IP SLAs operation (ICMP echo) before you can configure any of the other parameters of the operation. To change the operation values (`destination-ip-address` or `source-interface-name`) of an existing scheduled IP SLAs ICMP echo operation, you must stop the IP SLA operation by using the `no ip sla schedule operation-number`. Or else you must first delete the IP SLAs operation (using the `no ip sla global configuration` command) and then reconfigure the operation with the new operation values.

IP SLAs ICMP echo operations support both IPv4 and IPv6 addresses.

Example:

In the following example, IP SLAs operation 12 is created and configured as an echo operation using the ICMP protocol and the destination IPv4 address 143.1.16.125:

```
(Routing)(config)#ip sla 12
(Routing)(config-ip-sla)#icmp-echo 143.1.16.125
```

In the following example, IP SLAs operation 13 is created and configured as an echo operation using the ICMP protocol and the destination IPv6 address 3001:CD6:200::1:

```
(Routing)(config)#ip sla 13
(Routing)(config-ip-sla)#icmp-echo 3001:CD6:200::1
```

Clear Commands

clear ip sla statistics

Use this command to clear IP SLA statistical information for given IP SLA operation or all IP SLAs.

Format	clear ip sla statistics [operation-number]
Mode	Privileged Exec

Parameters	Description
operation-number	IP SLA number of a specific operation whose statistics needs to be cleared.

Show Commands

show ip sla configuration

Use this command in user EXEC or privileged EXEC mode to see the configuration values (including all defaults) for a specified IP SLAs operation or all operations.

Format	show ip sla configuration [*operation-number*]
Mode	Privileged Exec

Parameters	Description
operation-number	IP SLA number of a specific operation associated with the statistics to display.

Example:

IP SLAs Internet Control Message Protocol (ICMP) echo operations support both IPv4 and IPv6 addresses. The sample outputs from the `show ip sla configuration` command for different IP SLAs operations in IPv4 and IPv6 networks are shown below.

```
(Routing)#show ip sla configuration 3

Entry number: 3
Type of operation: echo
Target address/Source address: 1.1.1.1/0.0.0.0
```

```
Operation timeout (milliseconds): 5000
Vrf Name:
Schedule:
   Next Scheduled Start Time: Start Time already passed
   Operation frequency (seconds): 60
   Life: Forever
Threshold (milliseconds): 5000
```

In the following example the output from the `show ip sla configuration` command when the specified operation is an ICMP echo operation in an IPv6 network is shown:

```
(Routing)#show ip sla configuration 5

Entry number: 3
Type of operation: echo
Target address/Source address: 2001:DB8:100::1/2001:0DB8:200::FFFE
Operation timeout (milliseconds): 5000
Vrf Name:
Schedule:
   Next Scheduled Start Time: Pending Trigger
   Operation frequency (seconds): 60
   Life: Forever
Threshold (milliseconds): 5000
```

show ip sla statistics

Use this command in user EXEC or privileged EXEC mode to see the statistics and the current operational status of a specified IP SLA operation or of all operations.

Format	show ip sla statistics [*operation-number*] [details]
Mode	Privileged Exec

Parameters	Description
operation-number	IP SLA operation number for which statistics and the operational status are displayed.
details	Include this option to display statistics and the operational status in greater detail.

Usage Guidelines

This command shows the current state of IP SLAs operations, including whether the operation is active and also the monitoring data returned for the last (most recently completed) operation.

Example:

```
(Routing)# show ip sla statistics details

Round Trip Time (RTT) for      Index 1
Type of operation: icmp-echo
      Latest RTT: 1 ms
Latest operation start time: 47 milliseconds
Latest operation return code: OK
Over thresholds occurred: FALSE
Number of successes: 14
Number of failures: 0
Operation time to live: Forever
Operational state of entry: Active
```

show ip route track-table

This command displays information for all tracked IPv4 static routes for a given VRF or the default the VRF.

Format	show ip route [vrf *vrf-name*] track-table
Mode	Privileged Exec

Parameters	Description
vrf vrf-name	Displays all tracked static routes associated with a specific VRF.

Example:

```
(Routing)#show ip route track-table

ip route 0.0.0.0 0.0.0.0 10.130.167.129 track 10 state is [up]
```

show ipv6 route track-table

This command displays information about all IPv6 static routes being tracked.

Format	show ipv6 route track-table
Mode	Privileged Exec

Example:

```
(Routing)#show ipv6 route track-table

ipv6 route 2001:B66::/32 4001::1 track 15 state is [up]
```

show track

This command is used display detailed information for all track objects or for a specific track-object. This command is also used to display brief information for all track objects or for track-objects associated with a given IP SLA operation.

Format	show track [brief | *track-number* | {ip sla *operation-number*}]
Mode	Privileged Exec

Parameters	Description
brief	Displays brief information for all track objects.
track-number	The track object's number with the detailed information to display.
ip sla operation-number	IP SLA operation number of whose associated track-objects related brief information needs to be displayed.

Example: The following example shows detailed information for all track objects.

```
(Routing)#show track

Track 10
```

```
 IP SLA 1 reachability
 Reachability is Up
   1 change, last change 01:12:36
 Delay up 5 secs, down 5 secs
 Latest operation return code: OK
 Latest RTT (millisecs) 1500

Track 11
 IP SLA 2 state
 State is Up
   1 change, last change 00:41:55
 Delay up 10 secs, down 10 secs
 Latest operation return code: OK
 Latest RTT (millisecs) 1000

Track 13
 IP SLA 1 state
 State is Up
   1 change, last change 00:34:08
 Delay up 5 secs, down 5 secs
 Latest operation return code: OK
 Latest RTT (millisecs) 1500
```

Example: The following example shows detailed information for track object 10.

```
(Routing)#show track 10

Track 10
 IP SLA 1 reachability
 Reachability is Up
   1 change, last change 01:12:36
 Delay up 5 secs, down 5 secs
 Latest operation return code: OK
 Latest RTT (millisecs) 1500
```

Example: The following example shows brief information for all track objects associated with IP SLA operation 1.

```
(Routing)#show track ip sla 1

Track   Object          Parameter      Value Last Change
10      ip sla    1     reachability   Up    01:12:36
13      ip sla    1     state          Up    00:34:08
```

Example: The following example shows brief information for all track objects.

```
(Routing)#show track brief

Track   Object          Parameter      Value Last Change
10      ip sla    1     reachability   Up    01:12:36
11      ip sla    2     state          Up    00:41:55

13      ip sla    1     state          Up    00:34:08
```

Chapter 8. IPv6 Management Commands

This chapter describes the IPv6 commands available in the CE0128XB/CE0152XB CLI.

Note: The commands in this chapter are in one of three functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Clear commands clear some or all of the settings to factory defaults.

IPv6 Management Commands

IPv6 Management commands allow a device to be managed via an IPv6 address in a switch or IPv4 routing (i.e., independent from the IPv6 Routing package). For Routing/IPv6 builds of CE0128XB/CE0152XB dual IPv4/IPv6 operation over the service port is enabled. CE0128XB/CE0152XB has capabilities such as:

- Static assignment of IPv6 addresses and gateways for the service/network ports.
- The ability to ping an IPv6 link-local address over the service/network port.
- Using IPv6 Management commands, you can send SNMP traps and queries via the service/network port.
- The user can manage a device via the network port (in addition to a Routing Interface or the Service port).

serviceport ipv6 enable

Use this command to enable IPv6 operation on the service port. By default, IPv6 operation is enabled on the service port.

Default	enabled
Format	serviceport ipv6 enable
Mode	Privileged EXEC

no serviceport ipv6 enable

Use this command to disable IPv6 operation on the service port.

Format	no serviceport ipv6 enable
Mode	Privileged EXEC

network ipv6 enable

Use this command to enable IPv6 operation on the network port. By default, IPv6 operation is enabled on the network port.

Default	enabled

Format network ipv6 enable

Mode Privileged EXEC

no network ipv6 enable

Use this command to disable IPv6 operation on the network port.

Format no network ipv6 enable

Mode Privileged EXEC

serviceport ipv6 address

Use the options of this command to manually configure IPv6 global address, enable/disable stateless global address autoconfiguration and to enable/disable dhcpv6 client protocol information on the service port.

Note: Multiple IPv6 prefixes can be configured on the service port.

Format serviceport ipv6 address {*address/prefix-length* [eui64]|autoconfig|dhcp}

Mode Privileged EXEC

Parameter	Description
address	IPv6 prefix in IPv6 global address format.
prefix-length	IPv6 prefix length value.
eui64	Formulate IPv6 address in eui64 address format.
autoconfig	Configure stateless global address autoconfiguration capability.
dhcp	Configure dhcpv6 client protocol.

no serviceport ipv6 address

Use the command `no serviceport ipv6 address` to remove all configured IPv6 prefixes on the service port interface.

Use the command with the address option to remove the manually configured IPv6 global address on the network port interface.

Use the command with the `autoconfig` option to disable the stateless global address autoconfiguration on the service port.

Use the command with the `dhcp` option to disable the dhcpv6 client protocol on the service port.

Format no serviceport ipv6 address {*address/prefix-length* [eui64] | autoconfig | dhcp}

Mode Privileged EXEC

serviceport ipv6 gateway

Use this command to configure IPv6 gateway (i.e. Default routers) information for the service port.

Note: Only a single IPv6 gateway address can be configured for the service port. There may be a combination of IPv6 prefixes and gateways that are explicitly configured and those that are set through auto-address configuration with a connected IPv6 router on their service port interface.

Format	serviceport ipv6 gateway *gateway-address*
Mode	Privileged EXEC

Parameter	Description
gateway-address	Gateway address in IPv6 global or link-local address format.

no serviceport ipv6 gateway

Use this command to remove IPv6 gateways on the service port interface.

Format	no serviceport ipv6 gateway
Mode	Privileged EXEC

serviceport ipv6 neighbor

Use this command to manually add IPv6 neighbors to the IPv6 neighbor table for the service port. If an IPv6 neighbor already exists in the neighbor table, the entry is automatically converted to a static entry. Static entries are not modified by the neighbor discovery process. They are, however, treated the same for IPv6 forwarding. Static IPv6 neighbor entries are applied to the kernel stack and to the hardware when the corresponding interface is operationally active.

Format	serviceport ipv6 neighbor *ipv6-address macaddr*
Mode	Privileged EXEC

Parameter	Description
ipv6-address	The IPv6 address of the neighbor or interface.
macaddr	The link-layer address.

no serviceport ipv6 neighbor

Use this command to remove IPv6 neighbors from the IPv6 neighbor table for the service port.

Format	no serviceport ipv6 neighbor *ipv6-address macaddr*
Mode	Privileged EXEC

network ipv6 address

Use the options of this command to manually configure IPv6 global address, enable/disable stateless global address autoconfiguration and to enable/disable dhcpv6 client protocol information for the network port. Multiple IPv6 addresses can be configured on the network port.

Format	network ipv6 address {*address/prefix-length* [eui64] | autoconfig | dhcp}
Mode	Privileged EXEC

Parameter	Description
address	IPv6 prefix in IPv6 global address format.
prefix-length	IPv6 prefix length value.
eui64	Formulate IPv6 address in eui64 format.
autoconfig	Configure stateless global address autoconfiguration capability.
dhcp	Configure dhcpv6 client protocol.

no network ipv6 address

The command `no network ipv6 address` removes all configured IPv6 prefixes.

Use this command with the `address` option to remove the manually configured IPv6 global address on the network port interface.

Use this command with the `autoconfig` option to disable the stateless global address autoconfiguration on the network port.

Use this command with the `dhcp` option disables the dhcpv6 client protocol on the network port.

Format	no network ipv6 address {*address/prefix-length* [eui64] | autoconfig | dhcp}
Mode	Privileged EXEC

network ipv6 gateway

Use this command to configure IPv6 gateway (i.e. default routers) information for the network port.

Format	network ipv6 gateway *gateway-address*
Mode	Privileged EXEC

Parameter	Description
gateway-address	Gateway address in IPv6 global or link-local address format.

no network ipv6 gateway

Use this command to remove IPv6 gateways on the network port interface.

Format	no network ipv6 gateway
Mode	Privileged EXEC

network ipv6 neighbor

Use this command to manually add IPv6 neighbors to the IPv6 neighbor table for this network port. If an IPv6 neighbor already exists in the neighbor table, the entry is automatically converted to a static entry. Static entries are not modified by the neighbor discovery process. They are, however, treated the same for IPv6 forwarding. Static IPv6 neighbor entries are applied to the kernel stack and to the hardware when the corresponding interface is operationally active.

Format	network ipv6 neighbor *ipv6-address macaddr*
Mode	Privileged EXEC

Parameter	Description
ipv6-address	The IPv6 address of the neighbor or interface.
macaddr	The link-layer address.

no network ipv6 neighbor

Use this command to remove IPv6 neighbors from the neighbor table.

Format	no network ipv6 neighbor *ipv6-address macaddr*
Mode	Privileged EXEC

show network ipv6 neighbors

Use this command to display the information about the IPv6 neighbor entries cached on the network port. The information is updated to show the type of the entry.

Default	none
Format	show network ipv6 neighbors
Mode	Privileged EXEC

Field	Description
IPv6 Address	The IPv6 address of the neighbor.
MAC Address	The MAC Address of the neighbor.
isRtr	Shows if the neighbor is a router. If TRUE, the neighbor is a router; FALSE it is not a router.
Neighbor State	The state of the neighbor cache entry. Possible values are: Incomplete, Reachable, Stale, Delay, Probe, and Unknown
Age	The time in seconds that has elapsed since an entry was added to the cache.
Last Updated	The time in seconds that has elapsed since an entry was added to the cache.

Field	Description
Type	The type of neighbor entry. The type is Static if the entry is manually configured and Dynamic if dynamically resolved.

Example: The following is an example of the command.

```
(Routing) #show network ipv6 neighbors
                                    Neighbor  Age
IPv6 Address           MAC Address       isRtr State    (Secs)      Type
------------------------ ----------------- ----- --------- ------     ------
FE80::5E26:AFF:FEBD:852C 80:96:21:bd:85:2c FALSE Reachable 0         Static
```

show serviceport ipv6 neighbors

Use this command to displays information about the IPv6 neighbor entries cached on the service port. The information is updated to show the type of the entry.

Default	none
Format	show serviceport ipv6 neighbors
Mode	Privileged EXEC

Field	Description
IPv6 Address	The IPv6 address of the neighbor.
MAC Address	The MAC Address of the neighbor.
isRtr	Shows if the neighbor is a router. If TRUE, the neighbor is a router; if FALSE, it is not a router.
Neighbor State	The state of the neighbor cache entry. The possible values are: Incomplete, Reachable, Stale, Delay, Probe, and Unknown.
Age	The time in seconds that has elapsed since an entry was added to the cache.
Type	The type of neighbor entry. The type is Static if the entry is manually configured and Dynamic if dynamically resolved.

Example: The following is an example of the command.

```
(Routing) #show serviceport ipv6 neighbors

                                              Neighbor  Age
IPv6 Address                       MAC Address       isRtr State    (Secs)   Type
--------------------------------------- ---------------- ----- --------- ------  --------
FE80::5E26:AFF:FEBD:852C            5c:26:0a:bd:85:2c FALSE Reachable 0      Dynamic
```

ping ipv6

Use this command to determine whether another computer is on the network. Ping provides a synchronous response when initiated from the CLI interface. To use the command, configure the switch for network (in-band) connection. The source and target devices must have the ping utility enabled and running on top of TCP/IP. The switch can be pinged from any IP workstation with which the switch is connected through the default VLAN (VLAN 1), as long as there is a physical path between the switch and the workstation. The terminal interface sends three pings to the target station. Use the `ipv6-address|hostname` parameter to ping an interface by using the global IPv6 address of the interface. Use the optional `size` keyword to specify the size of the ping packet. Use the `outgoing-interface` option to specify the outgoing interface for a multicast IP/IPv6 ping.

You can utilize the ping or traceroute facilities over the service/network ports when using an IPv6 global address `ipv6-global-address|hostname`. Any IPv6 global address or gateway assignments to these interfaces will cause IPv6 routes to be installed within the IP stack such that the ping or traceroute request is routed out the service/network port properly. When referencing an IPv6 link-local address, you must also specify the service or network port interface by using the `serviceport` or `network` parameter.

Default
- The default count is 1.
- The default interval is 3 seconds.
- The default size is 0 bytes.

Format ping ipv6 {*ipv6-global-address*|*hostname* | {interface {*unit/slot/port* | *vlan vlan-id* | serviceport | loopback | tunnel | network} *link-local-address*} [size *datagram-size]* [outgoing-interface {*unit/slot/port* | vlan 1-4093 | serviceport | network}]}

Mode
- Privileged EXEC
- User EXEC

ping ipv6 interface

Use this command to determine whether another computer is on the network. To use the command, configure the switch for network (in-band) connection. The source and target devices must have the ping utility enabled and running on top of TCP/IP. The switch can be pinged from any IP workstation with which the switch is connected through the default VLAN (VLAN 1), as long as there is a physical path between the switch and the workstation. The terminal interface sends three pings to the target station. Use the `interface` keyword to ping an interface by using the link-local address or the global IPv6 address of the interface. You can use a loopback, network port, serviceport, tunnel, or physical interface as the source. Use the optional `size` keyword to specify the size of the ping packet. The `ipv6-address` is the link local IPv6 address of the device you want to query. Use the `outgoing-interface` option to specify the outgoing interface for a multicast IP/IPv6 ping.

Format ping ipv6 interface {*unit/slot/port* | loopback *loopback-id* |network |serviceport} {link-local-address *link-local-address* | *ipv6-address*} [size *datagram-size*] [outgoing-interface {*unit/slot/port* | vlan 1-4093 | serviceport | network}]

Modes
- Privileged EXEC
- User EXEC

Parameter	Description
interface	Use the *`interface`* keyword to ping an interface by using the link-local address or the global IPv6 address of the interface.
size	Use the optional *`size`* keyword to specify the size of the ping packet.
ipv6-address	The link local IPv6 address of the device you want to query.

Loopback Interface Commands

The commands in this section describe how to create, delete, and manage loopback interfaces. A loopback interface is always expected to be up. This interface can provide the source address for sent packets and can receive both local and remote packets. The loopback interface is typically used by routing protocols.

To assign an IP address to the loopback interface, see "ip address" on page 600. To assign an IPv6 address to the loopback interface, see "ipv6 address" on page 758.

interface loopback

Use this command to enter the Interface Config mode for a loopback interface. The range of the loopback ID is 0 to 7.

Format	interface loopback *loopback-id*
Mode	Global Config

no interface loopback

This command removes the loopback interface and associated configuration parameters for the specified loopback interface.

Format	no interface loopback *loopback-id*
Mode	Global Config

show interface loopback

This command displays information about configured loopback interfaces.

Format	show interface loopback [*loopback-id*]
Mode	Privileged EXEC

If you do not specify a loopback ID, the following information appears for each loopback interface on the system.

Parameter	Definition
Loopback ID	The loopback ID associated with the rest of the information in the row.
Interface	The interface name.
IP Address	The IPv4 address of the interface.

If you specify a loopback ID, the following information appears.

Parameter	Definition
Interface Link Status	Shows whether the link is up or down.
IP Address	The IPv4 address of the interface.
MTU size	The maximum transmission size for packets on this interface, in bytes.

IPv6 Routing Commands

This section describes the IPv6 commands you use to configure IPv6 on the system and on the interfaces. This section also describes IPv6 management commands and show commands.

ipv6 hop-limit

This command defines the unicast hop count used in ipv6 packets originated by the node. The value is also included in router advertisements. Valid values for `hops` are 1-255 inclusive. The default *not configured* means that a value of zero is sent in router advertisements and a value of 64 is sent in packets originated by the node. Note that this is not the same as configuring a value of 64.

Default	not configured
Format	ipv6 hop-limit *hops*
Mode	Global Config

no ipv6 hop-limit

This command returns the unicast hop count to the default.

Format	no ipv6 hop-limit
Mode	Global Config

ipv6 unicast-routing

Use this command to enable the forwarding of IPv6 unicast datagrams.

Default	disabled
Format	ipv6 unicast-routing
Mode	Global Config

no ipv6 unicast-routing

Use this command to disable the forwarding of IPv6 unicast datagrams.

Format	no ipv6 unicast-routing
Mode	Global Config

ipv6 enable

Use this command to enable IPv6 routing on an interface or range of interfaces, including tunnel and loopback interfaces, that has not been configured with an explicit IPv6 address. When you use this command, the interface is automatically configured with a link-local address. You do not need to use this command if you configured an IPv6 global address on the interface.

Default	disabled

Format	ipv6 enable
Mode	Interface Config

no ipv6 enable

Use this command to disable IPv6 routing on an interface.

Format	no ipv6 enable
Mode	Interface Config

ipv6 address

Use this command to configure an IPv6 address on an interface or range of interfaces, including tunnel and loopback interfaces, and to enable IPv6 processing on this interface. You can assign multiple globally reachable addresses to an interface by using this command. You do not need to assign a link-local address by using this command since one is automatically created. The *`prefix`* field consists of the bits of the address to be configured. The *`prefix_length`* designates how many of the high-order contiguous bits of the address make up the prefix.

You can express IPv6 addresses in eight blocks. Also of note is that instead of a period, a colon now separates each block. For simplification, leading zeros of each 16 bit block can be omitted. One sequence of 16 bit blocks containing only zeros can be replaced with a double colon "::", but not more than one at a time (otherwise it is no longer a unique representation).

- Dropping zeros: `3ffe:ffff:100:f101:0:0:0:1` becomes `3ffe:ffff:100:f101::1`
- Local host: `0000:0000:0000:0000:0000:0000:0000:0001` becomes `::1`
- Any host: `0000:0000:0000:0000:0000:0000:0000:0000` becomes `::`

The hexadecimal letters in the IPv6 addresses are not case-sensitive. An example of an IPv6 prefix and prefix length is `3ffe:1::1234/64`.

The optional [`link-local`] field configures the provided IPv6 address as the link-local address on an interface. Configuring the link-local address overwrites the automatically generated link-local address on an interface.

The optional [`eui-64`] field designates that IPv6 processing on the interfaces was enabled using an EUI-64 interface ID in the low order 64 bits of the address. If you use this option, the value of *`prefix_length`* must be 64 bits.

Format	ipv6 address *prefix/prefix_length* [link-local] [eui64]
Mode	Interface Config

no ipv6 address

Use this command to remove all IPv6 addresses on an interface or specified IPv6 address. The *`prefix`* parameter consists of the bits of the address to be configured. The *`prefix_length`* designates how many of the high-order contiguous bits of the address comprise the prefix.The optional `[eui-64]` field designates that IPv6 processing on the interfaces was enabled using an EUI-64 interface ID in the low order 64 bits of the address.

If you do not supply any parameters, the command deletes all the IPv6 addresses on an interface.

Format	no ipv6 address [*prefix/prefix_length*] [eui64]
Mode	Interface Config

ipv6 address autoconfig

Use this command to allow an in-band interface to acquire an IPv6 address through IPv6 Neighbor Discovery Protocol (NDP) and through the use of Router Advertisement messages.

Default	disabled
Format	ipv6 address autoconfig
Mode	Interface Config

no ipv6 address autoconfig

This command the IPv6 autoconfiguration status on an interface to the default value.

Format	no ipv6 address autoconfig
Mode	Interface Config

ipv6 address dhcp

This command enables the DHCPv6 client on an in-band interface so that it can acquire network information, such as the IPv6 address, from a network DHCP server.

Default	disabled
Format	ipv6 address dhcp
Mode	Interface Config

no ipv6 address dhcp

This command releases a leased address and disables DHCPv6 on an interface.

Format	no ipv6 address dhcp
Mode	Interface Config

ipv6 route

Use this command to configure an IPv6 static route. The `ipv6-prefix` is the IPv6 network that is the destination of the static route. The `prefix_ length` is the length of the IPv6 prefix — a decimal value (usually 0-64) that shows how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address). A slash mark must precede the `prefix_ length`. The `next-hop-address` is the IPv6 address of the next hop that can be used to reach the specified network. Specifying `Null0` as nexthop parameter adds a static reject route. The `preference` parameter is a value the router uses to compare this route with routes from other route sources that have the same destination. The range for `preference` is 1–255, and the default value is 1. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword **vlan** is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format. You can specify a `unit/slot/port` or `vlan id` or `tunnel tunnel_id` interface to identify direct static routes from point-to-point and broadcast interfaces. The interface must be specified when using a link-local address as the next hop. A route with a preference of 255 cannot be used to forward traffic.

Use the `track object-number` to specify that the static route is installed only if the configured track object is up. When the track object is down the static route is removed from the Route Table. Use the `no` form of this command to delete the tracked static route. The `object-number` parameter is the object number representing the object to be tracked. The range is from 1 to 128. Only one track object can be associated with a specific static route. If you configure a different track object, the previously configured track object is replaced by the newly configured track object. To display the IPv6 static routes that being tracked by track objects, use the `show ipv6 route track-table` command.

Default	disabled
Format	ipv6 route *ipv6-prefix/prefix_length* {*next-hop-address* | Null0 | interface {*unit/slot/port*|*vlan 1-4093*|tunnel *tunnel_id*} *next-hop-address*} [*preference*] [track *object-number*]
Mode	Global Config

no ipv6 route

Use this command to delete an IPv6 static route. Use the command without the optional parameters to delete all static routes to the specified destination. Use the `preference` parameter to revert the preference of a route to the default preference.

Format	no ipv6 route *ipv6-prefix/prefix_length* [{*next-hop-address* | Null0 | interface {*unit/slot/port*|*vlan 1-4093*|tunnel *tunnel_id*} *next-hop-address* | *preference*}]
Mode	Global Config

ipv6 route distance

This command sets the default distance (preference) for IPv6 static routes. Lower route distance values are preferred when determining the best route. The `ipv6 route` command allows you to optionally set the distance (preference) of an individual static route. The default distance is used when no distance is specified in this command.

Changing the default distance does not update the distance of existing static routes, even if they were assigned the original default distance. The new default distance will only be applied to static routes created after invoking the `ipv6 route distance` command.

Default	1
Format	ipv6 route distance *1-255*
Mode	Global Config

no ipv6 route distance

This command resets the default static route preference value in the router to the original default preference. Lower route preference values are preferred when determining the best route.

Format	no ipv6 route distance
Mode	Global Config

ipv6 route net-prototype

This command adds net prototype IPv6 routes to the hardware.

Format	ip route net-prototype *prefix/prefix-length nexthopip num-routes*
Mode	Global Config

Parameter	Description
prefix/prefix-length	The destination network and mask for the route.
nexthopip	The next-hop ip address, It must belong to an active routing interface, but it does not need to be resolved.
num-routes	The number of routes need to added into hardware starting from the given prefix argument and within the given prefix-length.

no ipv6 route net-prototype

This command deletes all the net prototype IPv6 routes added to the hardware.

Format	ip route net-prototype *prefix/prefix-length nexthopip num-routes*
Mode	Global Config

ipv6 route static bfd interface

This command sets up a BFD session between two directly connected neighbors specified by the local interface and the neighbor's IPv6 address. The IPv6 address can be a global or a link-local address. The BFD session parameters can be set on the interface by using the existing command

bfd interval *milliseconds* min_rx *milliseconds* multiplier *interval-multiplier*

This command is supported in IPv6 networks. The maximum number of IP static BFD sessions that can be supported is limited by the max BFD sessions configurable per DUT.

Format	ipv6 route static bfd interface *unit/slot/port* | vlan *id neighbor ip address* [*global* | *link-local*]
Mode	Global Config

Parameter	Description
interface	Specify the local interface either in unit/slot/port format or as a VLAN ID.
neighbor IPv6 address	Specify the other end of the BFD session, peer address.

Example:

```
(localhost) #configure
(localhost) (Config)#interface 0/29
(localhost) (Interface 0/29)#routing
(localhost) (Interface 0/29)#ipv6 address 2001::1/64
(localhost) (Interface 0/29)#bfd interval 100 min_rx 100 multiplier 5
(localhost) (Interface 0/29)#exit

(localhost) (Config)#show running-config interface 0/29

!Current Configuration:
!
interface  0/29
no shutdown
routing
ipv6 address 2001::1/64
bfd interval 100 min_rx 100 multiplier 5
exit

(localhost) (Config)#ipv6 route static bfd interface 0/29 2001::2
```

ipv6 mtu

This command sets the maximum transmission unit (MTU) size, in bytes, of IPv6 packets on an interface or range of interfaces. This command replaces the default or link MTU with a new MTU value.

Note: The default MTU value for a tunnel interface is 1480. You cannot change this value.

Default	0 or link speed (MTU value (1500))
Format	ipv6 mtu *1280-9198*
Mode	Interface Config

no ipv6 mtu

This command resets maximum transmission unit value to default value.

Format	no ipv6 mtu
Mode	Interface Config

ipv6 nd dad attempts

This command sets the number of duplicate address detection probes transmitted on an interface or range of interfaces. Duplicate address detection verifies that an IPv6 address on an interface is unique.

Default	1
Format	ipv6 nd dad attempts *0 - 600*
Mode	Interface Config

no ipv6 nd dad attempts

This command resets to number of duplicate address detection value to default value.

Format	no ipv6 nd dad attempts
Mode	Interface Config

ipv6 nd managed-config-flag

This command sets the *managed address configuration* flag in router advertisements on the interface or range of interfaces. When the value is true, end nodes use DHCPv6. When the value is false, end nodes automatically configure addresses.

Default	false
Format	ipv6 nd managed-config-flag
Mode	Interface Config

no ipv6 nd managed-config-flag

This command resets the *managed address configuration* flag in router advertisements to the default value.

Format	no ipv6 nd managed-config-flag
Mode	Interface Config

ipv6 nd ns-interval

This command sets the interval between router advertisements for advertised neighbor solicitations, in milliseconds. An advertised value of 0 means the interval is unspecified. This command can configure a single interface or a range of interfaces.

Default	0
Format	ipv6 nd ns-interval {*1000-4294967295* | *0*}
Mode	Interface Config

no ipv6 nd ns-interval

This command resets the neighbor solicit retransmission interval of the specified interface to the default value.

Format	no ipv6 nd ns-interval
Mode	Interface Config

ipv6 nd other-config-flag

This command sets the *other stateful configuration* flag in router advertisements sent from the interface.

Default	false
Format	ipv6 nd other-config-flag
Mode	Interface Config

no ipv6 nd other-config-flag

This command resets the *other stateful configuration* flag back to its default value in router advertisements sent from the interface.

Format	no ipv6 nd other-config-flag
Mode	Interface Config

ipv6 nd ra-interval

This command sets the transmission interval between router advertisements on the interface or range of interfaces.

Default	600
Format	ipv6 nd ra-interval-max *4- 1800*
Mode	Interface Config

no ipv6 nd ra-interval

This command sets router advertisement interval to the default.

Format	no ipv6 nd ra-interval-max
Mode	Interface Config

ipv6 nd ra-lifetime

This command sets the value, in seconds, that is placed in the Router Lifetime field of the router advertisements sent from the interface or range of interfaces. The `lifetime` value must be zero, or it must be an integer between the value of the router advertisement transmission interval and 9000. A value of zero means this router is not to be used as the default router.

Default	1800
Format	ipv6 nd ra-lifetime *lifetime*
Mode	Interface Config

no ipv6 nd ra-lifetime

This command resets router lifetime to the default value.

Format	no ipv6 nd ra-lifetime
Mode	Interface Config

ipv6 nd ra hop-limit unspecified

This command configures the router to send Router Advertisements on an interface with an unspecified (0) Current Hop Limit value. This tells the hosts on that link to ignore the Hop Limit from this Router.

Default	disable
Format	ipv6 nd ra hop-limit unspecified
Mode	Interface Config

no ipv6 nd ra hop-limit unspecified

This command configures the router to send Router Advertisements on an interface with the global configured Hop Limit value.

Format	no ipv6 nd ra hop-limit unspecified
Mode	Interface Config

ipv6 nd reachable-time

This command sets the router advertisement time to consider a neighbor reachable after neighbor discovery confirmation. Reachable time is specified in milliseconds. A value of zero means the time is unspecified by the router. This command can configure a single interface or a range of interfaces.

Default	0
Format	ipv6 nd reachable-time *0–4294967295*
Mode	Interface Config

no ipv6 nd reachable-time

This command means reachable time is unspecified for the router.

Format	no ipv6 nd reachable-time
Mode	Interface Config

ipv6 nd router-preference

Use this command to configure default router preferences that the interface advertises in router advertisement messages.

Default	medium
Format	ipv6 nd router-preference { low | medium | high}
Mode	Interface Config

no ipv6 nd router-preference

This command resets the router preference advertised by the interface to the default value.

Format	no ipv6 nd router-preference
Mode	Interface Config

ipv6 nd suppress-ra

This command suppresses router advertisement transmission on an interface or range of interfaces.

Default	disabled
Format	ipv6 nd suppress-ra
Mode	Interface Config

no ipv6 nd suppress-ra

This command enables router transmission on an interface.

Format	no ipv6 nd suppress-ra
Mode	Interface Config

ipv6 nd prefix

Use the `ipv6 nd prefix` command to configure parameters associated with prefixes the router advertises in its router advertisements. The first optional parameter is the valid lifetime of the router, in seconds. You can specify a value or indicate that the lifetime value is infinite. The second optional parameter is the preferred lifetime of the router.

This command can be used to configure a single interface or a range of interfaces.

The router advertises its global IPv6 prefixes in its router advertisements (RAs). An RA only includes the prefixes of the IPv6 addresses configured on the interface where the RA is transmitted. Addresses are configured using the `ipv6 address` interface configuration command. Each prefix advertisement includes information about the prefix, such as its lifetime values and whether hosts should use the prefix for on-link determination or address auto-configuration. Use the `ipv6 nd prefix` command to configure these values.

The `ipv6 nd prefix` command allows you to preconfigure RA prefix values before you configure the associated interface address. In order for the prefix to be included in RAs, you must configure an address that matches the prefix using the `ipv6 address` command. Prefixes specified using `ipv6 nd prefix` without associated interface address will not be included in RAs and will not be committed to the device configuration.

Default	- valid-lifetime—2592000 - preferred-lifetime— 604800 - autoconfig—enabled - on-link—enabled
Format	ipv6 nd prefix *prefix/prefix_length [*{*0-4294967295* | infinite} {*0-4294967295* | infinite}] [no-autoconfig off-link]
Mode	Interface Config

no ipv6 nd prefix

This command sets prefix configuration to default values.

Format	no ipv6 nd prefix *prefix/prefix_length*
Mode	Interface Config

ipv6 neighbor

Configures a static IPv6 neighbor with the given IPv6 address and MAC address on a routing or host interface.

Format	ipv6 neighbor *ipv6address* {*unit/slot/port*|vlan *1-4093*} *macaddr*
Mode	Global Config

Parameter	Definition
ipv6address	The IPv6 address of the neighbor.
unit/slot/port	The *`unit/slot/port`* for the interface.
vlan	The VLAN for the interface.
macaddr	The MAC address for the neighbor.

no ipv6 neighbor

Removes a static IPv6 neighbor with the given IPv6 address on a routing or host interface.

Format no ipv6 neighbor *ipv6address* {*unit/slot/port*|vlan *1-4093*}

Mode Global Config

ipv6 neighbors dynamicrenew

Use this command to automatically renew the IPv6 neighbor entries. Enables/disables the periodic NUD (neighbor unreachability detection) to be run on the existing IPv6 neighbor entries based on the activity of the entries in the hardware. If the setting is disabled, only those entries that are actively used in the hardware are triggered for NUD at the end of STALE timeout of 1200 seconds. If the setting is enabled, periodically every 40 seconds a set of 300 entries are triggered for NUD irrespective of their usage in the hardware.

Default disabled

Format ipv6 neighbors dynamicrenew

Mode Global Config

no ipv6 neighbors dynamicrenew

Disables automatic renewing of IPv6 neighbor entries.

Format no ipv6 neighbors dynamicrenew

Mode Global Config

ipv6 nud

Use this command to configure Neighbor Unreachability Detection (NUD). NUD verifies that communication with a neighbor exists.

Format ipv6 nud {backoff-multiple | max-multicast-solicits | max-unicast-solicits}

Mode Global Config

Parameter	Definition
backoff-multiple	Sets the exponential backoff multiple to calculate time outs in NS transmissions during NUD. The value ranges from 1 to 5. 1 is the default. The next timeout value is limited to a maximum value of 60 seconds if the value with exponential backoff calculation is greater than 60 seconds.
max-multicast-solicits	Sets the maximum number of multicast solicits sent during Neighbor Unreachability Detection. The value ranges from 3 to 255. 3 is the default.
max-unicast-solicits	Sets the maximum number of unicast solicits sent during Neighbor Unreachability Detection. The value ranges from 3 to 10. 3 is the default.

ipv6 prefix-list

To create a prefix list or add a prefix list entry, use the `ipv6 prefix-list` command in Global Configuration mode. Prefix lists allow matching of route prefixes with those specified in the prefix list. Each prefix list includes a sequence of prefix list entries ordered by their sequence numbers. A router sequentially examines each prefix list entry to determine if the route's prefix matches that of the entry. An empty or nonexistent prefix list permits all prefixes. An implicit deny is assume if a given prefix does not match any entries of a prefix list. Once a match or deny occurs the router does not go through the rest of the list.

Up to 128 prefix lists may be configured. The maximum number of statements allowed in prefix list is 64.

Default No prefix lists are configured by default. When neither the `ge` nor the `le` option is configured, the destination prefix must match the network/length exactly. If the `ge` option is configured without the `le` option, any prefix with a network mask greater than or equal to the `ge` value is considered a match. Similarly, if the `le` option is configured without the `ge` option, a prefix with a network mask less than or equal to the `le` value is considered a match.

Format ipv6 prefix-list *list-name* {[seq *number*] {permit | deny} *ipv6-prefix/prefix-length* [ge *length*] [le *length*] | renumber *renumber-interval first-statement-number*}

Mode Global Configuration

Parameter	Description
list-name	The text name of the prefix list. Up to 32 characters.
seq number	(Optional) The sequence number for this prefix list statement. Prefix list statements are ordered from lowest sequence number to highest and applied in that order. If you do not specify a sequence number, the system will automatically select a sequence number five larger than the last sequence number in the list. Two statements may not be configured with the same sequence number. The value ranges from 1 to 4,294,967,294.
permit	Permit routes whose destination prefix matches the statement.
deny	Deny routes whose destination prefix matches the statement.
ipv6-prefix/prefix-length	Specifies the match criteria for routes being compared to the prefix list statement. The ipv6-prefix can be any valid IP prefix. The length is any IPv6 prefix length from 0 to 32.
ge length	(Optional) If this option is configured, then a prefix is only considered a match if its network mask length is greater than or equal to this value. This value must be longer than the network length and less than or equal to 32.
le length	(Optional) If this option is configured, then a prefix is only considered a match if its network mask length is less than or equal to this value. This value must be longer than the `ge` length and less than or equal to 32.
renumber	(Optional) Provides the option to renumber the sequence numbers of the IP prefix list statements with a given interval starting from a particular sequence number. The valid range for *`renumber-interval`* is 1 to 100, and the valid range for *`first-statement-number`* is 1 to 1000.

no ipv6 prefix-list

To delete a prefix list or a statement in a prefix list, use the `no` form of this command. The command `no ipv6 prefix-list list-name` deletes the entire prefix list. To remove an individual statement from a prefix list, you must specify the statement exactly, with all its options.

Format	no ipv6 prefix-list *list-name* [seq *number*] {permit | deny} *network/length* [ge *length*] [le *length*]
Mode	Global Configuration

ipv6 unreachables

Use this command to enable the generation of ICMPv6 Destination Unreachable messages on the interface or range of interfaces. By default, the generation of ICMPv6 Destination Unreachable messages is enabled.

Default	enable
Format	ipv6 unreachables
Mode	Interface Config

no ipv6 unreachables

Use this command to prevent the generation of ICMPv6 Destination Unreachable messages.

Format	no ipv6 unreachables
Mode	Interface Config

ipv6 unresolved-traffic

Use this command to control the rate at which IPv6 data packets come into the CPU. By default, rate limiting is disabled. When enabled, the rate can range from 50 to 1024 packets per second.

Default	enable
Format	ipv6 unresolved-traffic rate-limit <*50-1024*>
Mode	Global Config

no ipv6 unresolved-traffic

Use this command to disable the rate limiting.

Format	no ipv6 unresolved-traffic rate-limit
Mode	Global Config

ipv6 icmp error-interval

Use this command to limit the rate at which ICMPv6 error messages are sent. The rate limit is configured as a token bucket, with two configurable parameters, *burst-size* and *burst-interval*.

The *burst-interval* specifies how often the token bucket is initialized with *burst-size* tokens. *burst-interval* is from 0 to 2147483647 milliseconds (msec).

The *burst-size* is the number of ICMPv6 error messages that can be sent during one *burst-interval*. The range is from 1 to 200 messages.

To disable ICMP rate limiting, set *burst-interval* to zero (0).

Default	• *burst-interval* of 1000 msec. • *burst-size* of 100 messages
Format	ipv6 icmp error-interval *burst-interval* [*burst-size*]
Mode	Global Config

no ipv6 icmp error-interval

Use the no form of the command to return *burst-interval* and *burst-size* to their default values.

Format	no ipv6 icmp error-interval
Mode	Global Config

show ipv6 brief

Use this command to display the IPv6 status of forwarding mode and IPv6 unicast routing mode.

Format	show ipv6 brief
Mode	Privileged EXEC

Parameter	Definition
IPv6 Forwarding Mode	Shows whether the IPv6 forwarding mode is enabled.
IPv6 Unicast Routing Mode	Shows whether the IPv6 unicast routing mode is enabled.
IPv6 Hop Limit	Shows the unicast hop count used in IPv6 packets originated by the node. For more information, see "ipv6 hop-limit" on page 757.
ICMPv6 Rate Limit Error Interval	Shows how often the token bucket is initialized with burst-size tokens. For more information, see "ipv6 icmp error-interval" on page 771.
ICMPv6 Rate Limit Burst Size	Shows the number of ICMPv6 error messages that can be sent during one *burst-interval*. For more information, see "ipv6 icmp error-interval" on page 771.
Maximum Routes	Shows the maximum IPv6 route table size.

Parameter	Definition
IPv6 Unresolved Data Rate Limit	Shows the rate in packets-per-second for the number of IPv6 data packets trapped to CPU when the packet fails to be forwarded in the hardware due to unresolved hardware address of the destined IPv6 node.
IPv6 Neighbors Dynamic Renew	Shows the dynamic renewal mode for the periodic NUD (neighbor unreachability detection) run on the existing IPv6 neighbor entries based on the activity of the entries in the hardware.
IPv6 NUD Maximum Unicast Solicits	Shows the maximum number of unicast Neighbor Solicitations sent during NUD (neighbor unreachabililty detection) before switching to multicast Neighbor Solicitations.
IPv6 NUD Maximum Multicast Solicits	Shows the maximum number of multicast Neighbor Solicitations sent during NUD (neighbor unreachabililty detection) when in UNREACHABLE state.
IPv6 NUD Exponential Backoff Multiple	Shows the exponential backoff multiple to be used in the calculation of the next timeout value for Neighbor Solicitation transmission during NUD (neighbor unreachabililty detection) following the exponential backoff algorithm.
System uRPF Mode	Shows whether unicast Reverse Path Forwarding (uRPF) is enabled.

Example: The following shows example CLI display output for the command.

```
(Switch) #show ipv6 brief

IPv6 Unicast Routing Mode...................... Disable
IPv6 Hop Limit................................. 0
ICMPv6 Rate Limit Error Interval............... 1000 msec
ICMPv6 Rate Limit Burst Size................... 100 messages
Maximum Routes................................. 4096

IPv6 Unresolved Data Rate Limit................ 1024 pps
IPv6 Neighbors Dynamic Renew................... Disable
IPv6 NUD Maximum Unicast Solicits.............. 3
IPv6 NUD Maximum Multicast Solicits............ 3
IPv6 NUD Exponential Backoff Multiple.......... 1
System uRPF Mode............................... Enabled
```

show ipv6 interface

Use this command to show the usability status of IPv6 interfaces and whether ICMPv6 Destination Unreachable messages may be sent. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format. The keyword `loopback` specifies the loopback interface directly. The keyword tunnel specifies the IPv6 tunnel interface.

Format	show ipv6 interface {brief | *unit/slot/port*|*vlan 1-4093*|*loopback 0-7*|tunnel *0-7}*
Mode	Privileged EXEC

If you use the ***brief*** parameter, the following information displays for all configured IPv6 interfaces:

Parameter	Definition
Interface	The interface in *`unit/slot/port`* format.
IPv6 Operational Mode	Shows whether the mode is enabled or disabled.

Parameter	Definition
IPv6 Address/Length	Shows the IPv6 address and length on interfaces with IPv6 enabled.
Method	Indicates how each IP address was assigned. The field contains one of the following values: • **DHCP** - The address is leased from a DHCP server. • **Manual** - The address is manually configured. Global addresses with no annotation are assumed to be manually configured.

If you specify an interface, the following information also appears.

Parameter	Definition
Routing Mode	Shows whether IPv6 routing is enabled or disabled.
IPv6 Enable Mode	Shows whether IPv6 is enabled on the interface.
Administrative Mode	Shows whether the interface administrative mode is enabled or disabled.
Bandwidth	Shows bandwidth of the interface.
Interface Maximum Transmission Unit	The MTU size, in bytes.
Router Duplicate Address Detection Transmits	The number of consecutive duplicate address detection probes to transmit.
Address Autoconfigure Mode	Shows whether the autoconfigure mode is enabled or disabled.
Address DHCP Mode	Shows whether the DHCPv6 client is enabled on the interface.
IPv6 Hop Limit Unspecified	Indicates if the router is configured on this interface to send Router Advertisements with unspecified (0) as the Current Hop Limit value.
Router Advertisement NS Interval	The interval, in milliseconds, between router advertisements for advertised neighbor solicitations.
Router Advertisement Lifetime	Shows the router lifetime value of the interface in router advertisements.
Router Advertisement Reachable Time	The amount of time, in milliseconds, to consider a neighbor reachable after neighbor discovery confirmation.
Router Advertisement Interval	The frequency, in seconds, that router advertisements are sent.
Router Advertisement Managed Config Flag	Shows whether the managed configuration flag is set (enabled) for router advertisements on this interface.
Router Advertisement Other Config Flag	Shows whether the other configuration flag is set (enabled) for router advertisements on this interface.
Router Advertisement Router Preference	Shows the router preference.
Router Advertisement Suppress Flag	Shows whether router advertisements are suppressed (enabled) or sent (disabled).
IPv6 Destination Unreachables	Shows whether ICMPv6 Destination Unreachable messages may be sent (enabled) or not (disabled). For more information, see “ipv6 unreachables” on page 770.
ICMPv6 Redirect	Specifies if ICMPv6 redirect messages are sent back to the sender by the Router in the redirect scenario is enabled on this interface.

If an IPv6 prefix is configured on the interface, the following information also appears.

Parameter	Definition
IPv6 Prefix is	The IPv6 prefix for the specified interface.
Preferred Lifetime	The amount of time the advertised prefix is a preferred prefix.
Valid Lifetime	The amount of time the advertised prefix is valid.
Onlink Flag	Shows whether the onlink flag is set (enabled) in the prefix.
Autonomous Flag	Shows whether the autonomous address-configuration flag (autoconfig) is set (enabled) in the prefix.

Example: The following shows example CLI display output for the command.

```
(alpha-stack) #show ipv6 interface brief

           Oper.
Interface  Mode     IPv6 Address/Length
---------- -------- ---------------------------------
1/0/33     Enabled  FE80::211:88FF:FE2A:3E3C/128
                    2033::211:88FF:FE2A:3E3C/64
2/0/17     Enabled  FE80::211:88FF:FE2A:3E3C/128
                    2017::A42A:26DB:1049:43DD/128          [DHCP]
0/4/1      Enabled  FE80::211:88FF:FE2A:3E3C/128
                    2001::211:88FF:FE2A:3E3C/64           [AUTO]
0/4/2      Disabled FE80::211:88FF:FE2A:3E3C/128              [TENT]
```

Example: The following shows example CLI display output for the command.

```
(Switch) #show ipv6 interface 0/4/1

IPv6 is enabled
IPv6 Prefix is ............................... fe80::210:18ff:fe00:1105/128
                                               2001::1/64
Routing Mode.................................. Enabled
IPv6 Enable Mode.............................. Enabled
Administrative Mode........................... Enabled
IPv6 Operational Mode......................... Enabled
Bandwidth..................................... 10000  kbps
Interface Maximum Transmit Unit............... 1500
Router Duplicate Address Detection Transmits... 1
Address DHCP Mode............................. Disabled
IPv6 Hop Limit Unspecified.................... Enabled
Router Advertisement NS Interval.............. 0
Router Advertisement Lifetime................. 1800
Router Advertisement Reachable Time........... 0
Router Advertisement Interval................. 600
Router Advertisement Managed Config Flag....... Disabled
Router Advertisement Other Config Flag......... Disabled
Router Advertisement Router Preference......... medium
Router Advertisement Suppress Flag............ Disabled
IPv6 Destination Unreachables................. Enabled
ICMPv6 Redirects.............................. Enabled


Prefix 2001::1/64
Preferred Lifetime............................ 604800
Valid Lifetime................................ 2592000
Onlink Flag................................... Enabled
Autonomous Flag............................... Enabled
```

show ipv6 interface vlan

Use the show ipv6 interface vlan in Privileged EXEC mode to show to show the usability status of IPv6 VLAN interfaces.

Format	show ipv6 interface vlan *vlan-id* [prefix]
Mode	- Privileged EXEC - User EXEC

Parameter	Description
vlan-id	Valid VLAN ID
prefix	Display IPv6 Interface Prefix Information

show ipv6 dhcp interface

This command displays a list of all IPv6 addresses currently leased from a DHCP server on a specific in-band interface. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format.

Format	show ipv6 dhcp [interface {*unit/slot/port*|*vlan 1-4093}*]
Modes	Privileged EXEC

Parameter	Definition
Mode	Displays whether the specified interface is in Client mode or not.
State	State of the DHCPv6 Client on this interface.The valid values are: INACTIVE, SOLICIT, REQUEST, ACTIVE, RENEW, REBIND, RELEASE.
Server DUID	DHCPv6 Unique Identifier of the DHCPv6 Server on this interface.
T1 Time	The T1 time specified by the DHCPv6 server. After the client has held the address for this length of time, the client tries to renew the lease.
T2 Time	The T2 time specified by the DHCPv6 server. If the lease renewal fails, then when the client has held the lease for this length of time, the client sends a Rebind message to the server.
Interface IAID	An identifier for an identity association chosen by this client.
Leased Address	The IPv6 address leased by the DHCPv6 Server for this interface.
Preferred Lifetime	The preferred lifetime of the IPv6 address, as defined in RFC 2462.
Valid Lifetime	The valid lifetime of the IPv6 address, as defined by RFC 2462.
Renew Time	The time until the client tries to renew the lease
Expiry Time	The time until the address expires.

show ipv6 nd raguard policy

This command shows the status of IPv6 RA GUARD feature on the switch. It lists the ports/interfaces on which this feature is enabled and the associated device role.

Format	show ipv6 nd raguard policy
Mode	Privileged EXEC

Parameter	Definition
Interface	The port/interface on which this feature is enabled.
Role	The associated device role for the interface.

Example:

```
(Switching) # show ipv6 nd raguard policy

        Configured Interfaces

        Interface       Role
        --------------- -------
        Gi1/0/1         Host
```

show ipv6 neighbors

Use this command to display information about the IPv6 neighbors.

Format	show ipv6 neighbor [interface {*unit/slot/port* | vlan *1-4093* | tunnel *0-7*} | *ipv6-address*]
Mode	Privileged EXEC

Parameter	Definition
Interface	The interface in *unit/slot/port* format.
IPv6 Address	IPV6 address of neighbor or interface.
MAC Address	Link-layer Address.
IsRtr	Shows whether the neighbor is a router. If the value is TRUE, the neighbor is known to be a router, and FALSE otherwise. A value of FALSE might mean that routers are not always *known* to be routers.
Neighbor State	State of neighbor cache entry. Possible values are Incomplete, Reachable, Stale, Delay, Probe, and Unknown.
Last Updated	The time in seconds that has elapsed since an entry was added to the cache.
Type	The type of neighbor entry. The type is Static if the entry is manually configured and Dynamic if dynamically resolved.

clear ipv6 neighbors

Use this command to clear all entries IPv6 neighbor table or an entry on a specific interface. Use the `unit/slot/port` parameter to specify an interface, the `ipv6address` parameter to specify an IPV6 address, or the `vlan` parameter to specify a VLAN.

Format	clear ipv6 neighbors [{*unit/slot/port* | *ipv6address* | vlan *id*}]
Mode	Privileged EXEC

show ipv6 protocols

This command lists a summary of the configuration and status for the active IPv6 routing protocols. The command lists routing protocols that are configured and enabled. If a protocol is selected on the command line, the display is limited to that protocol.

Format	show ipv6 protocols [ospf]
Mode	Privileged EXEC

Parameter	Description
OSPFv3 Section:	
Routing Protocol	OSPFv3.
Router ID	The router ID configured for OSPFv3.
OSPF Admin Mode	Whether OSPF is enabled or disabled globally.
Maximum Paths	The maximum number of next hops in an OSPF route.
Default Route Advertise	Whether OSPF is configured to originate a default route.
Always	Whether default advertisement depends on having a default route in the common routing table.
Metric	The metric configured to be advertised with the default route.
Metric Type	The metric type for the default route.

Example: The following shows example CLI display output for the command.

```
(Router) #show ipv6 protocols

Routing Protocol ............................. OSPFv3
Router ID ..................................... 1.1.1.1
OSPF Admin Mode .............................. Enable
Maximum Paths ................................ 4
Distance ..................................... Intra 110 Inter 110 Ext 110

Default Route Advertise ...................... Disabled
Always ........................................ FALSE
Metric ........................................ Not configured
Metric Type .................................. External Type 2

Number of Active Areas ....................... 0 (0 normal, 0 stub, 0 nssa)
ABR Status .................................... Disable
ASBR Status ................................... Disable
```

show ipv6 route

This command displays the IPv6 routing table The *`ipv6-address`* specifies a specific IPv6 address for which the best-matching route would be displayed. The *`ipv6-prefix/ipv6-prefix-length`* specifies a specific IPv6 network for which the matching route would be displayed. The *`interface`* specifies that the routes with next-hops on the *`interface`* be displayed. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format. The *`protocol`* specifies the protocol that installed the routes. The `protocol` is one of the following keywords: `connected`, `ospf`, `static`. The `all` specifies that all routes including best and nonbest routes are displayed. Otherwise, only the best routes are displayed.

Note: If you use the `connected` keyword for `protocol`, the `all` option is not available because there are no best or nonbest connected routes.

Format	show ipv6 route [{*ipv6-address* [*protocol*] | {{*ipv6-prefix*/*ipv6-prefix-length* | *unit*/*slot*/*port* | *vlan 1-4093*} [*protocol*] | *protocol* | summary} [all] | all}]
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Route Codes	The key for the routing protocol codes that might appear in the routing table output.

The `show ipv6 route` command displays the routing tables in the following format:

```
Codes: C - connected, S - static
    O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
    ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2, Truncated
```

The columns for the routing table display the following information:

Parameter	Definition
Code	The code for the routing protocol that created this routing entry.
Default Gateway	The IPv6 address of the default gateway. When the system does not have a more specific route to a packet's destination, it sends the packet to the default gateway.
IPv6-Prefix/IPv6-Prefix-Length	The IPv6-Prefix and prefix-length of the destination IPv6 network corresponding to this route.
Preference/Metric	The administrative distance (preference) and cost (metric) associated with this route. An example of this output is [1/0], where 1 is the preference and 0 is the metric.
Tag	The decimal value of the tag associated with a redistributed route, if it is not 0.
Next-Hop	The outgoing router IPv6 address to use when forwarding traffic to the next router (if any) in the path toward the destination.
Route-Timestamp	The last updated time for dynamic routes. The format of Route-Timestamp will be • Days:Hours:Minutes if days > = 1 • Hours:Minutes:Seconds if days < 1
Interface	The outgoing router interface to use when forwarding traffic to the next destination. For reject routes, the next hop interface would be `Null0` interface.

To administratively control the traffic destined to a particular network and prevent it from being forwarded through the router, you can configure a static reject route on the router. Such traffic would be discarded and the ICMP destination unreachable message is sent back to the source. This is typically used for preventing routing loops. The reject route added in the RTO is of the type **OSPF**

Inter-Area. Reject routes (routes of REJECT type installed by any protocol) are not redistributed by OSPF/RIP. Reject routes are supported in both OSPFv2 and OSPFv3.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 route

IPv6 Routing Table - 3 entries

Codes: C - connected, S - static
      O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
      ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2, P - Net Prototype

S    2001::/64 [10/0] directly connected,   Null0
C    2003::/64 [0/0]
     via ::,   0/11
S    2005::/64 [1/0]
     via 2003::2,   0/11
C 5001::/64 [0/0]
                                                                      via ::,   0/5
OE1 6001::/64 [110/1]
                                                                      via fe80::200:42ff:fe7d:2f19,   00h:00m:23s,  0/5
OI 7000::/64 [110/6]
                                                                      via fe80::200:4fff:fe35:c8bb,   00h:01m:47s,  0/11
```

Example: The following shows example CLI display output for the command to indicate a truncated route.

```
(router) #show ipv6 route

IPv6 Routing Table - 2 entries

Codes: C - connected, S - static, 6To4 - 6to4 Route
      O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
      ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2P - Net Prototype

C    2001:db9:1::/64 [0/0]
     via ::,   0/1
OI   3000::/64 [110/1]
     via fe80::200:e7ff:fe2e:ec3f,   00h:00m:11s,  0/1   T
```

Example: The following is an example of the CLI display output with a hardware failure.

```
(router) #
(router) #configure
(router) (Config)#interface 0/1
(router) (Interface 0/1)#routing
(router) (Interface 0/1)#ipv6 enable
(router) (Interface 0/1)#ipv6 address 2001::2/64
(router) (Interface 0/1)#exit
(router) (Config)#ipv6 route net-prototype 3001::/64 2001::4 1

(router) #show ipv6 route

IPv6 Routing Table - 1 entries

Codes: C - connected, S - static, 6To4 - 6to4 Route,
      O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
      ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2, K - kernel
                                                                     P – Net Prototype

C    2001::/128 [0/0]
     via ::,   0/1
P    3001::/64 [0/1]
```

```
     via 2001::4,   00h:00m:04s,  0/1  hw-failure
```

show ipv6 route hw-failure

Use this command to display the routes that failed to be added to the hardware due to hash errors or a table full condition.

Format	show ipv6 route hw-failure
Mode	Privileged EXEC

Example: The following example displays the command output.

```
(Routing) #show ipv6 route connected

IPv6 Routing Table - 2 entries

Codes: C - connected, S - static, 6To4 - 6to4 Route,
      O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
      ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2, K - kernel
P – Net Prototype

C    2001::/128 [0/0]
     via ::,   0/1
C    2005::/128 [0/0]
     via ::,   0/2

(Routing) #show ipv6 route hw-failure

IPv6 Routing Table - 4 entries

Codes: C - connected, S - static, 6To4 - 6to4 Route,
      O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
      ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2, K - kernel
P – Net Prototype

P    3001::/64 [0/1]
     via 2001::4,   00h:00m:04s,  0/1  hw-failure
P    3001:0:0:1::/64 [0/1]
     via 2001::4,   00h:00m:04s,  0/1  hw-failure
P    3001:0:0:2::/64 [0/1]
     via 2001::4,   00h:00m:04s,  0/1  hw-failure
P    3001:0:0:3::/64 [0/1]
     via 2001::4,   00h:00m:04s,  0/1  hw-failure
```

show ipv6 route net-prototype

This command displays the net-prototype routes. The net-prototype routes are displayed with a P.

Format	show ipv6 route net-prototype
Modes	Privileged EXEC

Example:

```
(Routing) #show ipv6 route net-prototype
IPv6 Routing Table - 2 entries

Codes: C - connected, S - static, 6To4 - 6to4 Route,
      O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
      ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2, K - kernel
```

```
    P – Net Prototype

P   3001::/64 [0/1]
     via 2001::4,   00h:00m:04s,  0/1
P   3001:0:0:1::/64 [0/1]
     via 2001::4,   00h:00m:04s,  0/1
```

show ipv6 route preferences

Use this command to show the preference value associated with the type of route. Lower numbers have a greater preference. A route with a preference of 255 cannot be used to forward traffic.

Format	show ipv6 route preferences
Mode	Privileged EXEC

Parameter	Definition
Local	Preference of directly-connected routes.
Static	Preference of static routes.
OSPF Intra	Preference of routes within the OSPF area.
OSPF Inter	Preference of routes to other OSPF routes that are outside of the area.
OSPF External	Preference of OSPF external routes.

Example:

```
(lb6m) #show ipv6 route preferences

Local.......................................... 0
Static......................................... 1
OSPF Intra..................................... 110
OSPF Inter..................................... 110
OSPF External.................................. 110
```

show ipv6 route static bfd

This command displays information about the IPv6 static BFD configured parameters configured with the `ipv6 route static bfd` command.

Format	show ipv6 route static bfd
Modes	Privileged EXEC

Example:

```
(localhost) (Config)#show ipv6 route static bfd

S      1001::2   via   0/28        Up
S      3001::2   via    4/1        Up
```

show ipv6 route summary

This command displays a summary of the state of the routing table. When the optional `all` keyword is given, some statistics, such as the number of routes from each source, include counts for alternate routes. An alternate route is a route that is not the most preferred route to its destination and therefore is not installed in the forwarding table. To include only the number of best routes, do not use the optional keyword.

Format	show ipv6 route summary [all]
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Connected Routes	Total number of connected routes in the routing table.
Static Routes	Total number of static routes in the routing table.
OSPF Routes	Total number of routes installed by OSPFv3 protocol.
Reject Routes	Total number of reject routes installed by all protocols.
Net Prototype Routes	The total number of net-prototype routes.
Number of Prefixes	Summarizes the number of routes with prefixes of different lengths.
Total Routes	The total number of routes in the routing table.
Best Routes	The number of best routes currently in the routing table. This number only counts the best route to each destination.
Alternate Routes	The number of alternate routes currently in the routing table. An alternate route is a route that was not selected as the best route to its destination.
Route Adds	The number of routes that have been added to the routing table.
Route Modifies	The number of routes that have been changed after they were initially added to the routing table.
Route Deletes	The number of routes that have been deleted from the routing table.
Unresolved Route Adds	The number of route adds that failed because none of the route's next hops were on a local subnet. Note that static routes can fail to be added to the routing table at startup because the routing interfaces are not yet up. This counter gets incremented in this case. The static routes are added to the routing table when the routing interfaces come up.
Invalid Route Adds	The number of routes that failed to be added to the routing table because the route was invalid. A log message is written for each of these failures.
Failed Route Adds	The number of routes that failed to be added to the routing table because of a resource limitation in the routing table.
Hardware Failed Route Adds	The number of routes that failed to be inserted into the hardware due to a hash error or a table full condition.
Reserved Locals	The number of routing table entries reserved for a local subnet on a routing interface that is down. Space for local routes is always reserved so that local routes can be installed when a routing interface bounces.
Unique Next Hops	The number of distinct next hops used among all routes currently in the routing table. These include local interfaces for local routes and neighbors for indirect routes.
Unique Next Hops High Water	The highest count of unique next hops since counters were last cleared.
Next Hop Groups	The current number of next hop groups in use by one or more routes. Each next hop group includes one or more next hops.

Parameter	Definition
Next Hop Groups High Water	The highest count of next hop groups since counters were last cleared.
Routes with n Next Hops	The current number of routes with each number of next hops.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 route summary

Connected Routes.............................. 4
Static Routes................................. 0
6To4 Routes................................... 0
OSPF Routes................................... 13
  Intra Area Routes........................... 0
  Inter Area Routes........................... 13
  External Type-1 Routes...................... 0
  External Type-2 Routes...................... 0
Reject Routes................................. 0
Net Prototype Routes.......................... 10004
Total routes.................................. 17

Best Routes (High)............................ 17 (17)
Alternate Routes.............................. 0
Route Adds.................................... 44
Route Deletes................................. 27
Unresolved Route Adds......................... 0
Invalid Route Adds............................ 0
Failed Route Adds............................. 0
Hardware Failed Route Adds.................... 4
Reserved Locals............................... 0

Unique Next Hops (High)....................... 8 (8)
Next Hop Groups (High)........................ 8 (8)
Routes with 1 Next Hop........................ 5
Routes with 2 Next Hops....................... 1
Routes with 3 Next Hops....................... 1
Routes with 4 Next Hops....................... 10

  Number of Prefixes:
    /64: 17
```

show ipv6 snooping counters

This command displays the counters associated with IPv6 RA GUARD feature. The number of router advertisement and router redirect packets dropped by the switch globally due to RA GUARD feature are displayed in the command output.

Format	show ipv6 snooping counters
Modes	• Privileged EXEC • Global Config

Example:

```
(Switching) #  show ipv6 snooping counters

IPv6 Dropped Messages

RA(Router Advertisement - ICMP type 134)

REDIR(Router Redirect - ICMP type 137)
```

```
RA       Redir
-------  -------
0        0
```

show ipv6 vlan

This command displays IPv6 VLAN routing interface addresses.

Format	show ipv6 vlan
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
MAC Address used by Routing VLANs	Shows the MAC address.

The rest of the output for this command is displayed in a table with the following column headings:

Column Headings	Definition
VLAN ID	The VLAN ID of a configured VLAN.
Logical Interface	The interface in *unit/slot/port* format that is associated with the VLAN ID.
IPv6 Address/Prefix Length	The IPv6 prefix and prefix length associated with the VLAN ID.

show ipv6 traffic

Use this command to show traffic and statistics for IPv6 and ICMPv6. Specify a logical or loopback interface to view information about traffic on a specific interface. The argument unit/slot/port corresponds to a physical routing interface or VLAN routing interface. The keyword vlan is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format. If you do not specify an interface, the command displays information about traffic on all interfaces.

Format	show ipv6 traffic [{*unit/slot/port*|*vlan 1-4093*| loopback *loopback-id*}]
Mode	Privileged EXEC

Parameter	Definition
Total Datagrams Received	Total number of input datagrams received by the interface, including those received in error.
Received Datagrams Locally Delivered	Total number of datagrams successfully delivered to IPv6 user-protocols (including ICMP). This counter increments at the interface to which these datagrams were addressed, which might not necessarily be the input interface for some of the datagrams.

Parameter	Definition
Received Datagrams Discarded Due To Header Errors	Number of input datagrams discarded due to errors in their IPv6 headers, including version number mismatch, other format errors, hop count exceeded, errors discovered in processing their IPv6 options, etc.
Received Datagrams Discarded Due To MTU	Number of input datagrams that could not be forwarded because their size exceeded the link MTU of outgoing interface.
Received Datagrams Discarded Due To No Route	Number of input datagrams discarded because no route could be found to transmit them to their destination.
Received Datagrams With Unknown Protocol	Number of locally-addressed datagrams received successfully but discarded because of an unknown or unsupported protocol. This counter increments at the interface to which these datagrams were addressed, which might not be necessarily the input interface for some of the datagrams.
Received Datagrams Discarded Due To Invalid Address	Number of input datagrams discarded because the IPv6 address in their IPv6 header's destination field was not a valid address to be received at this entity. This count includes invalid addresses (for example, `::0`) and unsupported addresses (for example, addresses with unallocated prefixes). Forentities which are not IPv6 routers and therefore do not forward datagrams, this counter includes datagrams discarded because the destination address was not a local address.
Received Datagrams Discarded Due To Truncated Data	Number of input datagrams discarded because datagram frame didn't carry enough data.
Received Datagrams Discarded Other	Number of input IPv6 datagrams for which no problems were encountered to prevent their continue processing, but which were discarded (e.g., for lack of buffer space). Note that this counter does not include datagrams discarded while awaiting re-assembly.
Received Datagrams Reassembly Required	Number of IPv6 fragments received which needed to be reassembled at this interface. Note that this counter increments at the interface to which these fragments were addressed, which might not be necessarily the input interface for some of the fragments.
Datagrams Successfully Reassembled	Number of IPv6 datagrams successfully reassembled. Note that this counter increments at the interface to which these datagrams were addressed, which might not be necessarily the input interface for some of the fragments.
Datagrams Failed To Reassemble	Number of failures detected by the IPv6 reassembly algorithm (for whatever reason: timed out, errors, etc.). Note that this is not necessarily a count of discarded IPv6 fragments since some algorithms (notably the algorithm in by combining them as they are received. This counter increments at the interface to which these fragments were addressed, which might not be necessarily the input interface for some of the fragments.
Datagrams Forwarded	Number of output datagrams which this entity received and forwarded to their final destinations. In entities which do not act as IPv6 routers, this counter will include only those packets which were Source-Routed via this entity, and the Source-Route processing was successful. Note that for a successfully forwarded datagram the counter of the outgoing interface increments.
Datagrams Locally Transmitted	Total number of IPv6 datagrams which local IPv6 user-protocols (including ICMP) supplied to IPv6 in requests for transmission. Note that this counter does not include any datagrams counted in ipv6IfStatsOutForwDatagrams.

Parameter	Definition
Datagrams Transmit Failed	Number of output IPv6 datagrams for which no problem was encountered to prevent their transmission to their destination, but which were discarded (e.g., for lack of buffer space). Note that this counter would include datagrams counted in ipv6IfStatsOutForwDatagrams if any such packets met this (discretionary) discard criterion.
Fragments Created	Number of output datagram fragments that have been generated as a result of fragmentation at this output interface.
Datagrams Successfully Fragmented	Number of IPv6 datagrams that have been successfully fragmented at this output interface.
Datagrams Failed To Fragment	Number of IPv6 datagrams that have been discarded because they needed to be fragmented at this output interface but could not be.
Fragments Created	The number of fragments that were created.
Multicast Datagrams Received	Number of multicast packets received by the interface.
Multicast Datagrams Transmitted	Number of multicast packets transmitted by the interface.
Total ICMPv6 messages received	Total number of ICMP messages received by the interface which includes all those counted by ipv6IfIcmpInErrors. Note that this interface is the interface to which the ICMP messages were addressed which may not be necessarily the input interface for the messages.
ICMPv6 Messages with errors	Number of ICMP messages which the interface received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, etc.).
ICMPv6 Destination Unreachable Messages Received	Number of ICMP Destination Unreachable messages received by the interface.
ICMPv6 Messages Prohibited Administratively Received	Number of ICMP destination unreachable/communication administratively prohibited messages received by the interface.
ICMPv6 Time Exceeded Messages Received	Number of ICMP Time Exceeded messages received by the interface.
ICMPv6 Parameter Problem Messages Received	Number of ICMP Parameter Problem messages received by the interface.
ICMPv6 Packet Too Big Messages Received	Number of ICMP Packet Too Big messages received by the interface.
ICMPv6 Echo Request Messages Received	Number of ICMP Echo (request) messages received by the interface.
ICMPv6 Echo Reply Messages Received	Number of ICMP Echo Reply messages received by the interface.
ICMPv6 Router Solicit Messages Received	Number of ICMP Router Solicit messages received by the interface.
ICMPv6 Router Advertisement Messages Received	Number of ICMP Router Advertisement messages received by the interface.
ICMPv6 Neighbor Solicit Messages Received	Number of ICMP Neighbor Solicit messages received by the interface.
ICMPv6 Neighbor Advertisement Messages Received	Number of ICMP Neighbor Advertisement messages received by the interface.
ICMPv6 Redirect Messages Received	Number of Redirect messages received by the interface.

Parameter	Definition
ICMPv6 Group Membership Query Messages Received	Number of ICMPv6 Group Membership Query messages received by the interface.
ICMPv6 Group Membership Response Messages Received	Number of ICMPv6 Group Membership response messages received by the interface.
ICMPv6 Group Membership Reduction Messages Received	Number of ICMPv6 Group Membership reduction messages received by the interface.
Total ICMPv6 Messages Transmitted	Total number of ICMP messages which this interface attempted to send. Note that this counter includes all those counted by icmpOutErrors.
ICMPv6 Messages Not Transmitted Due To Error	Number of ICMP messages which this interface did not send due to problems discovered within ICMP such as a lack of buffers. This value should not include errors discovered outside the ICMP layer such as the inability of IPv6 to route the resultant datagram. In some implementations there may be no types of error which contribute to this counter's value.
ICMPv6 Destination Unreachable Messages Transmitted	Number of ICMP Destination Unreachable messages sent by the interface.
ICMPv6 Messages Prohibited Administratively Transmitted	Number of ICMP destination unreachable/communication administratively prohibited messages sent.
ICMPv6 Time Exceeded Messages Transmitted	Number of ICMP Time Exceeded messages sent by the interface.
ICMPv6 Parameter Problem Messages Transmitted	Number of ICMP Parameter Problem messages sent by the interface.
ICMPv6 Packet Too Big Messages Transmitted	Number of ICMP Packet Too Big messages sent by the interface.
ICMPv6 Echo Request Messages Transmitted	Number of ICMP Echo (request) messages sent by the interface.ICMP echo messages sent.
ICMPv6 Echo Reply Messages Transmitted	Number of ICMP Echo Reply messages sent by the interface.
ICMPv6 Router Solicit Messages Transmitted	Number of ICMP Router Solicitation messages sent by the interface.
ICMPv6 Router Advertisement Messages Transmitted	Number of ICMP Router Advertisement messages sent by the interface.
ICMPv6 Neighbor Solicit Messages Transmitted	Number of ICMP Neighbor Solicitation messages sent by the interface.
ICMPv6 Neighbor Advertisement Messages Transmitted	Number of ICMP Neighbor Advertisement messages sent by the interface.
ICMPv6 Redirect Messages Received	Number of Redirect messages sent. For a host, this object will always be zero, since hosts do not send redirects.
ICMPv6 Group Membership Query Messages Transmitted	Number of ICMPv6 Group Membership Query messages sent.
ICMPv6 Group Membership Response Messages Transmitted	Number of ICMPv6 Group Membership Response messages sent.
ICMPv6 Group Membership Reduction Messages Transmitted	Number of ICMPv6 Group Membership Reduction messages sent.

Parameter	Definition
ICMPv6 Duplicate Address Detects	Number of duplicate addresses detected by the interface.

clear ipv6 route counters

The command resets to zero the IPv6 routing table counters reported in the "show ipv6 route summary" on page 781 command. The command only resets event counters. Counters that report the current state of the routing table, such as the number of routes of each type, are not reset.

Format	clear ipv6 route counters
Mode	Privileged EXEC

clear ipv6 snooping counters

This command clears the counters associated with IPv6 RA GUARD feature.

Format	clear ipv6 snooping counters
Mode	• Privileged EXEC • Global Config

clear ipv6 statistics

Use this command to clear IPv6 statistics for all interfaces or for a specific interface, including loopback, tunnel, and VLAN interfaces. IPv6 statistics display in the output of the `show ipv6 traffic` command. If you do not specify an interface, the counters for all IPv6 traffic statistics reset to zero.

Format	clear ipv6 statistics [{*unit/slot/port* | loopback *loopback-id* | vlan *id*}]
Mode	Privileged EXEC

OSPFv3 Commands

This section describes the commands you use to configure OSPFv3, which is a link-state routing protocol that you use to route traffic within a network.

Global OSPFv3 Commands

ipv6 router ospf

Use this command to enter Router OSPFv3 Config mode.

Format	router ospf
Mode	Global Config

area default-cost (OSPFv3)

This command configures the monetary default cost for the stub area. The operator must specify the area id and an integer value between 1–16,777,215.

Format	area *areaid* default-cost *1-16777215*
Mode	Router OSPFv3 Config

area nssa (OSPFv3)

This command configures the specified areaid to function as NSSA.

Format	area *areaid* nssa
Mode	Router OSPFv3 Config

no area nssa

This command disables NSSA from the specified area id.

Format	no area *areaid* nssa
Mode	Router OSPFv3 Config

area nssa default-info-originate (OSPFv3)

This command configures the metric value and type for the default route advertised into the NSSA. The optional metric parameter specifies the metric of the default route and is to be in a range of 1-16777214. If no metric is specified, the default value is 10. The metric type can be comparable (nssa-external 1) or noncomparable (nssa-external 2).

Format	area *areaid* nssa default-info-originate [*metric*] [{comparable | non-comparable}]
Mode	Router OSPFv3 Config

no area nssa default-info-originate (OSPFv3)

This command disables the default route advertised into the NSSA.

Format	no area *areaid* nssa default-info-originate [*metric*] [{comparable | non-comparable}]
Mode	Router OSPFv3 Config

area nssa no-redistribute (OSPFv3)

This command configures the NSSA ABR so that learned external routes will not be redistributed to the NSSA.

Format	area *areaid* nssa no-redistribute
Mode	Router OSPFv3 Config

no area nssa no-redistribute (OSPFv3)

This command disables the NSSA ABR so that learned external routes are redistributed to the NSSA.

Format	no area *areaid* nssa no-redistribute
Mode	Router OSPFv3 Config

area nssa no-summary (OSPFv3)

This command configures the NSSA so that summary LSAs are not advertised into the NSSA.

Format	area *areaid* nssa no-summary
Mode	Router OSPFv3 Config

no area nssa no-summary (OSPFv3)

This command disables nssa from the summary LSAs.

Format	no area *areaid* nssa no-summary
Mode	Router OSPFv3 Config

area nssa translator-role (OSPFv3)

This command configures the translator role of the NSSA. A value of `always` causes the router to assume the role of the translator the instant it becomes a border router and a value of `candidate` causes the router to participate in the translator election process when it attains border router status.

Format	area *areaid* nssa translator-role {always | candidate}
Mode	Router OSPFv3 Config

no area nssa translator-role (OSPFv3)

This command disables the nssa translator role from the specified area id.

Format	no area *areaid* nssa translator-role {always | candidate}
Mode	Router OSPFv3 Config

area nssa translator-stab-intv (OSPFv3)

This command configures the translator *stabilityinterval* of the NSSA. The *stabilityinterval* is the period of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router.

Format	area *areaid* nssa translator-stab-intv *stabilityinterval*
Mode	Router OSPFv3 Config

no area nssa translator-stab-intv (OSPFv3)

This command disables the nssa translator's *stabilityinterval* from the specified area id.

Format	no area *areaid* nssa translator-stab-intv *stabilityinterval*
Mode	Router OSPFv3 Config

area range (OSPFv3)

Use this command to configure a summary prefix that an area border router advertises for a specific area.

Default	No area ranges are configured by default. No cost is configured by default.
Format	area*area-id*range*prefix netmask*{summarylink | nssaexternallink}[advertise | not-advertise] [cost *cost*]
Mode	Router OSPFv3 Config

Parameter	Description
area-id	The area identifier for the area whose networks are to be summarized.
prefix netmask	The summary prefix to be advertised when the ABR computes a route to one or more networks within this prefix in this area.
summarylink	When this keyword is given, the area range is used when summarizing prefixes advertised in type 3 summary LSAs.
nssaexternallink	When this keyword is given, the area range is used when translating type 7 LSAs to type 5 LSAs.
advertise	[Optional] When this keyword is given, the summary prefix is advertised when the area range is active. This is the default.

Parameter	Description
not-advertise	[Optional] When this keyword is given, neither the summary prefix nor the contained prefixes are advertised when the area range is active. When the not-advertise option is given, any static cost previously configured is removed from the system configuration.
cost	[Optional] If an optional cost is given, OSPF sets the metric field in the inter-area -prefix LSA to the configured value rather than setting the metric to the largest cost among the networks covered by the area range.

no area range

The **no** form of this command to delete a summary prefix or remove a static cost.

Format	no area *areaid* range *prefix netmask* {summarylink | nssaexternallink} cost
Mode	Router OSPFv3 Config

area stub (OSPFv3)

This command creates a stub area for the specified area ID. A stub area is characterized by the fact that AS External LSAs are not propagated into the area. Removing AS External LSAs and Summary LSAs can significantly reduce the link state database of routers within the stub area.

Format	area *areaid* stub
Mode	Router OSPFv3 Config

no area stub

This command deletes a stub area for the specified area ID.

Format	no area *areaid* stub
Mode	Router OSPFv3 Config

area stub no-summary (OSPFv3)

This command disables the import of Summary LSAs for the stub area identified by `areaid`.

Default	enabled
Format	area *areaid* stub no-summary
Mode	Router OSPFv3 Config

no area stub no-summary

This command sets the Summary LSA import mode to the default for the stub area identified by `areaid`.

Format	no area *areaid* stub summarylsa

Mode	Router OSPFv3 Config

area virtual-link (OSPFv3)

This command creates the OSPF virtual interface for the specified `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor.

Format	area *areaid* virtual-link *neighbor*
Mode	Router OSPFv3 Config

no area virtual-link

This command deletes the OSPF virtual interface from the given interface, identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor.

Format	no area *areaid* virtual-link *neighbor*
Mode	Router OSPFv3 Config

area virtual-link dead-interval (OSPFv3)

This command configures the dead interval for the OSPF virtual interface on the virtual interface identified by `areaid` and `neighbor.` The `neighbor` parameter is the Router ID of the neighbor. The range for `seconds` is 1 to 65535.

Default	40
Format	area *areaid* virtual-link *neighbor* dead-interval *seconds*
Mode	Router OSPFv3 Config

no area virtual-link dead-interval

This command configures the default dead interval for the OSPF virtual interface on the virtual interface identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor.

Format	no area *areaid* virtual-link *neighbor* dead-interval
Mode	Router OSPFv3 Config

area virtual-link hello-interval (OSPFv3)

This command configures the hello interval for the OSPF virtual interface on the virtual interface identified by `areaid` and `neighbor`. The `neighbor` parameter is the Router ID of the neighbor. The range for `seconds` is 1 to 65535.

Default	10
Format	area *areaid* virtual-link *neighbor* hello-interval *seconds*
Mode	Router OSPFv3 Config

no area virtual-link hello-interval

This command configures the default hello interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	no area *areaid* virtual-link *neighbor* hello-interval
Mode	Router OSPFv3 Config

area virtual-link retransmit-interval (OSPFv3)

This command configures the retransmit interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor. The range for ***seconds*** is 0 to 3600.

Default	5
Format	area *areaid* virtual-link *neighbor* retransmit-interval *seconds*
Mode	Router OSPFv3 Config

no area virtual-link retransmit-interval

This command configures the default retransmit interval for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	no area *areaid* virtual-link *neighbor* retransmit-interval
Mode	Router OSPFv3 Config

area virtual-link transmit-delay (OSPFv3)

This command configures the transmit delay for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor. The range for ***seconds*** is 0 to 3600 (1 hour).

Default	1
Format	area *areaid* virtual-link *neighbor* transmit-delay *seconds*
Mode	Router OSPFv3 Config

no area virtual-link transmit-delay

This command configures the default transmit delay for the OSPF virtual interface on the virtual interface identified by ***areaid*** and ***neighbor***. The ***neighbor*** parameter is the Router ID of the neighbor.

Format	no area *areaid* virtual-link *neighbor* transmit-delay
Mode	Router OSPFv3 Config

auto-cost (OSPFv3)

By default, OSPF computes the link cost of each interface from the interface bandwidth. Faster links have lower metrics, making them more attractive in route selection. The configuration parameters in the `auto-cost reference bandwidth` and `bandwidth` commands give you control over the default link cost. You can configure for OSPF an interface bandwidth that is independent of the actual link speed. A second configuration parameter allows you to control the ratio of interface bandwidth to link cost. The link cost is computed as the ratio of a reference bandwidth to the interface bandwidth (ref_bw / interface bandwidth), where interface bandwidth is defined by the `bandwidth` command. Because the default reference bandwidth is 100 Mb/s, OSPF uses the same default link cost for all interfaces whose bandwidth is 100 Mbps or greater. Use the `auto-cost` command to change the reference bandwidth, specifying the reference bandwidth in megabits per second (Mbps). The reference bandwidth range is 1–4,294,967 Mb/s.

Default	100Mbps
Format	auto-cost reference-bandwidth *1-4294967*
Mode	Router OSPFv3 Config

no auto-cost reference-bandwidth (OSPFv3)

Use this command to set the reference bandwidth to the default value.

Format	no auto-cost reference-bandwidth
Mode	Router OSPFv3 Config

clear ipv6 ospf

Use this command to disable and reenable OSPF.

Format	clear ipv6 ospf
Mode	Privileged EXEC

clear ipv6 ospf configuration

Use this command to reset the OSPF configuration to factory defaults.

Format	clear ipv6 ospf configuration
Mode	Privileged EXEC

clear ipv6 ospf counters

Use this command to reset global and interface statistics.

Format	clear ipv6 ospf counters
Mode	Privileged EXEC

clear ipv6 ospf neighbor

Use this command to drop the adjacency with all OSPF neighbors. On each neighbor's interface, send a one-way hello. Adjacencies may then be re-established. To drop all adjacencies with a specific router ID, specify the neighbor's Router ID using the optional parameter *[neighbor-id]*.

Format	clear ipv6 ospf neighbor *[neighbor-id]*
Mode	Privileged EXEC

clear ipv6 ospf neighbor interface

To drop adjacency with all neighbors on a specific interface, use the optional parameter `[unit/slot/port]`. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword **vlan** is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format. To drop adjacency with a specific router ID on a specific interface, use the optional parameter *[neighbor-id]*.

Format	clear ipv6 ospf neighbor interface *[unit/slot/port|vlan 1-4093] [neighbor-id]*
Mode	Privileged EXEC

clear ipv6 ospf redistribution

Use this command to flush all self-originated external LSAs. Reapply the redistribution configuration and re-originate prefixes as necessary.

Format	clear ipv6 ospf redistribution
Mode	Privileged EXEC

default-information originate (OSPFv3)

This command is used to control the advertisement of default routes.

Default	• metric—unspecified • type—2
Format	default-information originate [always] [metric *0-16777214*] [metric-type {1 | 2}]
Mode	Router OSPFv3 Config

no default-information originate (OSPFv3)

This command is used to control the advertisement of default routes.

Format	no default-information originate *[metric] [metric-type]*
Mode	Router OSPFv3 Config

default-metric (OSPFv3)

This command is used to set a default for the metric of distributed routes.

Format	default-metric *1-16777214*
Mode	Router OSPFv3 Config

no default-metric (OSPFv3)

This command is used to set a default for the metric of distributed routes.

Format	no default-metric
Mode	Router OSPFv3 Config

distance ospf (OSPFv3)

This command sets the route preference value of OSPF route types in the router. Lower route preference values are preferred when determining the best route. The type of OSPF route can be intra, inter, or external. All the external type routes are given the same preference value. The range of ***preference*** value is 1 to 255.

Default	110
Format	distance ospf {intra-area *1-255* | inter-area *1-255* | external *1-255*}
Mode	Router OSPFv3 Config

no distance ospf

This command sets the default route preference value of OSPF routes in the router. The type of OSPF route can be intra, inter, or external. All the external type routes are given the same preference value.

Format	no distance ospf {intra-area | inter-area | external}
Mode	Router OSPFv3 Config

enable (OSPFv3)

This command resets the default administrative mode of OSPF in the router (active).

Default	enabled
Format	enable
Mode	Router OSPFv3 Config

no enable (OSPFv3)

This command sets the administrative mode of OSPF in the router to inactive.

Format	no enable
Mode	Router OSPFv3 Config

exit-overflow-interval (OSPFv3)

This command configures the exit overflow interval for OSPF. It describes the number of seconds after entering Overflow state that a router will wait before attempting to leave the overflow state. This allows the router to again originate nondefault AS-external-LSAs. When set to 0, the router will not leave overflow state until restarted. The range for `seconds` is 0 to 2147483647 seconds.

Default	0
Format	exit-overflow-interval *seconds*
Mode	Router OSPFv3 Config

no exit-overflow-interval

This command configures the default exit overflow interval for OSPF.

Format	no exit-overflow-interval
Mode	Router OSPFv3 Config

external-lsdb-limit (OSPFv3)

This command configures the external LSDB limit for OSPF. If the value is –1, then there is no limit. When the number of nondefault AS-external-LSAs in a router's link-state database reaches the external LSDB limit, the router enters overflow state. The router never holds more than the external LSDB limit nondefault AS-external-LSAs in it database. The external LSDB limit MUST be set identically in all routers attached to the OSPF backbone and/or any regular OSPF area. The range for `limit` is –1 to 2147483647.

Default	-1
Format	external-lsdb-limit *limit*
Mode	Router OSPFv3 Config

no external-lsdb-limit

This command configures the default external LSDB limit for OSPF.

Format	no external-lsdb-limit
Mode	Router OSPFv3 Config

maximum-paths (OSPFv3)

This command sets the number of paths that OSPF can report for a given destination where `maxpaths` is platform dependent.

Default	4
Format	maximum-paths *maxpaths*
Mode	Router OSPFv3 Config

no maximum-paths

This command resets the number of paths that OSPF can report for a given destination back to its default value.

Format	no maximum-paths
Mode	Router OSPFv3 Config

passive-interface default (OSPFv3)

Use this command to enable global passive mode by default for all interfaces. It overrides any interface level passive mode. OSPF shall not form adjacencies over a passive interface.

Default	disabled
Format	passive-interface default
Mode	Router OSPFv3 Config

no passive-interface default

Use this command to disable the global passive mode by default for all interfaces. Any interface previously configured to be passive reverts to nonpassive mode.

Format	no passive-interface default
Mode	Router OSPFv3 Config

passive-interface (OSPFv3)

Use this command to set the interface as passive. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format. It overrides the global passive mode that is currently effective on the interface.

Default	disabled
Format	passive-interface {*unit/slot/port*|*vlan 1-4093*}
Mode	Router OSPFv3 Config

no passive-interface

Use this command to set the interface or tunnel as nonpassive. It overrides the global passive mode that is currently effective on the interface or tunnel.

Format	no passive-interface {*unit/slot/port*|*vlan 1-4093*}
Mode	Router OSPFv3 Config

redistribute (OSPFv3)

This command configures the OSPFv3 protocol to allow redistribution of routes from the specified source protocol/routers.

Default	- metric—unspecified - type—2 - tag—0
Format	redistribute{static | connected} [metric *0-16777214*] [metric-type {1 | 2}] [tag *0-4294967295*]
Mode	Router OSPFv3 Config

no redistribute

This command configures OSPF protocol to prohibit redistribution of routes from the specified source protocol/routers.

Format	no redistribute {static | connected} *[metric] [metric-type] [tag]*
Mode	Router OSPFv3 Config

router-id (OSPFv3)

This command sets a 4-digit dotted-decimal number uniquely identifying the router ospf id. The ***ipaddress*** is a configured value.

Format	router-id *ipaddress*
Mode	Router OSPFv3 Config

timers pacing lsa-group

Use this command to adjust how OSPFv3 groups LSAs for periodic refresh. OSPFv3 refreshes self-originated LSAs approximately once every 30 minutes. When OSPFv3 refreshes LSAs, it considers all self-originated LSAs whose age is from 1800 to 1800 plus the pacing group size. Grouping LSAs for refresh allows OSPFv3 to combine refreshed LSAs into a minimal number of LS Update packets. Minimizing the number of Update packets makes LSA distribution more efficient.

When OSPFv3 originates a new or changed LSA, it selects a random refresh delay for the LSA. When the refresh delay expires, OSPFv3 refreshes the LSA. By selecting a random refresh delay, OSPFv3 avoids refreshing a large number of LSAs at one time, even if a large number of LSAs are originated at one time.

seconds is the width of the window in which LSAs are refreshed. The range for the pacing group window is from 10 to 1800 seconds.

Default	60 seconds
Format	timers pacing lsa-group *seconds*
Mode	Privileged EXEC

no timers pacing lsa-group

This command returns the LSA Group Pacing parameter to the factory default value of 60 seconds.

Format	no timers pacing lsa-group
Mode	Privileged EXEC

timers throttle spf

The initial "wait interval" is set to an amount of delay specified by the spf-hold value. If an SPF calculation is not scheduled during the current "wait interval", the next SPF calculation is scheduled at a delay of *spf-start*. If there has been an SPF calculation scheduled during the current "wait interval", the "wait interval" is set to two times the current "wait interval" until the "wait interval" reaches the maximum time in milliseconds as specified in *spf-maximum*. Subsequent wait times remain at the maximum until the values are reset or an LSA is received between SPF calculations.

Default	*spf-start* = 2000 ms *spf-hold* = 5000 ms *spf-maximum* = 5000 ms
Format	timers throttle spf *spf-start spf-hold spf-maximum*
Mode	Privileged EXEC

Parameter	Description
spf-start	Indicates the SPF schedule delay in milliseconds when no SPF calculation has been scheduled during the current "wait interval". Value range is 1 to 600000 milliseconds.
spf-hold	Indicates the initial SPF "wait interval" in milliseconds. Value range is 1 to 600000 milliseconds.
spf-maximum	Indicates the maximum SPF "wait interval" in milliseconds. Value range is 1 to 600000 milliseconds.

no timers throttle spf

This command returns the SPF throttling parameters to the factory default values.

Format	no timers throttle spf
Mode	Privileged EXEC

trapflags (OSPFv3)

Use this command to enable individual OSPF traps, enable a group of trap flags at a time, or enable all the trap flags at a time. The different groups of trapflags, and each group's specific trapflags to enable or disable, are listed in Table 15.

Table 15. *Trapflag Groups (OSPFv3)*

Group	Flags
errors	• authentication-failure • bad-packet • config-error • virt-authentication-failure • virt-bad-packet • virt-config-error
lsa	• lsa-maxage • lsa-originate

Table 15. *Trapflag Groups (OSPFv3)*

Group	Flags
overflow	• lsdb-overflow • lsdb-approaching-overflow
retransmit	• packets • virt-packets
state-change	• if-state-change • neighbor-state-change • virtif-state-change • virtneighbor-state-change

- To enable the individual flag, enter the `group name` followed by that particular flag.
- To enable all the flags in that group, give the group name followed by `all`.
- To enable all the flags, give the command as `trapflags all`.

Default	disabled
Format	trapflags {all |errors {all | authentication-failure | bad-packet | config-error | virt-authentication-failure | virt-bad-packet | virt-config-error} | lsa {all | lsa-maxage | lsa-originate} | overflow {all | lsdb-overflow | lsdb-approaching-overflow} | retransmit {all | packets | virt-packets} | state-change {all | if-state-change | neighbor-state-change | virtif-state-change | virtneighbor-state-change}}
Mode	Router OSPFv3 Config

no trapflags

Use this command to revert to the default reference bandwidth.

- To disable the individual flag, enter the `group name` followed by that particular flag.
- To disable all the flags in that group, give the group name followed by `all`.
- To disable all the flags, give the command as `trapflags all`.

Format	no trapflags {all | errors {all | authentication-failure | bad-packet | config-error | virt-authentication-failure | virt-bad-packet | virt-config-error} | lsa {all | lsa-maxage | lsa-originate} | overflow {all | lsdb-overflow | lsdb-approaching-overflow} | retransmit {all | packets | virt-packets} | state-change {all | if-state-change | neighbor-state-change | virtif-state-change | virtneighbor-state-change}}
Mode	Router OSPFv3 Config

OSPFv3 Interface Commands

ipv6 ospf area

This command sets the OSPF area to which the specified router interface or range of interfaces belongs. It also enables OSPF on the specified router interface or range of interfaces. The *`area`* is a 32-bit integer, formatted as a 4-digit dotted-decimal number or a decimal value in the range of 0-4294967295. The *`area`* uniquely identifies the area to which the interface connects. Assigning an area ID for an area that does not yet exist, causes the area to be created with default values.

Format	ipv6 ospf area *0-4294967295*
Mode	Interface Config

ipv6 ospf cost

This command configures the cost on an OSPF interface or range of interfaces. The `cost` parameter has a range of 1 to 65535.

Default	10
Format	ipv6 ospf cost *1-65535*
Mode	Interface Config

no ipv6 ospf cost

This command configures the default cost on an OSPF interface.

Format	no ipv6 ospf cost
Mode	Interface Config

ipv6 ospf dead-interval

This command sets the OSPF dead interval for the specified interface or range of interfaces. The value for *`seconds`* is a valid positive integer, which represents the length of time in seconds that a router's Hello packets have not been seen before its neighbor routers declare that the router is down. The value for the length of time must be the same for all routers attached to a common network. This value should be some multiple of the Hello Interval (i.e., 4). Valid values range for *`seconds`* is from 1 to 2147483647.

Note: Valid values range in seconds from 1 to 65535.

Default	40
Format	ipv6 ospf dead-interval *1-2147483647*
Mode	Interface Config

no ipv6 ospf dead-interval

This command sets the default OSPF dead interval for the specified interface or range of interfaces.

Format	no ipv6 ospf dead-interval
Mode	Interface Config

ipv6 ospf hello-interval

This command sets the OSPF hello interval for the specified interface. The value for *`seconds`* is a valid positive integer, which represents the length of time in seconds. The value for the length of time must be the same for all routers attached to a network. Valid values for *`seconds`* range from 1 to 65535.

Default	10
Format	ipv6 ospf hello-interval *seconds*
Mode	Interface Config

no ipv6 ospf hello-interval

This command sets the default OSPF hello interval for the specified interface.

Format	no ipv6 ospf hello-interval
Mode	Interface Config

ipv6 ospf link-lsa-suppression

Use this command to enable Link LSA Suppression on an interface. When Link LSA Suppression is enabled on a point-to-point (P2P) interface, no Link LSA protocol packets are originated (transmitted) on the interface. This configuration does not apply to non-P2P interfaces.

Default	false
Format	ipv6 ospf link-lsa-suppression
Mode	Privileged EXEC

no ipv6 ospf link-lsa-suppression

This command returns Link LSA Suppression for the interface to disabled. When Link LSA Suppression is disabled, Link LSA protocol packets are originated (transmitted) on the P2P interface.

Format	no ipv6 ospf link-lsa-suppression
Mode	Privileged EXEC

ipv6 ospf mtu-ignore

This command disables OSPF maximum transmission unit (MTU) mismatch detection on an interface or range of interfaces. OSPF Database Description packets specify the size of the largest IP packet that can be sent without fragmentation on the interface. When a router receives a Database Description packet, it examines the MTU advertised by the neighbor. By default, if the MTU is larger than the router can accept, the Database Description packet is rejected and the OSPF adjacency is not established.

Default	enabled
Format	ipv6 ospf mtu-ignore
Mode	Interface Config

no ipv6 ospf mtu-ignore

This command enables the OSPF MTU mismatch detection.

Format	no ipv6 ospf mtu-ignore
Mode	Interface Config

ipv6 ospf network

This command changes the default OSPF network type for the interface or range of interfaces. Normally, the network type is determined from the physical IP network type. By default all Ethernet networks are OSPF type broadcast. Similarly, tunnel interfaces default to point-to-point. When an Ethernet port is used as a single large bandwidth IP network between two routers, the network type can be point-to-point since there are only two routers. Using point-to-point as the network type eliminates the overhead of the OSPF designated router election. It is normally not useful to set a tunnel to OSPF network type broadcast.

Default	broadcast
Format	ipv6 ospf network {broadcast | point-to-point}
Mode	Interface Config

no ipv6 ospf network

This command sets the interface type to the default value.

Format	no ipv6 ospf network {broadcast | point-to-point}
Mode	Interface Config

ipv6 ospf prefix-suppression

This command suppresses the advertisement of the IPv6 prefixes that are associated with an interface, except for those associated with secondary IPv6 addresses. This command takes precedence over the global configuration. If this configuration is not specified, the global prefix-suppression configuration applies.

Prefix-suppression can be disabled at the interface level by using the disable option. The disable option is useful for excluding specific interfaces from performing prefix-suppression when the feature is enabled globally.

Note that the disable option `disable` is not equivalent to not configuring the interface specific prefix-suppression. If prefix-suppression is not configured at the interface level, the global prefix-suppression configuration is applicable for the IPv6 prefixes associated with the interface.

Default	Prefix-suppression is not configured.
Format	ipv6 ospf prefix-suppression [disable]
Mode	Interface Config

no ipv6 ospf prefix-suppression

This command removes prefix-suppression configurations at the interface level. When the `no ipv6 ospf prefix-suppression` command is used, global prefix-suppression applies to the interface. Not configuring the command is not equal to disabling interface level prefix-suppression.

Format	no ipv6 ospf prefix-suppression
Mode	Interface Config

ipv6 ospf priority

This command sets the OSPF priority for the specified router interface or range of interfaces. The priority of the interface is a priority integer from 0 to 255. A value of 0 indicates that the router is not eligible to become the designated router on this network.

Default	1, which is the highest router priority.
Format	ipv6 ospf priority *0-255*
Mode	Interface Config

no ipv6 ospf priority

This command sets the default OSPF priority for the specified router interface.

Format	no ipv6 ospf priority
Mode	Interface Config

ipv6 ospf retransmit-interval

This command sets the OSPF retransmit Interval for the specified interface or range of interfaces. The retransmit interval is specified in seconds. The value for *`seconds`* is the number of seconds between link-state advertisement retransmissions for adjacencies belonging to this router interface. This value is also used when retransmitting database description and link-state request packets. Valid values range from 0 to 3600 (1 hour).

Default	5
Format	ipv6 ospf retransmit-interval *seconds*
Mode	Interface Config

no ipv6 ospf retransmit-interval

This command sets the default OSPF retransmit Interval for the specified interface.

Format	no ipv6 ospf retransmit-interval
Mode	Interface Config

ipv6 ospf transmit-delay

This command sets the OSPF Transit Delay for the specified interface or range of interfaces. The transmit delay is specified in seconds. In addition, it sets the estimated number of seconds it takes to transmit a link state update packet over this interface. Valid values for `seconds` range from 1 to 3600 (1 hour).

Default	1
Format	ipv6 ospf transmit-delay *seconds*
Mode	Interface Config

no ipv6 ospf transmit-delay

This command sets the default OSPF Transit Delay for the specified interface.

Format	no ipv6 ospf transmit-delay
Mode	Interface Config

OSPFv3 Graceful Restart Commands

The OSPFv3 protocol can be configured to participate in the checkpointing service, so that these protocols can execute a *graceful restart* when the management unit fails. In a graceful restart, the hardware to continues forwarding IPv6 packets using OSPFv3 routes while a backup switch takes over management unit responsibility.

Graceful restart uses the concept of *helpful neighbors*. A fully adjacent router enters helper mode when it receives a link state announcement (LSA) from the restarting management unit indicating its intention of performing a graceful restart. In helper mode, a switch continues to advertise to the rest of the network that they have full adjacencies with the restarting router, thereby avoiding announcement of a topology change and the potential for flooding of LSAs and shortest-path-first (SPF) runs (which determine OSPF routes). Helpful neighbors continue to forward packets through the restarting router. The restarting router relearns the network topology from its helpful neighbors.

Graceful restart can be enabled for either planned or unplanned restarts, or both. A planned restart is initiated by the operator through the management command `initiate failover`. The operator may initiate a failover in order to take the management unit out of service (for example, to address a partial hardware failure), to correct faulty system behavior which cannot be corrected through less severe management actions, or other reasons. An unplanned restart is an unexpected failover caused by a fatal hardware failure of the management unit or a software hang or crash on the management unit.

nsf (OSPFv3)

Use this command to enable the OSPF graceful restart functionality on an interface. To disable graceful restart, use the `no` form of the command.

Default	disabled
Format	nsf [ietf] [planned-only]

Modes Router OSPFv3 Config

Parameter	Description
ietf	This keyword is accepted but not required.
planned-only	This optional keyword indicates that OSPF should only perform a graceful restart when the restart is planned (i.e., when the restart is a result of the initiate failover command).

no nsf (OSPFv3)

Use this command to disable graceful restart for all restarts.

nsf restart-interval (OSPFv3)

Use this command to configure the number of seconds that the restarting router asks its neighbors to wait before exiting helper mode. This is referred to as the grace period. The restarting router includes the grace period in its grace LSAs. For planned restarts (using the `initiate failover` command), the grace LSAs are sent prior to restarting the management unit, whereas for unplanned restarts, they are sent after reboot begins.

The grace period must be set long enough to allow the restarting router to reestablish all of its adjacencies and complete a full database exchange with each of those neighbors.

Default 120 seconds

Format nsf [ietf] restart-interval *1-1800*

Modes Router OSPFv3 Config

Parameter	Description
ietf	This keyword is accepted but not required.
seconds	The number of seconds that the restarting router asks its neighbors to wait before exiting helper mode. The range is from 1 to 1800 seconds.

no nsfrestart-interval (OSPFv3)

Use this command to revert the grace period to its default value.

Format no [ietf] nsf restart-interval

Modes Router OSPFv3 Config

nsf helper (OSPFv3)

Use this command to enable helpful neighbor functionality for the OSPF protocol. You can enable this functionality for planned or unplanned restarts, or both.

Default OSPF may act as a helpful neighbor for both planned and unplanned restarts.

Format nsf helper [planned-only]

Modes Router OSPFv3 Config

Parameter	Description
planned-only	This optional keyword indicates that OSPF should only help a restarting router performing a planned restart.

no nsf helper (OSPFv3)

Use this command to disable helpful neighbor functionality for OSPF.

Format	no nsf helper
Modes	Router OSPFv3 Config

nsf ietf helper disable (OSPFv3)

Use this command to disable helpful neighbor functionality for OSPF.

Note: The commands `no nsf helper` and `nsf ietf helper disable` are functionally equivalent. The command `nsf ietf helper disable` is supported solely for compatibility with other network software CLI.

Format	nsf ietf helper disable
Modes	Router OSPFv3 Config

nsf helper strict-lsa-checking (OSPFv3)

The restarting router is unable to react to topology changes. In particular, the restarting router will not immediately update its forwarding table; therefore, a topology change may introduce forwarding loops or black holes that persist until the graceful restart completes. By exiting the graceful restart on a topology change, a router tries to eliminate the loops or black holes as quickly as possible by routing around the restarting router. A helpful neighbor considers a link down with the restarting router to be a topology change, regardless of the strict LSA checking configuration.

Use this command to require that an OSPF helpful neighbor exit helper mode whenever a topology change occurs.

Default	enabled
Format	nsf [ietf] helper strict-lsa-checking
Modes	Router OSPFv3 Config

Parameter	Description
ietf	This keyword is accepted but not required.

no nsf [ietf] helper strict-lsa-checking (OSPFv3)

Use this command to allow OSPF to continue as a helpful neighbor in spite of topology changes.

Default	enabled
Format	nsf [ietf] helper strict-lsa-checking

Modes	Router OSPFv3 Config

OSPFv3 Stub Router Commands

max-metric router-lsa

To configure OSPFv3 to enter stub router mode, use this command in Router OSPFv3 Global Configuration mode. When OSPFv3 is in stub router mode, OSPFv3 sets the metric in the nonstub links in its router LSA to MaxLinkMetric. Other routers therefore compute very long paths through the stub router, and prefer any alternate path. Doing so eliminates all transit traffic through the stub router, when alternate routes are available. Stub router mode is useful when adding or removing a router from a network or to avoid transient routes when a router reloads.

You can administratively force OSPFv3 into stub router mode. OSPFv3 remains in stub router mode until you take OSPFv3 out of stub router mode. Alternatively, you can configure OSPF to start in stub router mode for a configurable period of time after the router boots up.

If you set the summary LSA metric to 16,777,215, other routers will skip the summary LSA when they compute routes.

If you have configured the router to enter stub router mode on startup (`max-metric router-lsa on-startup`), and then enter `max-metric router lsa`, there is no change. If OSPFv3 is administratively in stub router mode (the `max-metric router-lsa` command has been given), and you configure OSPFv3 to enter stub router mode on startup (`max-metric router-lsa on-startup`), OSPFv3 exits stub router mode (assuming the startup period has expired) and the configuration is updated. Without any parameters, stub router mode only sends maximum metric values for router LSAs.

Default	OSPF is not in stub router mode by default.
Format	max-metric router-lsa [on-startup seconds] [summary-lsa {metric}] max-metric router-lsa [external-lsa [*max-metric-value*]] [inter-area-lsas [*max-metric-value*]] [on-startup *seconds*] [summary-lsa [*max-metric-value*]]
Mode	OSPFv3 Router Configuration

Parameter	Description
external-lsa	(Optional) Sends the maximum metric values for external LSAs. *max-metric-value* is the maximum metric value to use for LSAs. The range is 1 to 16777215 (0xFFFFFF). The default value is 16711680 (0xFF0000).
inter-area-lsas	(Optional) Sends the maximum metric values for Inter-Area-Router LSAs
on-startup	(Optional) Starts OSPF in stub router mode. *seconds* is the number of seconds that OSPF remains in stub router mode after a reboot. The range is 5 to 86,400 seconds. There is no default value.
summary-lsa	(Optional) Sends the maximum metric values for Summary LSAs

no max-metric router-lsa

Use this command in OSPFv3 Router Configuration mode to disable stub router mode. The command clears either type of stub router mode (always or on-startup) and resets all LSA options. If OSPF is configured to enter global configuration mode on startup, and during normal operation you want to immediately place OSPF in stub router mode, issue the command `no max-metric router-lsa on-startup`. The command `no max-metric` with the external-lsa, inter-area-lsas, or summary-lsa option `router-lsa summary-lsa` causes OSPF to send summary LSAs with metrics computed using normal procedures.

Format	no max-metric router-lsa [external-lsa] [inter-area-lsas] [on-startup] [summary-lsa]
Mode	OSPFv3 Router Configuration

clear ipv6 ospf stub-router

Use this command to force OSPF to exit stub router mode when it has automatically entered stub router mode because of a resource limitation. OSPF only exits stub router mode if it entered stub router mode because of a resource limitation or it if is in stub router mode at startup. This command has no effect if OSPF is configured to be in stub router mode permanently.

Format	clear ipv6 ospf stub-router
Mode	Privileged EXEC

OSPFv3 Show Commands

show ipv6 ospf

This command displays information relevant to the OSPF router.

Format	show ipv6 ospf
Mode	• Privileged EXEC • User EXEC

Note: Some of the information below displays only if you enable OSPF and configure certain features.

Parameter	Definition
Router ID	A 32-bit integer in dotted decimal format identifying the router, about which information is displayed. This is a configured value.
OSPF Admin Mode	Shows whether the administrative mode of OSPF in the router is enabled or disabled. This is a configured value.
External LSDB Limit	The maximum number of non-default AS-external-LSAs entries that can be stored in the link-state database.
Exit Overflow Interval	The number of seconds that, after entering overflow state, a router will attempt to leave overflow state.
SPF Start Time	The number of milliseconds the SPF calculation is delayed if no SPF calculation has been scheduled during the current “wait interval”.
SPF Hold Time	The number of milliseconds of the initial “wait interval”.

Parameter	Definition
SPF Maximum Hold Time	The maximum number of milliseconds of the “wait interval”.
LSA Refresh Group Pacing Time	The size of the LSA refresh group window, in seconds.
AutoCost Ref BW	Shows the value of the auto-cost reference bandwidth configured on the router.
Default Passive Setting	Shows whether the interfaces are passive by default.
Maximum Paths	The maximum number of paths that OSPF can report for a given destination.
Default Metric	Default value for redistributed routes.
Default Route Advertise	Indicates whether the default routes received from other source protocols are advertised or not.
Always	Shows whether default routes are always advertised.
Metric	The metric for the advertised default routes. If the metric is not configured, this field is blank.
Metric Type	Shows whether the routes are External Type 1 or External Type 2.
Number of Active Areas	The number of active OSPF areas. An “active” OSPF area is an area with at least one interface up.
ABR Status	Shows whether the router is an OSPF Area Border Router.
ASBR Status	Shows if the ASBR mode is enabled or disabled. Enable implies that the router is an autonomous system border router. Router automatically becomes an ASBR when it is configured to redistribute routes learned from other protocol. The possible values for the ASBR status is enabled (if the router is configured to re-distribute routes learned by other protocols) or disabled (if the router is not configured for the same).
Stub Router Status	The status of the stub router: Active or Inactive.
Stub Router Reason	This is displayed only if the stub router is active. Shows the reason for the stub router: Configured, Startup, or Resource Limitation
Stub Router Startup Time Remaining	This is displayed only if the stub router is in startup stub router mode. The remaining time (in seconds) until OSPF exits stub router mode.
Stub Router Duration	This row is only listed if the stub router is active and the router entered stub mode because of a resource limitation. The time elapsed since the router last entered the stub router mode. The duration is displayed in DD:HH:MM:SS format.
External LSDB Overflow	When the number of non-default external LSAs exceeds the configured limit, External LSDB Limit, OSPF goes into LSDB overflow state. In this state, OSPF withdraws all of its self-originated non-default external LSAs. After the Exit Overflow Interval, OSPF leaves the overflow state, if the number of external LSAs has been reduced.
External LSA Count	The number of external (LS type 5) link-state advertisements in the link-state database.
External LSA Checksum	The sum of the LS checksums of external link-state advertisements contained in the link-state database.
New LSAs Originated	The number of new link-state advertisements that have been originated.
LSAs Received	The number of link-state advertisements received determined to be new instantiations.

Parameter	Definition
LSA Count	The total number of link state advertisements currently in the link state database.
Maximum Number of LSAs	The maximum number of LSAs that OSPF can store.
LSA High Water Mark	The maximum size of the link state database since the system started.
Retransmit List Entries	The total number of LSAs waiting to be acknowledged by all neighbors. An LSA may be pending acknowledgment from more than one neighbor.
Maximum Number of Retransmit Entries	The maximum number of LSAs that can be waiting for acknowledgment at any given time.
Retransmit Entries High Water Mark	The highest number of LSAs that have been waiting for acknowledgment.
Redistributing	This field is a heading and appears only if you configure the system to take routes learned from a non-OSPF source and advertise them to its peers.
Source	Shows source protocol/routes that are being redistributed. Possible values are static, connected, or RIP.
Metric	The metric of the routes being redistributed.
Metric Type	Shows whether the routes are External Type 1 or External Type 2.
Tag	The decimal value attached to each external route.
Subnets	For redistributing routes into OSPF, the scope of redistribution for the specified protocol.
Distribute-List	The access list used to filter redistributed routes.
Prefix-suppression	Displays whether prefix-suppression is enabled or disabled on the given interface.
NSF Support	Indicates whether nonstop forwarding (NSF) is enabled for the OSPF protocol for planned restarts, unplanned restarts or both (Always).
NSF Restart Interval	The user-configurable grace period during which a neighboring router will be in the helper state after receiving notice that the management unit is performing a graceful restart.
NSF Restart Status	The current graceful restart status of the router.
NSF Restart Age	Number of seconds until the graceful restart grace period expires.
NSF Restart Exit Reason	Indicates why the router last exited the last restart: • None — Graceful restart has not been attempted. • In Progress — Restart is in progress. • Completed — The previous graceful restart completed successfully. • Timed Out — The previous graceful restart timed out. • Topology Changed — The previous graceful restart terminated prematurely because of a topology change.
NSF Help Support	Indicates whether helpful neighbor functionality has been enabled for OSPF for planned restarts, unplanned restarts, or both (Always).
NSF help Strict LSA checking	Indicates whether strict LSA checking has been enabled. If enabled, then an OSPF helpful neighbor will exit helper mode whenever a topology change occurs. If disabled, an OSPF neighbor will continue as a helpful neighbor in spite of topology changes.

show ipv6 ospf abr

This command displays the internal OSPFv3 routes to reach Area Border Routers (ABR). This command takes no options.

Format	show ipv6 ospf abr
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Type	The type of the route to the destination. It can be either: • intra — Intra-area route • inter — Inter-area route
Router ID	Router ID of the destination.
Cost	Cost of using this route.
Area ID	The area ID of the area from which this route is learned.
Next Hop	Next hop toward the destination.
Next Hop Intf	The outgoing router interface to use when forwarding traffic to the next hop.

show ipv6 ospf area

This command displays information about the area. The `areaid` identifies the OSPF area that is being displayed.

Format	show ipv6 ospf area *areaid*
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
AreaID	The area id of the requested OSPF area.
External Routing	A number representing the external routing capabilities for this area.
Spf Runs	The number of times that the intra-area route table has been calculated using this area's link-state database.
Area Border Router Count	The total number of area border routers reachable within this area.
Area LSA Count	Total number of link-state advertisements in this area's link-state database, excluding AS External LSAs.
Area LSA Checksum	A number representing the Area LSA Checksum for the specified AreaID excluding the external (LS type 5) link-state advertisements.
Stub Mode	Represents whether the specified Area is a stub area or not. The possible values are enabled and disabled. This is a configured value.
Import Summary LSAs	Shows whether to import summary LSAs (enabled).
OSPF Stub Metric Value	The metric value of the stub area. This field displays only if the area is a configured as a stub area.

The following OSPF NSSA specific information displays only if the area is configured as an NSSA.

Parameter	Definition
Import Summary LSAs	Shows whether to import summary LSAs into the NSSA.
Redistribute into NSSA	Shows whether to redistribute information into the NSSA.
Default Information Originate	Shows whether to advertise a default route into the NSSA.
Default Metric	The metric value for the default route advertised into the NSSA.
Default Metric Type	The metric type for the default route advertised into the NSSA.
Translator Role	The NSSA translator role of the ABR, which is always or candidate.
Translator Stability Interval	The amount of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router.
Translator State	Shows whether the ABR translator state is disabled, always, or elected.

show ipv6 ospf asbr

This command displays the internal OSPFv3 routes to reach Autonomous System Boundary Routers (ASBR). This command takes no options.

Format	show ipv6 ospf asbr
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Type	The type of the route to the destination. It can be either: • intra — Intra-area route • inter — Inter-area route
Router ID	Router ID of the destination.
Cost	Cost of using this route.
Area ID	The area ID of the area from which this route is learned.
Next Hop	Next hop toward the destination.
Next Hop Intf	The outgoing router interface to use when forwarding traffic to the next hop.

show ipv6 ospf database

This command displays information about the link state database when OSPFv3 is enabled. If you do not enter any parameters, the command displays the LSA headers for all areas. Use the optional `areaid` parameter to display database information about a specific area. Use the other optional parameters to specify the type of link state advertisements to display. Use `external` to display the external LSAs. Use `inter-area` to display the inter-area LSAs. Use `link` to display the link

LSAs. Use `network` to display the network LSAs. Use nssa-external to display NSSA external LSAs. Use `prefix` to display intra-area Prefix LSAs. Use `router` to display router LSAs. Use `unknown area`, `unknown as`, or `unknown link` to display unknown area, AS or link-scope LSAs, respectively. Use `lsid` to specify the link state ID (LSID). Use `adv-router` to show the LSAs that are restricted by the advertising router. Use `self-originate` to display the LSAs in that are self originated. The information below is only displayed if OSPF is enabled.

Format show ipv6 ospf [*areaid*] database [{external | inter-area {prefix | router} | link | network | nssa-external | prefix | router | unknown {area | as | link}}] [*lsid*] [{adv-router [*rtrid*] | self-originate}]

Modes
- Privileged EXEC
- User EXEC

For each link-type and area, the following information is displayed.

Parameter	Definition
Link Id	A number that uniquely identifies an LSA that a router originates from all other self originated LSAs of the same LS type.
Adv Router	The Advertising Router. Is a 32-bit dotted decimal number representing the LSDB interface.
Age	A number representing the age of the link state advertisement in seconds.
Sequence	A number that represents which LSA is more recent.
Checksum	The total number LSA checksum.
Prefix	The IPv6 prefix.
Interface	The interface for the link.
Rtr Count	The number of routers attached to the network.

show ipv6 ospf database database-summary

Use this command to display the number of each type of LSA in the database and the total number of LSAs in the database.

Format show ipv6 ospf database database-summary

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Router	Total number of router LSAs in the OSPFv3 link state database.
Network	Total number of network LSAs in the OSPFv3 link state database.
Inter-area Prefix	Total number of inter-area prefix LSAs in the OSPFv3 link state database.
Inter-area Router	Total number of inter-area router LSAs in the OSPFv3 link state database.
Type-7 Ext	Total number of NSSA external LSAs in the OSPFv3 link state database.
Link	Total number of link LSAs in the OSPFv3 link state database.
Intra-area Prefix	Total number of intra-area prefix LSAs in the OSPFv3 link state database.

Parameter	Definition
Link Unknown	Total number of link-source unknown LSAs in the OSPFv3 link state database.
Area Unknown	Total number of area unknown LSAs in the OSPFv3 link state database.
AS Unknown	Total number of as unknown LSAs in the OSPFv3 link state database.
Type-5 Ext	Total number of AS external LSAs in the OSPFv3 link state database.
Self-Originated Type-5	Total number of self originated AS external LSAs in the OSPFv3 link state database.
Total	Total number of router LSAs in the OSPFv3 link state database.

show ipv6 ospf interface

This command displays the information for the IFO object or virtual interface tables. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format.

Format	show ipv6 ospf interface {*unit/slot/port*|*vlan 1-4093*|loopback *loopback-id*}
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
IP Address	The IPv6 address of the interface.
ifIndex	The interface index number associated with the interface.
OSPF Admin Mode	Shows whether the admin mode is enabled or disabled.
OSPF Area ID	The area ID associated with this interface.
Router Priority	The router priority. The router priority determines which router is the designated router.
Retransmit Interval	The frequency, in seconds, at which the interface sends LSA.
Hello Interval	The frequency, in seconds, at which the interface sends Hello packets.
Dead Interval	The amount of time, in seconds, the interface waits before assuming a neighbor is down.
LSA Ack Interval	The amount of time, in seconds, the interface waits before sending an LSA acknowledgment after receiving an LSA.
Interface Transmit Delay	The number of seconds the interface adds to the age of LSA packets before transmission.
Authentication Type	The type of authentication the interface performs on LSAs it receives.
Metric Cost	The priority of the path. Low costs have a higher priority than high costs.
Prefix-suppression	Displays whether prefix-suppression is enabled, disabled, or unconfigured on the given interface.
Passive Status	Shows whether the interface is passive or not.
OSPF MTU-ignore	Shows whether to ignore MTU mismatches in database descriptor packets sent from neighboring routers.
Link LSA Suppression	The configured state of Link LSA Suppression for the interface.

The following information only displays if OSPF is initialized on the interface:

Parameter	Definition
OSPF Interface Type	Broadcast LANs, such as Ethernet and IEEE 802.5, take the value `broadcast`. The OSPF Interface Type will be 'broadcast'.
State	The OSPF Interface States are: down, loopback, waiting, point-to-point, designated router, and backup designated router.
Designated Router	The router ID representing the designated router.
Backup Designated Router	The router ID representing the backup designated router.
Number of Link Events	The number of link events.
Metric Cost	The cost of the OSPF interface.

show ipv6 ospf interface brief

This command displays brief information for the IFO object or virtual interface tables.

Format	show ipv6 ospf interface brief
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	*unit/slot/port*
OSPF Admin Mode	States whether OSPF is enabled or disabled on a router interface.
OSPF Area ID	The OSPF Area ID for the specified interface.
Router Priority	The router priority. The router priority determines which router is the designated router.
Metric Cost	The priority of the path. Low costs have a higher priority than high costs.
Hello Interval	The frequency, in seconds, at which the interface sends Hello packets.
Dead Interval	The amount of time, in seconds, the interface waits before assuming a neighbor is down.
Retransmit Interval	The frequency, in seconds, at which the interface sends LSA.
Retransmit Delay Interval	The number of seconds the interface adds to the age of LSA packets before transmission.
LSA Ack Interval	The amount of time, in seconds, the interface waits before sending an LSA acknowledgment after receiving an LSA.

show ipv6 ospf interface stats

This command displays the statistics for a specific interface. The command displays information only if OSPF is enabled.

Format	show ipv6 ospf interface stats {*unit/slot/port* | vlan *id*}
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
OSPFv3 Area ID	The area id of this OSPF interface.
IP Address	The IP address associated with this OSPF interface.
OSPFv3 Interface Events	The number of times the specified OSPF interface has changed its state, or an error has occurred.
Virtual Events	The number of state changes or errors that occurred on this virtual link.
Neighbor Events	The number of times this neighbor relationship has changed state, or an error has occurred.
Packets Received	The number of OSPFv3 packets received on the interface.
Packets Transmitted	The number of OSPFv3 packets sent on the interface.
LSAs Sent	The total number of LSAs flooded on the interface.
LSA Acks Received	The total number of LSA acknowledged from this interface.
LSA Acks Sent	The total number of LSAs acknowledged to this interface.
Sent Packets	The number of OSPF packets transmitted on the interface.
Received Packets	The number of valid OSPF packets received on the interface.
Discards	The number of received OSPF packets discarded because of an error in the packet or an error in processing the packet.
Bad Version	The number of received OSPF packets whose version field in the OSPF header does not match the version of the OSPF process handling the packet.
Virtual Link Not Found	The number of received OSPF packets discarded where the ingress interface is in a non-backbone area and the OSPF header identifies the packet as belonging to the backbone, but OSPF does not have a virtual link to the packet's sender.
Area Mismatch	The number of OSPF packets discarded because the area ID in the OSPF header is not the area ID configured on the ingress interface.
Invalid Destination Address	The number of OSPF packets discarded because the packet's destination IP address is not the address of the ingress interface and is not the AllDrRouters or AllSpfRouters multicast addresses.
No Neighbor at Source Address	The number of OSPF packets dropped because the sender is not an existing neighbor or the sender's IP address does not match the previously recorded IP address for that neighbor. NOTE: Does not apply to Hellos.
Invalid OSPF Packet Type	The number of OSPF packets discarded because the packet type field in the OSPF header is not a known type.
Hellos Ignored	The number of received Hello packets that were ignored by this router from the new neighbors after the limit has been reached for the number of neighbors on an interface or on the system as a whole.

Table 12 on page 692 lists the number of OSPF packets of each type sent and received on the interface.

show ipv6 ospf lsa-group

This command displays the number of self-originated LSAs within each LSA group.

Format	show ipv6 ospf lsa-group
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Total self-originated LSAs	The number of LSAs the router is currently originating.
Average LSAs per group	The number of self-originated LSAs divided by the number of LSA groups. The number of LSA groups is the refresh interval (1800 seconds) divided by the pacing interval (configured with `timers pacing lsa-group`) plus two.
Pacing group limit	The maximum number of self-originated LSAs in one LSA group. If the number of LSAs in a group exceeds this limit, OSPF redistributes LSAs throughout the refresh interval to achieve better balance.
Groups	For each LSA pacing group, the output shows the range of LSA ages in the group and the number of LSAs in the group.

Example: The following shows an example of the command.

```
(R1) #show ipv6 ospf lsa-group

Total self-originated LSAs:  3019
Average LSAs per group:  100
Pacing group limit:  400
Number of self-originated LSAs within each LSA group...


Group Start Age   Group End Age    Count
         0            59       96
        60           119       88
       120            179      102
       180            239       95
       240            299       95
       300            359       92
       360            419       48
       420            479       58
       480            539      103
       540            599       99
       600            659      119
       660            719      110
       720            779      106
       780            839      122
       840            899      110
       900            959       99
       960           1019      135
      1020            1079      101
      1080            1139       94
      1140            1199      115
      1200            1259      110
      1260            1319      111
      1320            1379      111
      1380            1439       99
      1440            1499      102
      1500            1559       96
      1560            1619      106
      1620            1679      111
      1680            1739      106
      1740            1799       80
      1800            1859        0
      1860            1919        0
```

show ipv6 ospf max-metric

This command displays the configured maximum metrics for stub-router mode.

Format	show ipv6 ospf max-metric
Modes	• Privileged EXEC • User EXEC

Example: The following shows an example of the command.

```
(config)#show ipv6 ospf max-metric
OSPFv3 Router with ID (3.3.3.3)
 Start time: 00:00:00, Time elapsed: 00:01:05
 Originating router-LSAs with maximum metric
    Condition: on startup for 1000 seconds, State: inactive
    Advertise external-LSAs with metric 16711680
```

show ipv6 ospf neighbor

This command displays information about OSPF neighbors. If you do not specify a neighbor IP address, the output displays summary information in a table. If you specify an interface or tunnel, only the information for that interface or tunnel displays. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format. The ***`ip-address`*** is the IP address of the neighbor, and when you specify this, detailed information about the neighbor displays. The information below only displays if OSPF is enabled and the interface has a neighbor.

Format	show ipv6 ospf neighbor [interface {*unit/slot/port*|*vlan 1-4093*|tunnel *tunnel_id*}][*ip-address*]
Modes	• Privileged EXEC • User EXEC

If you do not specify an IP address, a table with the following columns displays for all neighbors or the neighbor associated with the interface that you specify:

Parameter	Definition
Router ID	The 4-digit dotted-decimal number of the neighbor router.
Priority	The OSPF priority for the specified interface. The priority of an interface is a priority integer from 0 to 255. A value of '0' indicates that the router is not eligible to become the designated router on this network.
Intf ID	The interface ID of the neighbor.
Interface	The interface of the local router in *`unit/slot/port`* format.

Parameter	Definition
State	The state of the neighboring routers. Possible values are: • Down- initial state of the neighbor conversation - no recent information has been received from the neighbor. • Attempt - no recent information has been received from the neighbor but a more concerted effort should be made to contact the neighbor. • Init - an Hello packet has recently been seen from the neighbor, but bidirectional communication has not yet been established. • 2 way - communication between the two routers is bidirectional. • Exchange start - the first step in creating an adjacency between the two neighboring routers, the goal is to decide which router is the master and to decide upon the initial DD sequence number. • Exchange - the router is describing its entire link state database by sending Database Description packets to the neighbor. • Full - the neighboring routers are fully adjacent and they will now appear in router-LSAs and network-LSAs.
Dead Time	The amount of time, in seconds, to wait before the router assumes the neighbor is unreachable.
Restart Helper Status	Indicates the status of this router as a helper during a graceful restart of the router specified in the command line: • Helping—This router is acting as a helpful neighbor to the specified router. • Not Helping—This router is not a helpful neighbor at this time.
Restart Reason	When this router is in helpful neighbor mode, this indicates the reason for the restart as provided by the restarting router.
Remaining Grace Time	The number of seconds remaining the in current graceful restart interval. This is displayed only when this router is currently acting as a helpful neighbor for the router specified in the command.
Restart Helper Exit Reason	Indicates the reason that the specified router last exited a graceful restart. • None—Graceful restart has not been attempted • In Progress—Restart is in progress • Completed—The previous graceful restart completed successfully • Timed Out—The previous graceful restart timed out • Topology Changed—The previous graceful restart terminated prematurely because of a topology change

If you specify an IP address for the neighbor router, the following fields display:

Parameter	Definition
Interface	The interface of the local router in *unit/slot/port* format.
Area ID	The area ID associated with the interface.
Options	An integer value that indicates the optional OSPF capabilities supported by the neighbor. These are listed in its Hello packets. This enables received Hello Packets to be rejected (i.e., neighbor relationships will not even start to form) if there is a mismatch in certain crucial OSPF capabilities.
Router Priority	The router priority for the specified interface.
Dead Timer Due	The amount of time, in seconds, to wait before the router assumes the neighbor is unreachable.
State	The state of the neighboring routers.
Events	Number of times this neighbor relationship has changed state, or an error has occurred.

Parameter	Definition
Retransmission Queue Length	An integer representing the current length of the retransmission queue of the specified neighbor router Id of the specified interface.

show ipv6 ospf range

This command displays the set of OSPFv3 area ranges configured for a given area.

Format	show ipv6 ospf range *areaid*
Modes	Privileged EXEC

Parameter	Definition
Area ID	The area whose prefixes are summarized.
IPv6 Prefix/Prefix Length	The summary prefix and prefix length.
Type	**S** (Summary Link) or **E** (External Link)
Action	**Enabled** or **Disabled**
Cost	Metric to be advertised when the range is active.

show ipv6 ospf statistics

This command displays information about the 15 most recent Shortest Path First (SPF) calculations. SPF is the OSPF routing table calculation.

Format	show ipv6 ospf statistics
Modes	• Privileged EXEC • User EXEC

The command displays the following information with the most recent statistics displayed at the end of the table.

Parameter	Definition
Delta T	The time since the routing table was computed. The time is in the format hours, minutes, and seconds (hh:mm:ss).
Intra	The time taken to compute intra-area routes, in milliseconds.
Summ	The time taken to compute inter-area routes, in milliseconds.
Ext	The time taken to compute external routes, in milliseconds.
SPF Total	The total time taken to compute routes, in milliseconds. The total may exceed the sum of Intra, Summ, and Ext times.
RIB Update	The time from the completion of the routing table calculation until all changes have been made in the common routing table [the Routing Information Base (RIB)], in milliseconds

Parameter	Definition
Reason	The event or events that triggered the SPF. The reason codes are as follows: • R: New router LSA • N: New network LSA • SN: New network (inter-area prefix) summary LSA • SA: New ASBR (inter-area router) summary LSA • X: New external LSA • IP: New intra-area prefix LSA • L: New Link LSA

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 ospf statistics

 Area 0.0.0.0: SPF algorithm executed 10 times

Delta T     Intra    Summ     Ext   SPF Total     RIB Update  Reason

23:32:46      0       0       0       0       0   R, IP
23:32:09      0       0       0       0       0   R, N, IP
23:32:04      0       0       0       0       0   R
23:31:44      0       0       0       0       0   R, N, IP
23:31:39      0       0       0       0       1   R
23:29:57      0       3       7      10     131   R
23:29:52      0      14      29      43      568   SN
04:07:23      0       9      23      33      117   SN
04:07:23      0       9      23      33      117   SN
04:07:18      0       0       0       1     485   SN
04:07:14      0       1       0       1       3   X
```

show ipv6 ospf stub table

This command displays the OSPF stub table. The information below will only be displayed if OSPF is initialized on the switch.

Format	show ipv6 ospf stub table
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Area ID	A 32-bit identifier for the created stub area.
Type of Service	Type of service associated with the stub metric. For this release, Normal TOS is the only supported type.
Metric Val	The metric value is applied based on the TOS. It defaults to the least metric of the type of service among the interfaces to other areas. The OSPF cost for a route is a function of the metric value.
Import Summary LSA	Controls the import of summary LSAs into stub areas.

show ipv6 ospf virtual-link

This command displays the OSPF Virtual Interface information for a specific area and neighbor. The `areaid` parameter identifies the area and the `neighbor` parameter identifies the neighbor’s Router ID.

Format	show ipv6 ospf virtual-link *areaid neighbor*
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Area ID	The area id of the requested OSPF area.
Neighbor Router ID	The input neighbor Router ID.
Hello Interval	The configured hello interval for the OSPF virtual interface.
Dead Interval	The configured dead interval for the OSPF virtual interface.
Interface Transmit Delay	The configured transmit delay for the OSPF virtual interface.
Retransmit Interval	The configured retransmit interval for the OSPF virtual interface.
Authentication Type	The type of authentication the interface performs on LSAs it receives.
State	The OSPF Interface States are: down, loopback, waiting, point-to-point, designated router, and backup designated router. This is the state of the OSPF interface.
Neighbor State	The neighbor state.

show ipv6 ospf virtual-link brief

This command displays the OSPFV3 Virtual Interface information for all areas in the system.

Format	show ipv6 ospf virtual-link brief
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Area ID	The area id of the requested OSPFV3 area.
Neighbor	The neighbor interface of the OSPFV3 virtual interface.
Hello Interval	The configured hello interval for the OSPFV3 virtual interface.
Dead Interval	The configured dead interval for the OSPFV3 virtual interface.
Retransmit Interval	The configured retransmit interval for the OSPFV3 virtual interface.
Transmit Delay	The configured transmit delay for the OSPFV3 virtual interface.

DHCPv6 Commands

This section describes the commands you use to configure the DHCPv6 server on the system and to view DHCPv6 information.

service dhcpv6

This command enables DHCPv6 configuration on the router.

Default	enabled
Format	service dhcpv6
Mode	Global Config

no service dhcpv6

This command disables DHCPv6 configuration on router.

Format	no service dhcpv6
Mode	Global Config

ipv6 dhcp client pd

Use this command to enable the Dynamic Host Configuration Protocol (DHCP) for IPv6 client process (if the process is not currently running) and to enable requests for prefix delegation through a specified interface. When prefix delegation is enabled and a prefix is successfully acquired, the prefix is stored in the IPv6 general prefix pool with an internal name defined by the automatic argument.

Note: The Prefix Delegation client is supported on only one IP interface.

rapid-commit enables the use of a two-message exchange method for prefix delegation and other configuration. If enabled, the client includes the rapid commit option in a solicit message.

The DHCP for IPv6 client, server, and relay functions are mutually exclusive on an interface. If one of these functions is already enabled and a user tries to configure a different function on the same interface, a message is displayed.

Default	Prefix delegation is disabled on an interface.
Format	ipv6 dhcp client pd [rapid-commit]
Mode	Interface Config

Example: The following examples enable prefix delegation on interface 1/0/1:

```
(Switch) #configure
(Switch) (Config)#interface 1/0/1
(Switch) (Interface 1/0/1)# ipv6 dhcp client pd

(Switch) #configure
(Switch) (Config)#interface 1/0/1
(Switch) (Interface 1/0/1)# ipv6 dhcp client pd          rapid-commit
```

no ipv6 dhcp client pd

This command disables requests for prefix delegation.

Format	no ipv6 dhcp client pd
Mode	Interface Config

ipv6 dhcp conflict logging

This command enables/disables the logging of the bindings reported to be conflicting by the DHCPv6 Clients via DECLINE messages.

Default	enabled
Format	ipv6 dhcp conflict logging
Mode	Global Config

Example:

```
(switch) #configure
(switch) (Config)# ipv6 dhcp conflict logging
```

ipv6 dhcp server

Use this command to configure DHCPv6 server functionality on an interface or range of interfaces. The `pool-name` is the DHCPv6 pool containing stateless and/or prefix delegation parameters, *automatic* enables the server to automatically determine which pool to use when allocating addresses for a client, `rapid-commit` is an option that allows for an abbreviated exchange between the client and server, and `pref-value` is a value used by clients to determine preference between multiple DHCPv6 servers. For a particular interface, DHCPv6 server and DHCPv6 relay functions are mutually exclusive.

Format	ipv6 dhcp server {*pool-name* | automatic}[rapid-commit] [preference *pref-value*]
Mode	Interface Config

ipv6 dhcp relay

Use this command to configure an interface for DHCPv6 relay functionality on an interface or range of interfaces. Use the `destination` keyword to set the relay server IPv6 address. The `relay-address` parameter is an IPv6 address of a DHCPv6 relay server. Use the `interface` keyword to set the relay server interface. The `relay-interface` parameter is an interface (*unit/slot/port*) to reach a relay server. Multiple relay addresses can be configured on an interface. To unconfigure a particular relay address use the `no` command with that particular relay address. To unconfigure all relay addresses on an interface, use the `no` command with the relay address and no arguments.

Note: If `relay-address` is an IPv6 global address, then `relay-interface` is not required. If `relay-address` is a link-local or multicast address, then `relay-interface` is required. Finally, if you do not specify a value for `relay-address`, then you must specify a value for `relay-interface` and the DHCPV6-ALL-AGENTS multicast address (i.e. `FF02::1:2`) is used to relay DHCPv6 messages to the relay server.

Format	ipv6 dhcp relay {destination [*relay-address*] interface [*relay-interface*]| interface [*relay-interface*]} [remote-id *(duid-ifid* | user-defined-string)]
Mode	Interface Config

ipv6 dhcp relay remote-id

This command configures the relay agent information option *remote ID* sub-option to be added to the DHCPv6 relayed messages. This can either be the special keyword `duid-ifid`, which causes the remote ID to be derived from the DHCPv6 Server DUID and the relay interface number, or it can be specified as a user-defined string.

Default	None configured
Format	ipv6 dhcp relay remote-id *{duid-ifid* | user-defined-string)]
Mode	Interface Config

no ipv6 dhcp relay remote-id

This command resets the relay agent information option *remote ID* sub-option to be added to the DHCPv6 relayed messages to the default value.

D

Default	None configured
Format	no ipv6 dhcp relay remote-id *{duid-ifid* | user-defined-string)]
Mode	Interface Config

ipv6 dhcp pool

Use this command from Global Config mode to enter IPv6 DHCP Pool Config mode. Use the `exit` command to return to Global Config mode. To return to the User EXEC mode, enter CTRL+Z. The *`pool-name`* should be less than 31 alpha-numeric characters. DHCPv6 pools are used to specify information for DHCPv6 server to distribute to DHCPv6 clients. These pools are shared between multiple interfaces over which DHCPv6 server capabilities are configured.

Once the DHCP for IPv6 configuration information pool has been created, use the `ipv6 dhcp server` command to associate the pool with a server on an interface. If you do not configure an information pool, use the `ipv6 dhcp server` interface configuration command to enable the DHCPv6 server function on an interface.

When you associate a DHCPv6 pool with an interface, only that pool services requests on the associated interface. The pool also services other interfaces. If you do not associate a DHCPv6 pool with an interface, it can service requests on any interface. Not using any IPv6 address prefix means that the pool returns only configured options.

Format	ipv6 dhcp pool *pool-name*
Mode	Global Config

no ipv6 dhcp pool

This command removes the specified DHCPv6 pool.

Format	no ipv6 dhcp pool *pool-name*
Mode	Global Config

address prefix (IPv6)

Use this command to sets an address prefix for address assignment. This address must be in hexadecimal, using 16-bit values between colons.

If `lifetime` values are not configured, the default lifetime values for *valid-lifetime* and *preferred-lifetime* are considered to be infinite.

Format	address prefix *ipv6-prefix* [lifetime {*valid-lifetime preferred-lifetime* | infinite}]
Mode	IPv6 DHCP Pool Config

Parameter	Definition
lifetime	(Optional) Sets a length of time for the hosts to remember router advertisements. If configured, both valid and preferred lifetimes must be configured.
valid-lifetime	The amount of time, in seconds, the prefix remains valid for the requesting router to use. The range is from 60 through 4294967294. The *preferred-lifetime* value cannot exceed the *valid-lifetime* value.
preferred-lifetime	The amount of time, in seconds, that the prefix remains preferred for the requesting router to use. The range is from 60 through 4294967294. The *preferred-lifetime* value cannot exceed the *valid-lifetime* value.
infinite	An unlimited lifetime.

Example: The following example shows how to configure an IPv6 address prefix for the IPv6 configuration pool *pool1*:

```
(Switch) #configure
(Switch) (Config)# ipv6 dhcp pool pool1
(Switch) (Config-dhcp6s-pool)# address prefix 2001::/64
(Switch) (Config-dhcp6s-pool)# exit
```

domain-name (IPv6)

This command sets the DNS domain name which is provided to DHCPv6 client by DHCPv6 server. DNS domain name is configured for stateless server support. Domain name consist of no more than 31 alpha-numeric characters. DHCPv6 pool can have multiple number of domain names with maximum of 8.

Format	domain-name *dns-domain-name*
Mode	IPv6 DHCP Pool Config

no domain-name

This command will remove dhcpv6 domain name from dhcpv6 pool.

Format	no domain-name *dns-domain-name*

Mode	IPv6 DHCP Pool Config

dns-server (IPv6)

This command sets the ipv6 DNS server address which is provided to dhcpv6 client by dhcpv6 server. DNS server address is configured for stateless server support. DHCPv6 pool can have multiple number of domain names with a maximum of 8.

Format	dns-server *dns-server-address*
Mode	IPv6 DHCP Pool Config

no dns-server

This command will remove DHCPv6 server address from DHCPv6 server.

Format	no dns-server *dns-server-address*
Mode	IPv6 DHCP Pool Config

prefix-delegation (IPv6)

Multiple IPv6 prefixes can be defined within a pool for distributing to specific DHCPv6 Prefix delegation clients. Prefix is the delegated IPv6 prefix. DUID is the client's unique DUID value (Example: 00:01:00:09:f8:79:4e:00:04:76:73:43:76'). Name is 31 characters textual client’s name which is useful for logging or tracing only. Valid lifetime is the valid lifetime for the delegated prefix in seconds and preferred lifetime is the preferred lifetime for the delegated prefix in seconds.

Default	• valid-lifetime—2592000 • preferred-lifetime—604800
Format	prefix-delegation *prefix/prefixlength DUID* [name *hostname*][valid-lifetime *04294967295*][preferred-lifetime *0-4294967295*]
Mode	IPv6 DHCP Pool Config

no prefix-delegation

This command deletes a specific prefix-delegation client.

Format	no prefix-delegation *prefix/prefix-delegation DUID*
Mode	IPv6 DHCP Pool Config

show ipv6 dhcp

This command displays the DHCPv6 server name, status, and conflict logging status.

Format	show ipv6 dhcp
Mode	Privileged EXEC

Parameter	Definition
DHCPv6 is Enabled (Disabled)	The status of the DHCPv6 server.
DHCPv6 Conflict Logging Mode	Indicates whether DHCPv6 Conflict Logging is enabled or disabled.
Server DUID	If configured, shows the DHCPv6 unique identifier.

Example:

```
(switch) #show ipv6 dhcp

DHCPv6 is enabled
DHCPv6 Conflict Logging Mode is enabled
Server DUID: 00:01:00:06:a5:e6:dc:bb:f8:b1:56:29:fc:2c
```

show ipv6 dhcp statistics

This command displays the IPv6 DHCP statistics for all interfaces.

Format	show ipv6 dhcp statistics
Mode	Privileged EXEC

Parameter	Definition
DHCPv6 Solicit Packets Received	Number of solicit received statistics.
DHCPv6 Request Packets Received	Number of request received statistics.
DHCPv6 Confirm Packets Received	Number of confirm received statistics.
DHCPv6 Renew Packets Received	Number of renew received statistics.
DHCPv6 Rebind Packets Received	Number of rebind received statistics.
DHCPv6 Release Packets Received	Number of release received statistics.
DHCPv6 Decline Packets Received	Number of decline received statistics.
DHCPv6 Inform Packets Received	Number of inform received statistics.
DHCPv6 Relay-forward Packets Received	Number of relay forward received statistics.
DHCPv6 Relay-reply Packets Received	Number of relay-reply received statistics.
DHCPv6 Malformed Packets Received	Number of malformed packets statistics.
Received DHCPv6 Packets Discarded	Number of DHCP discarded statistics.
Total DHCPv6 Packets Received	Total number of DHCPv6 received statistics
DHCPv6 Advertisement Packets Transmitted	Number of advertise sent statistics.
DHCPv6 Reply Packets Transmitted	Number of reply sent statistics.
DHCPv6 Reconfig Packets Transmitted	Number of reconfigure sent statistics.
DHCPv6 Relay-reply Packets Transmitted	Number of relay-reply sent statistics.
DHCPv6 Relay-forward Packets Transmitted	Number of relay-forward sent statistics.
Total DHCPv6 Packets Transmitted	Total number of DHCPv6 sent statistics.

show ipv6 dhcp interface

This command displays DHCPv6 information for all relevant interfaces or the specified interface. The argument `unit/slot/port` corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of a *unit/slot/port* format. If you specify an interface, you can use the optional `statistics` parameter to view statistics for the specified interface.

Format	show ipv6 dhcp interface *{unit/slot/port|vlan 1-4093}* [statistics]
Mode	Privileged EXEC

Parameter	Definition
IPv6 Interface	The interface name in *`unit/slot/port`* format.
Mode	Shows whether the interface is a IPv6 DHCP relay or server.

If the interface mode is server, the following information displays.

Parameter	Definition
Pool Name	The pool name specifying information for DHCPv6 server distribution to DHCPv6 clients.
Server Preference	The preference of the server.
Option Flags	Shows whether rapid commit is enabled.

If the interface mode is relay, the following information displays.

Parameter	Definition
Relay Address	The IPv6 address of the relay server.
Relay Interface Number	The relay server interface in *`unit/slot/port`* format.
Relay Remote ID	If configured, shows the name of the relay remote.
Option Flags	Shows whether rapid commit is configured.

If you use the statistics parameter, the command displays the IPv6 DHCP statistics for the specified interface. See “show ipv6 dhcp statistics” on page 831 for information about the output.

Example:

```
(Routing) # show ipv6 dhcp interface vlan 10

DHCPv6 Interface 3/1 Statistics
------------------------------------
DHCPv6 Client Statistics
------------------------------
DHCPv6 Advertisement Packets Received.......... 2
DHCPv6 Reply Packets Received.................. 3
Received DHCPv6 Advertisement Packets Discard.. 0
Received DHCPv6 Reply Packets Discarded........ 0
DHCPv6 Malformed Packets Received............. 0
Total DHCPv6 Packets Received.................. 5
DHCPv6 Solicit Packets Transmitted............ 2
DHCPv6 Request Packets Transmitted............ 2
DHCPv6 Renew Packets Transmitted.............. 0
DHCPv6 Rebind Packets Transmitted............. 0
```

```
DHCPv6 Release Packets Transmitted............. 0
DHCPv6 Decline Packets Transmitted............. 1
DHCPv6 Confirm Packets Transmitted............. 0
Total DHCPv6 Packets Transmitted............... 5
DHCPv6 Server/Relay Statistics
------------------------------
DHCPv6 Solicit Packets Received................ 0
DHCPv6 Request Packets Received................ 0
DHCPv6 Confirm Packets Received................ 0
DHCPv6 Renew Packets Received.................. 0
DHCPv6 Rebind Packets Received................. 0
DHCPv6 Release Packets Received................ 0
DHCPv6 Decline Packets Received................ 0
DHCPv6 Inform Packets Received................. 0
DHCPv6 Relay-forward Packets Received.......... 0
DHCPv6 Relay-reply Packets Received............ 0
DHCPv6 Malformed Packets Received.............. 0
Received DHCPv6 Packets Discarded.............. 0
Total DHCPv6 Packets Received.................. 0
DHCPv6 Advertisement Packets Transmitted....... 0
DHCPv6 Reply Packets Transmitted............... 0
DHCPv6 Reconfig Packets Transmitted............ 0
DHCPv6 Relay-reply Packets Transmitted......... 0
DHCPv6 Relay-forward Packets Transmitted....... 0
Total DHCPv6 Packets Transmitted............... 0
```

show ipv6 dhcp binding

This command displays configured DHCP pool.

Format	show ipv6 dhcp binding *[ipv6-address]*
Mode	Privileged EXEC

Parameter	Definition
DHCP Client Address	Address of DHCP Client.
DUID	String that represents the Client DUID.
IAID	Identity Association ID.
Prefix/Prefix Length	IPv6 address and mask length for delegated prefix.
Prefix Type	IPV6 Prefix type (IAPD, IANA, or IATA).
Client Address	Address of DHCP Client.
Client Interface	IPv6 Address of DHCP Client.
Expiration	Address of DNS server address.
Valid Lifetime	Valid lifetime in seconds for delegated prefix.
Preferred Lifetime	Preferred lifetime in seconds for delegated prefix.

show ipv6 dhcp conflict

This command displays the conflict bindings in the DHCPv6 server that are created when the leased bindings are declined by DHCPv6 clients. Passing an optional ipv6-address argument displays the details about the specific conflict binding corresponding to that IPv6 address.

Format	show ipv6 dhcp conflict [*ipv6-address*]
Mode	Privileged EXEC

Example:

```
(switch) #show ipv6 dhcp conflict


Pool Name..................................... STATEFUL
Prefix......................................... 2001::/64
Conflict Bindings............................. 2001::2
.......... ................................... 2001::3
```

show ipv6 dhcp pool

This command displays configured DHCP pool.

Format show ipv6 dhcp pool *pool-name*

Mode Privileged EXEC

Parameter	Definition
DHCP Pool Name	Unique pool name configuration.
Client DUID	Client's DHCP unique identifier. DUID is generated using the combination of the local system burned-in MAC address and a timestamp value.
Host	Name of the client.
Prefix/Prefix Length	IPv6 address and mask length for delegated prefix.
Preferred Lifetime	Preferred lifetime in seconds for delegated prefix.
Valid Lifetime	Valid lifetime in seconds for delegated prefix.
DNS Server Address	Address of DNS server address.
Domain Name	DNS domain name.

show network ipv6 dhcp statistics

This command displays the statistics of the DHCPv6 client running on the network management interface.

Format show network ipv6 dhcp statistics

Mode
- Privileged EXEC
- User EXEC

Field	Description
DHCPv6 Advertisement Packets Received	The number of DHCPv6 Advertisement packets received on the network interface.
DHCPv6 Reply Packets Received	The number of DHCPv6 Reply packets received on the network interface.
Received DHCPv6 Advertisement Packets Discarded	The number of DHCPv6 Advertisement packets discarded on the network interface.
Received DHCPv6 Reply Packets Discarded	The number of DHCPv6 Reply packets discarded on the network interface.

Field	Description
DHCPv6 Malformed Packets Received	The number of DHCPv6 packets that are received malformed on the network interface.
Total DHCPv6 Packets Received	The total number of DHCPv6 packets received on the network interface.
DHCPv6 Solicit Packets Transmitted	The number of DHCPv6 Solicit packets transmitted on the network interface.
DHCPv6 Request Packets Transmitted	The number of DHCPv6 Request packets transmitted on the network interface.
DHCPv6 Renew Packets Transmitted	The number of DHCPv6 Renew packets transmitted on the network interface.
DHCPv6 Rebind Packets Transmitted	The number of DHCPv6 Rebind packets transmitted on the network interface.
DHCPv6 Release Packets Transmitted	The number of DHCPv6 Release packets transmitted on the network interface.
Total DHCPv6 Packets Transmitted	The total number of DHCPv6 packets transmitted on the network interface.

Example: The following shows example CLI display output for the command.

```
(admin)#show network ipv6 dhcp statistics
DHCPv6 Client Statistics
-------------------------

DHCPv6 Advertisement Packets Received................. 0
DHCPv6 Reply Packets Received......................... 0
Received DHCPv6 Advertisement Packets Discarded....... 0
Received DHCPv6 Reply Packets Discarded............... 0
DHCPv6 Malformed Packets Received..................... 0
Total DHCPv6 Packets Received......................... 0

DHCPv6 Solicit Packets Transmitted.................... 0
DHCPv6 Request Packets Transmitted.................... 0
DHCPv6 Renew Packets Transmitted...................... 0
DHCPv6 Rebind Packets Transmitted..................... 0
DHCPv6 Release Packets Transmitted.................... 0
Total DHCPv6 Packets Transmitted...................... 0
```

show serviceport ipv6 dhcp statistics

This command displays the statistics of the DHCPv6 client running on the serviceport management interface.

Format	show serviceport ipv6 dhcp statistics
Mode	• Privileged EXEC • User EXEC

Field	Description
DHCPv6 Advertisement Packets Received	The number of DHCPv6 Advertisement packets received on the service port interface.
DHCPv6 Reply Packets Received	The number of DHCPv6 Reply packets received on the service port interface.
Received DHCPv6 Advertisement Packets Discarded	The number of DHCPv6 Advertisement packets discarded on the service port interface.

Field	Description
Received DHCPv6 Reply Packets Discarded	The number of DHCPv6 Reply packets discarded on the service port interface.
DHCPv6 Malformed Packets Received	The number of DHCPv6 packets that are received malformed on the service port interface.
Total DHCPv6 Packets Received	The total number of DHCPv6 packets received on the service port interface.
DHCPv6 Solicit Packets Transmitted	The number of DHCPv6 Solicit packets transmitted on the service port interface.
DHCPv6 Request Packets Transmitted	The number of DHCPv6 Request packets transmitted on the service port interface.
DHCPv6 Renew Packets Transmitted	The number of DHCPv6 Renew packets transmitted on the service port interface.
DHCPv6 Rebind Packets Transmitted	The number of DHCPv6 Rebind packets transmitted on the service port interface.
DHCPv6 Release Packets Transmitted	The number of DHCPv6 Release packets transmitted on the service port interface.
Total DHCPv6 Packets Transmitted	The total number of DHCPv6 packets transmitted on the service port interface.

Example: The following shows example CLI display output for the command.

```
(admin)#show serviceport ipv6 dhcp statistics
DHCPv6 Client Statistics
-------------------------

DHCPv6 Advertisement Packets Received................. 0
DHCPv6 Reply Packets Received......................... 0
Received DHCPv6 Advertisement Packets Discarded....... 0
Received DHCPv6 Reply Packets Discarded............... 0
DHCPv6 Malformed Packets Received..................... 0
Total DHCPv6 Packets Received......................... 0

DHCPv6 Solicit Packets Transmitted.................... 0
DHCPv6 Request Packets Transmitted.................... 0
DHCPv6 Renew Packets Transmitted...................... 0
DHCPv6 Rebind Packets Transmitted..................... 0
DHCPv6 Release Packets Transmitted.................... 0
Total DHCPv6 Packets Transmitted...................... 0
```

clear ipv6 dhcp

Use this command to clear DHCPv6 statistics for all interfaces or for a specific interface. Use the `unit/slot/port` parameter to specify an interface and the vlan parameter to specify a VLAN.

Format	clear ipv6 dhcp {statistics | interface {*unit/slot/port* | vlan *id*}}
Mode	Privileged EXEC

clear ipv6 dhcp binding

This command deletes an automatic address binding from the DHCP server database. `address` is a valid IPv6 address.

A binding table entry on the DHCP for IPv6 server is automatically:

- Created whenever a prefix is delegated to a client from the configuration pool.
- Updated when the client renews, rebinds, or confirms the prefix delegation.
- Deleted when the client releases all the prefixes in the binding voluntarily, all prefixes' valid lifetimes have expired, or an administrator runs the `clear ipv6 dhcp binding` command.

If the `clear ipv6 dhcp binding` command is used with the optional *ipv6-address* argument specified, only the binding for the specified client is deleted. If the `clear ipv6 dhcp binding` command is used without the *ipv6-address* argument, all automatic client bindings are deleted from the DHCP for IPv6 binding table.

Format	clear ipv6 dhcp binding [*ipv6-address*]
Mode	Privileged EXEC

clear ipv6 dhcp conflict

This command deletes the DHCPv6 Client conflict binding(s) that represent the address (es) declined by DHCPv6 Clients.

Format	clear ipv6 dhcp conflict { *ipv6-address* | * }
Mode	Privileged EXEC

Syntax	Description
ipv6-address	The conflicting address declined by a DHCPv6 Client.
*	Indicates all conflicting addresses in the database.

Usage Guidelines

The `clear ipv6 dhcp` conflict command is used as a server function.

A conflict binding entry is created by the DHCPv6 server whenever an advertised lease binding is declined by a DHCPv6 client.

If the `clear ipv6 dhcp` conflict command is used with the optional `ipv6-address` argument specified, only that specific conflict binding is deleted. If the `clear ipv6 dhcp conflict *` command is used without the `ipv6-address` argument, then all conflict client bindings are deleted.

Example:

```
(switch) # clear ipv6 dhcp conflict 2003:1::2
(switch) # clear ipv6 dhcp conflict *
```

clear network ipv6 dhcp statistics

Use this command to clear the DHCPv6 statistics on the network management interface.

Format	clear network ipv6 dhcp statistics
Mode	Privileged EXEC

clear serviceport ipv6 dhcp statistics

Use this command to clear the DHCPv6 client statistics on the service port interface.

Format	clear serviceport ipv6 dhcp statistics
Mode	Privileged EXEC

DHCPv6 Snooping Configuration Commands

This section describes commands you use to configure IPv6 DHCP Snooping.

ipv6 dhcp snooping

Use this command to globally enable IPv6 DHCP Snooping.

Default	disabled
Format	ipv6 dhcp snooping
Mode	Global Config

no ipv6 dhcp snooping

Use this command to globally disable IPv6 DHCP Snooping.

Format	no ipv6 dhcp snooping
Mode	Global Config

ipv6 dhcp snooping vlan

Use this command to enable DHCP Snooping on a list of comma-separated VLAN ranges.

Default	disabled
Format	ipv6 dhcp snooping vlan *vlan-list*
Mode	Global Config

no ipv6 dhcp snooping vlan

Use this command to disable DHCP Snooping on VLANs.

Format	no ipv6 dhcp snooping vlan *vlan-list*
Mode	Global Config

ipv6 dhcp snooping verify mac-address

Use this command to enable verification of the source MAC address with the client hardware address in the received DCHP message.

Default	enabled
Format	ipv6 dhcp snooping verify mac-address
Mode	Global Config

no ipv6 dhcp snooping verify mac-address

Use this command to disable verification of the source MAC address with the client hardware address.

Format	no ipv6 dhcp snooping verify mac-address
Mode	Global Config

ipv6 dhcp snooping database

Use this command to configure the persistent location of the DHCP Snooping database. This can be local or a remote file on a given IP machine.

Default	local
Format	ipv6 dhcp snooping database {local|tftp://hostIP/filename}
Mode	Global Config

ip dhcp snooping database write-delay

Use this command to configure the interval in seconds at which the DHCP Snooping database is persisted. The interval value ranges from 15 to 86400 seconds.

Default	300 seconds
Format	ip dhcp snooping database write-delay *in seconds*
Mode	Global Config

no ip dhcp snooping database write-delay

Use this command to set the write delay value to the default value.

Format	no ip dhcp snooping database write-delay
Mode	Global Config

ipv6 dhcp snooping binding

Use this command to configure static DHCP Snooping binding.

Format	ipv6 dhcp snooping binding *mac-address* vlan *vlan id ip address* interface *interface id*
Mode	Global Config

no ipv6 dhcp snooping binding

Use this command to remove the DHCP static entry from the DHCP Snooping database.

Format	no ipv6 dhcp snooping binding *mac-address*
Mode	Global Config

ipv6 dhcp snooping trust

Use this command to configure an interface or range of interfaces as trusted.

Default	disabled
Format	ipv6 dhcp snooping trust
Mode	Interface Config

no ipv6 dhcp snooping trust

Use this command to configure the port as untrusted.

Format	no ipv6 dhcp snooping trust
Mode	Interface Config

ipv6 dhcp snooping log-invalid

Use this command to control the logging DHCP messages filtration by the DHCP Snooping application. This command can be used to configure a single interface or a range of interfaces.

Default	disabled
Format	ipv6 dhcp snooping log-invalid
Mode	Interface Config

no ipv6 dhcp snooping log-invalid

Use this command to disable the logging DHCP messages filtration by the DHCP Snooping application.

Format	no ipv6 dhcp snooping log-invalid
Mode	Interface Config

ipv6 dhcp snooping limit

Use this command to control the rate at which the DHCP Snooping messages come on an interface or range of interfaces. By default, rate limiting is disabled. When enabled, the rate can range from 0 to 300 packets per second. The burst level range is 1 to 15 seconds. Rate limiting is configured on a physical port and may be applied to trusted and untrusted ports.

Default	disabled (no limit)
Format	ipv6 dhcp snooping limit {rate pps [*burst interval seconds*]}
Mode	Interface Config

no ipv6 dhcp snooping limit

Use this command to set the rate at which the DHCP Snooping messages come, and the burst level, to the defaults.

Format	no ipv6 dhcp snooping limit
Mode	Interface Config

ipv6 verify source

Use this command to configure the IPv6SG source ID attribute to filter the data traffic in the hardware. Source ID is the combination of IP address and MAC address. Normal command allows data traffic filtration based on the IP address. With the `port-security` option, the data traffic is filtered based on the IP and MAC addresses.

This command can be used to configure a single interface or a range of interfaces.

Default	The source ID is the IP address.
Format	ipv6 verify source {port-security}
Mode	Interface Config

no ipv6 verify source

Use this command to disable the IPv6SG configuration in the hardware. You cannot disable port-security alone if it is configured.

Format	no ipv6 verify source
Mode	Interface Config

ipv6 verify binding

Use this command to configure static IPv6 source guard (IPv6SG) entries.

Format	ipv6 verify binding *mac-address* vlan *vlan id ipv6 address* interface *interface id*
Mode	Global Config

no ipv6 verify binding

Use this command to remove the IPv6SG static entry from the IPv6SG database.

Format	no ipv6 verify binding *mac-address* vlan *vlan id ipv6 address* interface *interface id*
Mode	Global Config

show ipv6 dhcp snooping

Use this command to display the DHCP Snooping global configurations and per port configurations.

Format	show ipv6 dhcp snooping
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	The interface for which data is displayed.

Parameter	Definition
Trusted	If it is enabled, DHCP snooping considers the port as trusted. The factory default is disabled.
Log Invalid Pkts	If it is enabled, DHCP snooping application logs invalid packets on the specified interface.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 dhcp snooping

DHCP snooping is Disabled
DHCP snooping source MAC verification is enabled
DHCP snooping is enabled on the following VLANs:
11 - 30, 40

Interface   Trusted    Log Invalid Pkts
---------   --------   ----------------
0/1         Yes          No
0/2         No          Yes
0/3         No          Yes
0/4         No           No
0/6         No           No
```

show ipv6 dhcp snooping binding

Use this command to display the DHCP Snooping binding entries. To restrict the output, use the following options:

- Dynamic: Restrict the output based on DCHP snooping.
- Interface: Restrict the output based on a specific interface.
- Static: Restrict the output based on static entries.
- VLAN: Restrict the output based on VLAN.

Format	show ipv6 dhcp snooping binding [{static/dynamic}] [interface *unit/slot/port*] [vlan id]
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
MAC Address	Displays the MAC address for the binding that was added. The MAC address is the key to the binding database.
IPv6 Address	Displays the valid IPv6 address for the binding rule.
VLAN	The VLAN for the binding rule.
Interface	The interface to add a binding into the DHCP snooping interface.
Type	Binding type; statically configured from the CLI or dynamically learned.
Lease (sec)	The remaining lease time for the entry.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 dhcp snooping binding

Total number of bindings: 2

MAC Address         IPv6 Address  VLAN  Interface  Type  Lease time (Secs)
------------------  -------------- ----  ---------  ----                ------------------
```

```
80:96:21:06:60:80   2000::1/64     10    0/1                          86400
80:96:21:00:13:04   3000::1/64     10    0/1                            86400
```

show ipv6 dhcp snooping database

Use this command to display the DHCP Snooping configuration related to the database persistence.

Format show ipv6 dhcp snooping database

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
Agent URL	Bindings database agent URL.
Write Delay	The maximum write time to write the database into local or remote.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 dhcp snooping database

agent url:  /10.131.13.79:/sai1.txt

write-delay:  5000
```

show ipv6 dhcp snooping interfaces

Use this command to show the DHCP Snooping status of all interfaces or a specified interface.

Format show ipv6 dhcp snooping interfaces [interface *unit/slot/port*]

Mode Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 dhcp snooping interfaces

 Interface    Trust State                                          Rate LimitBurst Interval
                                                                  (pps) (seconds)
-----------   ----------   ----------   --------------
                                                                  1/g1No151
                                                                  1/g2No151
                                                                  1/g3No151

(switch) #show ip dhcp snooping interfaces ethernet 1/0/1

 Interface    Trust State                                          Rate LimitBurst Interval
                                                                  (pps) (seconds)
-----------   ----------   ----------   --------------
                                                                  1/0/1Yes151
```

show ipv6 dhcp snooping statistics

Use this command to list statistics for IPv6 DHCP Snooping security violations on untrusted ports.

Format show ipv6 dhcp snooping statistics

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
Interface	The IPv6 address of the interface in `unit/slot/port` format.
MAC Verify Failures	Represents the number of DHCP messages that were filtered on an untrusted interface because of source MAC address and client hardware address mismatch.
Client Ifc Mismatch	Represents the number of DHCP release and Deny messages received on the different ports than learned previously.
DHCP Server Msgs Rec'd	Represents the number of DHCP server messages received on Untrusted ports.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 dhcp snooping statistics

 Interface    MAC Verify   Client Ifc   DHCP Server
              Failures     Mismatch     Msgs Rec'd
-----------   ----------   ----------   -----------
1/0/2              0           0            0
1/0/3              0           0            0
1/0/4              0           0            0
1/0/5              0           0            0
1/0/6              0           0            0
1/0/7              0           0            0
1/0/8              0           0            0
1/0/9              0           0            0
1/0/10             0           0            0
1/0/11             0           0            0
1/0/12             0           0            0
1/0/13             0           0            0
1/0/14             0           0            0
1/0/15             0           0            0
1/0/16             0           0            0
1/0/17             0           0            0
1/0/18             0           0            0
1/0/19             0           0            0
1/0/20             0           0            0
```

clear ipv6 dhcp snooping binding

Use this command to clear all DHCPv6 Snooping bindings on all interfaces or on a specific interface.

Format clear ipv6 dhcp snooping binding [interface *unit/slot/port*]

Mode
- Privileged EXEC
- User EXEC

clear ipv6 dhcp snooping statistics

Use this command to clear all DHCPv6 Snooping statistics.

Format	clear ipv6 dhcp snooping statistics
Mode	• Privileged EXEC • User EXEC

show ipv6 verify

Use this command to display the IPv6 configuration on a specified unit/slot/port.

Format	show ipv6 verify *interface*
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	Interface address in unit/slot/port format.
Filter Type	Is one of two values: • ip-v6mac: User has configured MAC address filtering on this interface. • ipv6: Only IPv6 address filtering on this interface.
IPv6 Address	IPv6 address of the interface
MAC Address	If MAC address filtering is not configured on the interface, the MAC Address field is empty. If port security is disabled on the interface, then the MAC Address field displays “permit-all.”
VLAN	The VLAN for the binding rule.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 verify 0/1

Interface  Filter Type    IP Address       MAC Address      Vlan
---------  -----------  ---------------  -----------------  -----
   0/1     ipv6-mac      2000::1/64      80:96:21:06:60:80    10
   0/1     ipv6-mac      3000::1/64      80:96:21:00:13:04    10
```

show ipv6 verify source

Use this command to display the IPv6SG configurations on all ports. If the interface option is specified, the output is restricted to the specified unit/slot/port.

Format	show ipv6 verify source {*interface*}
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	Interface address in unit/slot/port format.
Filter Type	Is one of two values: • ip-v6mac: User has configured MAC address filtering on this interface. • ipv6: Only IPv6 address filtering on this interface.
IPv6 Address	IPv6 address of the interface

Parameter	Definition
MAC Address	If MAC address filtering is not configured on the interface, the MAC Address field is empty. If port security is disabled on the interface, then the MAC Address field displays “permit-all.”
VLAN	The VLAN for the binding rule.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 verify source

Interface  Filter Type   IP Address      MAC Address       Vlan
---------  -----------  ---------------  -----------------  -----
   0/1     ipv6-mac      2000::1/64     00:02:B3:06:60:80    10
   0/1     ipv6-mac      3000::1/64     00:0F:FE:00:13:04    10
```

show ipv6 source binding

Use this command to display the IPv6SG bindings.

Format show ipv6 source binding [{dhcp-snooping|static}] [interface *unit/slot/port*] [vlan id]

Mode
- Privileged EXEC
- User EXEC

Parameter	Definition
MAC Address	The MAC address for the entry that is added.
IP Address	The IP address of the entry that is added.
Type	Entry type; statically configured from CLI or dynamically learned from DHCP Snooping.
VLAN	VLAN for the entry.
Interface	IP address of the interface in `unit/slot/port` format.

Example: The following shows example CLI display output for the command.

```
(switch) #show ipv6 source binding

MAC Address          IP Address      Type        Vlan    Interface
-----------------  ---------------  -------------  -----  -------------
00:00:00:00:00:08        2000::1  dhcp-snooping    2       1/0/1
00:00:00:00:00:09        3000::1  dhcp-snooping    3       1/0/1
00:00:00:00:00:0A         4000::1  dhcp-snooping    4       1/0/1
```

Chapter 9. Quality of Service Commands

This chapter describes the Quality of Service (QoS) commands available in the CE0128XB/CE0152XB CLI.

Note: The commands in this chapter are in one of two functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.

Class of Service Commands

This section describes the commands you use to configure and view Class of Service (CoS) settings for the switch. The commands in this section allow you to control the priority and transmission rate of traffic.

Note: Commands you issue in the Interface Config mode only affect a single interface. Commands you issue in the Global Config mode affect all interfaces.

classofservice dot1p-mapping

This command maps an 802.1p priority to an internal traffic class. The `userpriority` values can range from 0-7. The `trafficclass` values range from 0-6, although the actual number of available traffic classes depends on the platform.

Format	classofservice dot1p-mapping *userpriority trafficclass*
Modes	• Global Config • Interface Config

no classofservice dot1p-mapping

This command maps each 802.1p priority to its default internal traffic class value.

Format	no classofservice dot1p-mapping
Modes	• Global Config • Interface Config

classofservice ip-dscp-mapping

This command maps an IP DSCP value to an internal traffic class. The `ipdscp` value is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef.

The `trafficclass` values can range from 0-6, although the actual number of available traffic classes depends on the platform.

Format	classofservice ip-dscp-mapping *ipdscp trafficclass*
Mode	Global Config

no classofservice ip-dscp-mapping

This command maps each IP DSCP value to its default internal traffic class value.

Format	no classofservice ip-dscp-mapping
Mode	Global Config

classofservice trust

This command sets the class of service trust mode of an interface or range of interfaces. You can set the mode to trust one of the Dot1p (802.1p), IP DSCP, or IP Precedence packet markings. You can also set the interface mode to untrusted. If you configure an interface to use Dot1p, the mode does not appear in the output of the `“show running-config” on page 191` command because Dot1p is the default.

Note: The `classofservice trust dot1p` command will not be supported in future releases of the software because Dot1p is the default value. Use the `no classofservice trust` command to set the mode to the default value.

Default	dot1p
Format	classofservice trust {dot1p | ip-dscp | untrusted}
Modes	• Global Config • Interface Config

no classofservice trust

This command sets the interface mode to the default value.

Format	no classofservice trust
Modes	• Global Config • Interface Config

cos-queue min-bandwidth

This command specifies the minimum transmission bandwidth guarantee for each interface queue on an interface, a range of interfaces, or all interfaces. The total number of queues supported per interface is platform specific. A value from 0-100 (percentage of link rate) must be specified for each supported queue, with 0 indicating no guaranteed minimum bandwidth. The sum of all values entered must not exceed 100.

Format	cos-queue min-bandwidth *bw-0 bw-1 … bw-n*
Modes	• Global Config • Interface Config

no cos-queue min-bandwidth

This command restores the default for each queue's minimum bandwidth value.

Format	no cos-queue min-bandwidth

Modes
- Global Config
- Interface Config

cos-queue strict

This command activates the strict priority scheduler mode for each specified queue for an interface queue on an interface, a range of interfaces, or all interfaces.

Format cos-queue strict *queue-id-1 [queue-id-2 … queue-id-n]*

Modes
- Global Config
- Interface Config

no cos-queue strict

This command restores the default weighted scheduler mode for each specified queue.

Format no cos-queue strict *queue-id-1* [*queue-id-2 … queue-id-n*]

Modes
- Global Config
- Interface Config

traffic-shape

This command specifies the maximum transmission bandwidth limit for the interface as a whole. The bandwidth values are from 0-100 in increments of 1. You can also specify this value for a range of interfaces or all interfaces. Also known as rate shaping, traffic shaping has the effect of smoothing temporary traffic bursts over time so that the transmitted traffic rate is bounded.

Format traffic-shape *bw*

Modes
- Global Config
- Interface Config

no traffic-shape

This command restores the interface shaping rate to the default value.

Format no traffic-shape

Modes
- Global Config
- Interface Config

show classofservice dot1p-mapping

This command displays the current Dot1p (802.1p) priority mapping to internal traffic classes for a specific interface. The `unit/slot/port` parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the 802.1p mapping table of the interface is displayed. If omitted, the most recent global configuration settings are displayed. For more information, see "Voice VLAN Commands" on page 401.

Format show classofservice dot1p-mapping [*unit/slot/port*]

Mode	Privileged EXEC

The following information is repeated for each user priority.

Parameter	Definition
User Priority	The 802.1p user priority value.
Traffic Class	The traffic class internal queue identifier to which the user priority value is mapped.

show classofservice ip-dscp-mapping

This command displays the current IP DSCP mapping to internal traffic classes for the global configuration settings.

Format	show classofservice ip-dscp-mapping
Mode	Privileged EXEC

The following information is repeated for each user priority.

Parameter	Definition
IP DSCP	The IP DSCP value.
Traffic Class	The traffic class internal queue identifier to which the IP DSCP value is mapped.

show classofservice trust

This command displays the current trust mode setting for a specific interface. The `unit/slot/port` parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If you specify an interface, the command displays the port trust mode of the interface. If you do not specify an interface, the command displays the most recent global configuration settings.

Format	show classofservice trust [*unit/slot/port*]
Mode	Privileged EXEC

Parameter	Definition
Class of Service Trust Mode	The the trust mode, which is either Dot1P, IP DSCP, or Untrusted.
Non-IP Traffic Class	(IP DSCP mode only) The traffic class used for non-IP traffic.
Untrusted Traffic Class	(Untrusted mode only) The traffic class used for all untrusted traffic.

show interfaces cos-queue

This command displays the class-of-service queue configuration for the specified interface. The `unit/slot/port` parameter is optional and is only valid on platforms that support independent per-port class of service mappings. If specified, the class-of-service queue configuration of the interface is displayed. If omitted, the most recent global configuration settings are displayed.

Format	show interfaces cos-queue [*unit/slot/port*]
Mode	Privileged EXEC

Parameter	Definition
Interface Shaping Rate	The global interface shaping rate value.
WRED Decay Exponent	The global WRED decay exponent value.
Queue Id	An interface supports n queues numbered 0 to (n-1). The specific n value is platform dependent.
Minimum Bandwidth	The minimum transmission bandwidth guarantee for the queue, expressed as a percentage. A value of 0 means bandwidth is not guaranteed and the queue operates using best-effort. This is a configured value.
Maximum Bandwidth	The maximum transmission bandwidth guarantee for the queue, expressed as a percentage. A value of 0 means bandwidth is not guaranteed and the queue operates using best-effort. This is a configured value.
Scheduler Type	Indicates whether this queue is scheduled for transmission using a strict priority or a weighted scheme. This is a configured value.
Queue Management Type	The queue depth management technique used for this queue (tail drop).

If you specify the interface, the command also displays the following information.

Parameter	Definition
Interface	The `unit/slot/port` of the interface. If displaying the global configuration, this output line is replaced with a Global Config indication.
Interface Shaping Rate	The maximum transmission bandwidth limit for the interface as a whole. It is independent of any per-queue maximum bandwidth value(s) in effect for the interface. This is a configured value.
WRED Decay Exponent	The configured WRED decay exponent for a CoS queue interface.

show interfaces tail-drop-threshold

This command displays the tail drop threshold information. If you specify the unit/slot/port, the command displays the tail drop threshold information for the specified interface.

Format	show interfaces tail-drop-threshold [*unit/slot/port*]
Mode	Privileged EXEC

Differentiated Services Commands

This section describes the commands you use to configure QOS Differentiated Services (DiffServ).

You configure DiffServ in several stages by specifying three DiffServ components:

1. Class
    a. Creating and deleting classes.
    b. Defining match criteria for a class.
2. Policy
    c. Creating and deleting policies
    d. Associating classes with a policy
    e. Defining policy statements for a policy/class combination
3. Service
    f. Adding and removing a policy to/from an inbound interface

The DiffServ class defines the packet filtering criteria. The attributes of a DiffServ policy define the way the switch processes packets. You can define policy attributes on a per-class instance basis. The switch applies these attributes when a match occurs.

Packet processing begins when the switch tests the match criteria for a packet. The switch applies a policy to a packet when it finds a class match within that policy.

The following rules apply when you create a DiffServ class:

- Each class can contain a maximum of one referenced (nested) class
- Class definitions do not support hierarchical service policies

A given class definition can contain a maximum of one reference to another class. You can combine the reference with other match criteria. The referenced class is truly a reference and not a copy since additions to a referenced class affect all classes that reference it. Changes to any class definition currently referenced by any other class must result in valid class definitions for all derived classes, otherwise the switch rejects the change. You can remove a class reference from a class definition.

The only way to remove an individual match criterion from an existing class definition is to delete the class and re-create it.

Note: The mark possibilities for policing include CoS, IP DSCP, and IP Precedence. While the latter two are only meaningful for IP packet types, CoS marking is allowed for both IP and non-IP packets, since it updates the 802.1p user priority field contained in the VLAN tag of the layer 2 packet header.

diffserv

This command sets the DiffServ operational mode to active. While disabled, the DiffServ configuration is retained and can be changed, but it is not activated. When enabled, DiffServ services are activated.

Format	diffserv
Mode	Global Config

no diffserv

This command sets the DiffServ operational mode to inactive. While disabled, the DiffServ configuration is retained and can be changed, but it is not activated. When enabled, DiffServ services are activated.

Format	no diffserv
Mode	Global Config

DiffServ Class Commands

Use the DiffServ class commands to define traffic classification. To classify traffic, you specify Behavior Aggregate (BA), based on DSCP and Multi-Field (MF) classes of traffic (name, match criteria)

This set of commands consists of class creation/deletion and matching, with the class match commands specifying Layer 3, Layer 2, and general match criteria. The class match criteria are also known as class rules, with a class definition consisting of one or more rules to identify the traffic that belongs to the class.

Note: Once you create a class match criterion for a class, you cannot change or delete the criterion. To change or delete a class match criterion, you must delete and re-create the entire class.

The CLI command root is `class-map`.

class-map

This command defines a DiffServ class of type match-all. When used without any match condition, this command enters the class-map mode. The *`class-map-name`* is a case sensitive alphanumeric string from 1 to 31 characters uniquely identifying an existing DiffServ class.

Note: The class-map-name 'default' is reserved and must not be used.

The class type of `match-all` indicates all of the individual match conditions must be true for a packet to be considered a member of the class.This command may be used without specifying a class type to enter the Class-Map Config mode for an existing DiffServ class.

Note: Note the following:

- The optional keywords [`{ipv4 | ipv6}`] specify the Layer 3 protocol for this class. If not specified, this parameter defaults to `ipv4`. This maintains backward compatibility for configurations defined on systems before IPv6 match items were supported. The optional keyword `appiq` creates a new DiffServ appiq class. Regular expressions found in the traffic patterns in layer 7 applications can be matched to the App-IQ class using a `match signature` command.
- The CLI mode is changed to Class-Map Config or Ipv6-Class-Map Config when this command is successfully executed depending on the `[{ipv4 | ipv6}]` keyword specified.

Format	class-map {match-all|match-any} *class-map-name* [{appiq | ipv4 | ipv6}]
Mode	Global Config

Parameter	Definition
match-all	For the match-all argument, a given packet needs to match all the rules configured in class-map to get classified as the configured class-map.
match-any	For the match-any argument, a given packet can match at least one of the rules configured in the class-map to get classified as the configured class-map.

Parameter	Definition
class-map-name	A case sensitive alphanumeric string from 1 to 31 characters uniquely identifying a DiffServ class.

Example: This example shows configuring a new class-map with the class-map name *test-class-map*.

```
(Switching) (Config)#class-map match-all test-class-map
(Switching) (Config-classmap)#
(Switching) (Config-classmap)#exit

(Switching) (Config)#class-map ?

<class-map-name>         Enter an existing DiffServ class name to enter the
                  class-map config mode.
match-all             Specify class type as all.
match-any               Specify class type as any.
rename                Rename a DiffServ Class.

(Switching) (Config)#class-map match-all test-class-map-1
(Switching) (Config-classmap)# match ip dscp 36
(Switching) (Config-classmap)# match protocol ip
(Switching) (Config-classmap)# exit

(Switching) (Config)#class-map match-any test-class-map-2
(Switching) (Config-classmap)# match ip dscp 36
(Switching) (Config-classmap)# match protocol ipv6
(Switching) (Config-classmap)# exit

(Switching) (Config)#class-map match-any test-class-map-3
(Switching) (Config-classmap)# match access-group test-access-list-3
(Switching) (Config-classmap)# exit
```

no class-map

This command eliminates an existing DiffServ class. The `class-map-name` is the name of an existing DiffServ class. (The class name **default** is reserved and is not allowed here.) This command may be issued at any time; if the class is currently referenced by one or more policies or by any other class, the delete action fails.

Format	no class-map *class-map-name*
Mode	Global Config

class-map rename

This command changes the name of a DiffServ class. The `class-map-name` is the name of an existing DiffServ class. The `new-class-map-name` parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the class.

Default	none
Format	class-map rename *class-map-name new-class-map-name*
Mode	Global Config

match ethertype

This command adds to the specified class definition a match condition based on the value of the ethertype. The `ethertype` value is specified as one of the following keywords: `appletalk`, `arp`, `ibmsna`, `ipv4`, `ipv6`, `ipx`, `mplsmcast`, `mplsucast`, `netbios`, `novell`, `pppoe`, `rarp` or as a custom EtherType value in the range of 0x0600-0xFFFF. Use the [not] option to negate the match condition.

Format	match [not] ethertype {*keyword* | *custom 0x0600-0xFFFF*}
Mode	Class-Map Config

match access-group

This command configures for the specified class a match condition based on the configured IPv4 access-list number. The value for `acl-number` is a valid standard or extended ACL in the range from 1 to 199.

Note: The `no` form does not exist for this command.

Format	match access-group *acl-number*
Mode	Class-Map Config

match access-group name

This command configures for the specified class a match condition based on the name of the configured access-list. The value for `acl-name` is in the range from 1 to 199.

The following notes apply to this command:

- Class-maps containing access-list as match criteria may only be applied to ingress policies.
- The action (mirror, redirect, time-range, etc) clauses in the access-lists referenced by a policy are ignored for the purpose of policy application. The access-lists are used for matching the traffic only.
- The `no` form does not exist for this command.
- IPv4, IPv6, and MAC ACLs can be configured as match criteria using this command.

Format	match access-group name *acl-name*
Mode	Class-Map Config

match any

This command adds to the specified class definition a match condition whereby all packets are considered to belong to the class. Use the [not] option to negate the match condition.

Default	none
Format	match [not] any

Mode	Class-Map Config

match class-map

This command adds to the specified class definition the set of match conditions defined for another class. The `refclassname` is the name of an existing DiffServ class whose match conditions are being referenced by the specified class definition.

Default	none
Format	match class-map *refclassname*
Mode	Class-Map Config

Note: Note the following:

- The parameters `refclassname` and `class-map-name` can not be the same.
- Only one other class may be referenced by a class.
- Any attempts to delete the `refclassname` class while the class is still referenced by any `class-map-name` fails.
- The combined match criteria of `class-map-name` and `refclassname` must be an allowed combination based on the class type.
- Any subsequent changes to the `refclassname` class match criteria must maintain this validity, or the change attempt fails.
- The total number of class rules formed by the complete reference class chain (including both predecessor and successor classes) must not exceed a platform-specific maximum. In some cases, each removal of a refclass rule reduces the maximum number of available rules in the class definition by one.

no match class-map

This command removes from the specified class definition the set of match conditions defined for another class. The `refclassname` is the name of an existing DiffServ class whose match conditions are being referenced by the specified class definition.

Format	no match class-map *refclassname*
Mode	Class-Map Config

match cos

This command adds to the specified class definition a match condition for the Class of Service value (the only tag in a single tagged packet or the first or outer 802.1Q tag of a double VLAN tagged packet). The value may be from 0 to 7. Use the `[not]` option to negate the match condition.

Default	none
Format	match [not] cos *0-7*
Mode	Class-Map Config

match secondary-cos

This command adds to the specified class definition a match condition for the secondary Class of Service value (the inner 802.1Q tag of a double VLAN tagged packet). The value may be from 0 to 7. Use the `[not]` option to negate the match condition.

Default	none
Format	match [not]secondary-cos *0-7*
Mode	Class-Map Config

match destination-address mac

This command adds to the specified class definition a match condition based on the destination MAC address of a packet. The ***macaddr*** parameter is any layer 2 MAC address formatted as six, two-digit hexadecimal numbers separated by colons (e.g., 00:11:22:dd:ee:ff). The ***macmask*** parameter is a layer 2 MAC address bit mask, which need not be contiguous, and is formatted as six, two-digit hexadecimal numbers separated by colons (e.g., ff:07:23:ff:fe:dc). Use the [not] option to negate the match condition.

Default	none
Format	match [not] destination-address mac *macaddr macmask*
Mode	Class-Map Config

match dstip

This command adds to the specified class definition a match condition based on the destination IP address of a packet. The ***ipaddr*** parameter specifies an IP address. The ***ipmask*** parameter specifies an IP address bit mask and must consist of a contiguous set of leading 1 bits. Use the [not] option to negate the match condition.

Default	none
Format	match [not] dstip *ipaddr ipmask*
Mode	Class-Map Config

match dstip6

This command adds to the specified class definition a match condition based on the destination IPv6 address of a packet. Use the `[not]` option to negate the match condition.

Default	none
Format	match [not] dstip6 *destination-ipv6-prefix/prefix-length*
Mode	Class-Map Config

match dstl4port

This command adds to the specified class definition a match condition based on the destination layer 4 port of a packet using a single keyword or numeric notation. To specify the match condition as a single keyword, the value for `portkey` is one of the supported port name keywords. The currently supported `portkey` values are: domain, echo, ftp, ftpdata, http, smtp, snmp, telnet, tftp, www. Each of these translates into its equivalent port number. To specify the match condition using a numeric notation, one layer 4 port number is required. The port number is an integer from 0 to 65535. Use the [not] option to negate the match condition.

Default	none
Format	match [not] dstl4port {*portkey* | *0-65535*}
Mode	Class-Map Config

match exp

This command configures for the specified class a match condition based on the MPLS-TP EXP (Traffic Class field) value. The `exp-value` parameter is the MPLS-TP traffic class field value, which has a possible range of 0 to 7.

Format	match exp *exp-value*
Mode	Class-Map Config

no match exp

This command removes the MPLS-TP EXP match statement from the class-map.

Format	no match exp *exp-value*
Mode	Class-Map Config

match ip dscp

This command adds to the specified class definition a match condition based on the value of the IP DiffServ Code Point (DSCP) field in a packet, which is defined as the high-order six bits of the Service Type octet in the IP header (the low-order two bits are not checked).

The `dscpval` value is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef. Use the [not] option to negate the match condition.

Note: The ip dscp, ip precedence, and ip tos match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header, but with a slightly different user notation.

Default	none
Format	match [not] ip dscp *dscpval*
Mode	Class-Map Config

match ip precedence

This command adds to the specified class definition a match condition based on the value of the IP Precedence field in a packet, which is defined as the high-order three bits of the Service Type octet in the IP header (the low-order five bits are not checked). The precedence value is an integer from 0 to 7. Use the [not] option to negate the match condition.

Note: The IP DSCP, IP Precedence, and IP ToS match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header, but with a slightly different user notation.

Default	none
Format	match [not] ip precedence *0-7*
Mode	Class-Map Config

match ip tos

This command adds to the specified class definition a match condition based on the value of the IP TOS field in a packet, which is defined as all eight bits of the Service Type octet in the IP header. The value of ***tosbits*** is a two-digit hexadecimal number from 00 to ff. The value of ***tosmask*** is a two-digit hexadecimal number from 00 to ff. The ***tosmask*** denotes the bit positions in ***tosbits*** that are used for comparison against the IP TOS field in a packet. For example, to check for an IP TOS value having bits 7 and 5 set and bit 1 clear, where bit 7 is most significant, use a ***tosbits*** value of a0 (hex) and a ***tosmask*** of a2 (hex). Use the [not] option to negate the match condition.

Note: Note the following:

- The IP DSCP, IP Precedence, and IP ToS match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header, but with a slightly different user notation.
- This “free form” version of the IP DSCP/Precedence/TOS match specification gives the user complete control when specifying which bits of the IP Service Type field are checked.

Default	none
Format	match [not] ip tos *tosbits tosmask*
Mode	Class-Map Config

match ip6flowlbl

Use this command to enter an IPv6 flow label value. Use the [not] option to negate the match condition.

Default	none
Format	match [not] ip6flowlbl label *0-1048575*
Mode	Class-Map Config

match protocol

This command converts an IPv4 class-map to either an IPv6 class-map (if the argument is *ipv6*) or non-IP class-map (if the argument is *none*.

Format	match protocol *none*|*ipv6*
Mode	Class-Map Config

Note: The `no` form does not exist for this command.

match protocol

This command adds to the specified class definition a match condition based on the protocol type using a single keyword notation or a numeric value notation.

To specify the match condition using a single keyword, use one of the following: `icmp`, `igmp`, `ip`, `tcp`, `udp`, `ipv6`, `gre`, and `icmpv6`.

To specify the match condition using a numeric value notation, the protocol number is a standard value assigned by IANA and is interpreted as an integer from 0 to 255. Use the [not] option to negate the match condition.

Note: This command does not validate the protocol number value against the current list defined by IANA.

Default	none
Format	match [not] protocol {*0-255* | { icmp | igmp | ip | tcp | udp | ipv6 | gre | icmpv6} | none}
Mode	Class-Map Config

Example: This example shows the process of configuring the protocol type `tcp` for a give class-map `test-class-map`

```
(switch) (Config)#class-map match-all test-class-map
(switch) (Config-classmap)# match protocol tcp
```

match signature

This command maps the available signatures from the rules file to the AppIQ class. When the appiq class is created, this menu displays an index number and its signature pattern. A single signature can be mapped using a number or multiple signatures can be selected and mapped to a class. Using this command without an index value maps all the available signatures to the same class.

Default	none
Format	match signature [<S*tartIndex*>-<*EndIndex*>]
Mode	Class-Map Config

match source-address mac

This command adds to the specified class definition a match condition based on the source MAC address of a packet. The ***address*** parameter is any layer 2 MAC address formatted as six, two-digit hexadecimal numbers separated by colons (e.g., 00:11:22:dd:ee:ff). The `macmask` parameter is a layer 2 MAC address bit mask, which may not be contiguous, and is formatted as six, two-digit hexadecimal numbers separated by colons (e.g., ff:07:23:ff:fe:dc). Use the [not] option to negate the match condition.

Default	none
Format	match [not] source-address mac *address macmask*
Mode	Class-Map Config

match srcip

This command adds to the specified class definition a match condition based on the source IP address of a packet. The `ipaddr` parameter specifies an IP address. The `ipmask` parameter specifies an IP address bit mask and must consist of a contiguous set of leading 1 bits. Use the [not] option to negate the match condition.

Default	none
Format	match [not] srcip *ipaddr ipmask*
Mode	Class-Map Config

match srcip6

This command adds to the specified class definition a match condition based on the source IP address of a packet. Use the [not] option to negate the match condition.

Default	none
Format	match [not] srcip6 *source-ipv6-prefix/prefix-length*
Mode	Ipv6-Class-Map Config

match srcl4port

This command adds to the specified class definition a match condition based on the source layer 4 port of a packet using a single keyword or numeric notation. To specify the match condition as a single keyword notation, the value for `portkey` is one of the supported port name keywords (listed below). The currently supported `portkey` values are: domain, echo, ftp, ftpdata, http, smtp, snmp, telnet, tftp, www. Each of these translates into its equivalent port number, which is used as both the start and end of a port range.

To specify the match condition as a numeric value, one layer 4 port number is required. The port number is an integer from 0 to 65535. Use the [not] option to negate the match condition.

Default	none
Format	match [not] srcl4port {*portkey* | *0-65535*}
Mode	Class-Map Config

match src port

This command adds a match condition for a range of layer source 4 ports. If an interface receives traffic that is within the configured range of layer 4 source ports, then only the `appiq` class is in effect. *portvalue* specifies a single source port.

Default	none
Format	match src port {*portstart-portend* | *portvalue*}
Mode	Class-Map Config

match vlan

This command adds to the specified class definition a match condition based on the value of the layer 2 VLAN Identifier field (the only tag in a single tagged packet or the first or outer tag of a double VLAN tagged packet). The VLAN ID is an integer from 0 to 4093. Use the `[not]` option to negate the match condition.

Default	none
Format	match [not] vlan *0-4093*
Mode	Class-Map Config

match secondary-vlan

This command adds to the specified class definition a match condition based on the value of the layer 2 secondary VLAN Identifier field (the inner 802.1Q tag of a double VLAN tagged packet). The secondary VLAN ID is an integer from 0 to 4093. Use the `[not]` option to negate the match condition.

Default	none
Format	match [not] secondary-vlan *0-4093*
Mode	Class-Map Config

DiffServ Policy Commands

Use the DiffServ policy commands to specify traffic conditioning actions, such as policing and marking, to apply to traffic classes

Use the policy commands to associate a traffic class that you define by using the class command set with one or more QoS policy attributes. Assign the class/policy association to an interface to form a service. Specify the policy name when you create the policy.

Each traffic class defines a particular treatment for packets that match the class definition. You can associate multiple traffic classes with a single policy. When a packet satisfies the conditions of more than one class, preference is based on the order in which you add the classes to the policy. The first class you add has the highest precedence.

This set of commands consists of policy creation/deletion, class addition/removal, and individual policy attributes.

Note: The only way to remove an individual policy attribute from a class instance within a policy is to remove the class instance and re-add it to the policy. The values associated with an existing policy attribute can be changed without removing the class instance.

The CLI command root is `policy-map`.

assign-queue

This command modifies the queue id to which the associated traffic stream is assigned. The ***`queueid`*** is an integer from 0 to *`n`*-1, where *`n`* is the number of egress queues supported by the device.

Format	assign-queue *queueid*
Mode	Policy-Class-Map Config
Incompatibilities	Drop

drop

This command specifies that all packets for the associated traffic stream are to be dropped at ingress.

Format	drop
Mode	Policy-Class-Map Config
Incompatibilities	Assign Queue, Mark (all forms), Mirror, Police, Redirect

mirror

This command specifies that all incoming packets for the associated traffic stream are copied to a specific egress interface (physical port or LAG).

Format	mirror *unit/slot/port*
Mode	Policy-Class-Map Config

Incompatibilities	Drop, Redirect

redirect

This command specifies that all incoming packets for the associated traffic stream are redirected to a specific egress interface (physical port or port-channel).

Format	redirect *unit/slot/port*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mirror

conform-color

Use this command to enable color-aware traffic policing and define the conform-color class map. Used in conjunction with the police command where the fields for the conform level are specified. The `class-map-name` parameter is the name of an existing DiffServ class map.

Note: This command may only be used after specifying a police command for the policy-class instance.

Format	conform-color *class-map-name*
Mode	Policy-Class-Map Config

class

This command creates an instance of a class definition within the specified policy for the purpose of defining treatment of the traffic class through subsequent policy attribute statements. The `classname` is the name of an existing DiffServ class.

Note: Note the following:

- This command causes the specified policy to create a reference to the class definition.
- The CLI mode is changed to Policy-Class-Map Config when this command is successfully executed.

Format	class *classname*
Mode	Policy-Map Config

no class

This command deletes the instance of a particular class and its defined treatment from the specified policy. `classname` is the names of an existing DiffServ class.

Note: This command removes the reference to the class definition for the specified policy.

Format	no class *classname*
Mode	Policy-Map Config

mark cos

This command marks all packets for the associated traffic stream with the specified class of service (CoS) value in the priority field of the 802.1p header (the only tag in a single tagged packet or the first or outer 802.1Q tag of a double VLAN tagged packet). If the packet does not already contain this header, one is inserted. The CoS value is an integer from 0 to 7.

Default	1
Format	mark-cos *0-7*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark IP DSCP, IP Precedence, Police

mark secondary-cos

This command marks the outer VLAN tags in the packets for the associated traffic stream as secondary CoS.

Default	1
Format	mark secondary-cos *0-7*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark IP DSCP, IP Precedence, Police

mark cos-as-sec-cos

This command marks outer VLAN tag priority bits of all packets as the inner VLAN tag priority, marking Cos as Secondary CoS. This essentially means that the inner VLAN tag CoS is copied to the outer VLAN tag CoS.

Format	mark-cos-as-sec-cos
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark IP DSCP, IP Precedence, Police

Example: The following shows an example of the command.

```
(switch) (Config-policy-classmap)#mark cos-as-sec-cos
```

mark exp

This command configures diffserv policy-map to mark all the packets of the associated traffic stream with the specified MPLS-TP EXP (Traffic Class field) value. The `exp-value` parameter is the MPLS-TP traffic class field value and has a possible range of 0 to 7.

Format	mark exp *exp-value*
Mode	Policy-Class-Map Config

no mark exp

This command removes the MPLS-TP EXP mark statement from the DiffServ policy-map.

Format	no mark exp
Mode	Policy-Class-Map Config

mark ip-dscp

This command marks all packets for the associated traffic stream with the specified IP DSCP value.

The *dscpval* value is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef.

Format	mark ip-dscp *dscpval*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark CoS, Mark IP Precedence, Police

mark ip-precedence

This command marks all packets for the associated traffic stream with the specified IP Precedence value. The IP Precedence value is an integer from 0 to 7.

Note: This command may not be used on IPv6 classes. IPv6 does not have a precedence field.

Format	mark ip-precedence *0-7*
Mode	Policy-Class-Map Config
Incompatibilities	Drop, Mark CoS, Mark IP Precedence, Police
Policy Type	In

police-simple

This command is used to establish the traffic policing style for the specified class. The simple form of the `police` command uses a single data rate and burst size, resulting in two outcomes: conform and violate. The conforming data rate is specified in kilobits-per-second (Kb/s) and is an integer from 1 to 4294967295. The conforming burst size is specified in kilobytes (KB) and is an integer from 1 to 128.

For each outcome, the only possible actions are drop, set-cos-as-sec-cos, set-cos-transmit, set-sec-cos-transmit, set-dscp-transmit, set-prec-transmit, or transmit. In this simple form of the `police` command, the conform action defaults to transmit and the violate action defaults to drop. These actions can be set with this command once the style has been configured.

For set-dscp-transmit, a *dscpval* value is required and is specified as either an integer from 0 to 63, or symbolically through one of the following keywords: af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef.

For set-prec-transmit, an IP Precedence value is required and is specified as an integer from 0-7.

For set-cos-transmit an 802.1p priority value is required and is specified as an integer from 0-7.

Format police-simple {*1-4294967295 1-128* conform-action {drop | set-cos-as-sec-cos | set-cos-transmit*0-7*|set-sec-cos-transmit*0-7*|set-prec-transmit*0-7*|set-dscp-transmit *0-63* | transmit} [violate-action {drop | set-cos-as-sec-cos | set-cos-transmit *0-7* | set-sec-cos-transmit *0-7* | set-prec-transmit *0-7* | set-dscp-transmit *0-63* | transmit}]}

Mode Policy-Class-Map Config

Incompatibilities Drop, Mark (all forms)

Example: The following shows an example of the command.

```
(switch) (Config-policy-classmap)#police-simple 1 128 conform-action transmit violate-action drop
```

police-single-rate

This command is the single-rate form of the `police` command and is used to establish the traffic policing style for the specified class. For each outcome, the only possible actions are drop, set-cos-as-sec-cost, set-cos-transmit, set-sec-cos-transmit, set-dscp-transmit, set-prec-transmit, or transmit. In this single-rate form of the `police` command, the conform action defaults to send, the exceed action defaults to drop, and the violate action defaults to drop. These actions can be set with this command once the style has been configured.

Format police-single-rate{*1-42949672951-1281-128* conform-action{drop | set-cos-as-sec-cos | set-cos-transmit*0-7*|set-sec-cos-transmit*0-7*|set-prec-transmit*0-7*|set-dscp-transmit*0-63* | transmit} exceed-action {drop | set-cos-as-sec-cos | set-cos-transmit *0-7* | set-sec-cos-transmit *0-7* | set-prec-transmit *0-7* | set-dscp-transmit *0-63* | transmit} [violate-action {drop | set-cos-as-sec-cos-transmit | set-cos-transmit *0-7* | set-sec-cos-transmit *0-7* | set-prec-transmit *0-7* | set-dscp-transmit *0-63* | transmit}]}

Mode Policy-Class-Map Config

police-two-rate

This command is the two-rate form of the `police` command and is used to establish the traffic policing style for the specified class. For each outcome, the only possible actions are drop, set-cos-as-sec-cos, set-cos-transmit, set-sec-cos-transmit, set-dscp-transmit, set-prec-transmit, or transmit. In this two-rate form of the `police` command, the conform action defaults to send, the exceed action defaults to drop, and the violate action defaults to drop. These actions can be set with this command once the style has been configured.

Format police-two-rate {*1-4294967295 1-4294967295 1-128 1-128* conform-action {drop | set-cos-as-sec-cos | set-cos-transmit*0-7* | set-sec-cos-transmit*0-7* | set-prec-transmit*0-7* | set-dscp-transmit*0-63*|transmit}exceed-action{drop|set-cos-as-sec-cos|set-cos-transmit *0-7* | set-sec-cos-transmit *0-7* | set-prec-transmit *0-7* | set-dscp-transmit *0-63* | transmit} [violate-action{drop | set-cos-as-sec-cos | set-cos-transmit*0-7* | set-sec-cos-transmit*0-7* | set-prec-transmit *0-7* | set-dscp-transmit *0-63* | transmit}]}

Mode Policy-Class-Map Config

policy-map

This command establishes a new DiffServ policy. The *`policyname`* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the policy. The type of policy is specific to the inbound traffic direction as indicated by the `in` parameter, or the outbound traffic direction as indicated by the `out` parameter, respectively.

Note: The CLI mode is changed to Policy-Map Config when this command is successfully executed.

Format	policy-map *policyname* {in|out}
Mode	Global Config

no policy-map

This command eliminates an existing DiffServ policy. The *`policyname`* parameter is the name of an existing DiffServ policy. This command may be issued at any time. If the policy is currently referenced by one or more interface service attachments, this delete attempt fails.

Format	no policy-map *policyname*
Mode	Global Config

policy-map rename

This command changes the name of a DiffServ policy. The *`policyname i`*s the name of an existing DiffServ class. The *`newpolicyname`* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the policy.

Format	policy-map rename *policyname newpolicyname*
Mode	Global Config

DiffServ Service Commands

Use the DiffServ service commands to assign a DiffServ traffic conditioning policy, which you specified by using the policy commands, to an interface in the incoming direction. The service commands attach a defined policy to a directional interface. You can assign only one policy at any one time to an interface in the inbound direction. DiffServ is not used in the outbound direction.

This set of commands consists of service addition/removal.

The CLI command root is `service-policy`.

service-policy

This command attaches a policy to an interface in the inbound direction as indicated by the `in` parameter, or the outbound direction as indicated by the `out` parameter, respectively. The ***policyname*** parameter is the name of an existing DiffServ policy. This command causes a service to create a reference to the policy.

Note: Note the following:

- This command effectively enables DiffServ on an interface in the inbound direction. There is no separate interface administrative 'mode' command for DiffServ.
- This command fails if any attributes within the policy definition exceed the capabilities of the interface. Once a policy is successfully attached to an interface, any attempt to change the policy definition, that would result in a violation of the interface capabilities, causes the policy change attempt to fail.
- Each interface can have one policy attached.

Format	service-policy {in|out} *policymapname*
Modes	• Global Config • Interface Config

no service-policy

This command detaches a policy from an interface in the inbound direction as indicated by the `in` parameter, or the outbound direction as indicated by the `out` parameter, respectively. The ***policyname*** parameter is the name of an existing DiffServ policy.

Note: This command causes a service to remove its reference to the policy. This command effectively disables DiffServ on an interface in the inbound direction or an interface in the outbound direction. There is no separate interface administrative 'mode' command for DiffServ.

Format	no service-policy {in|out} *policymapname*
Modes	• Global Config • Interface Config

DiffServ Show Commands

Use the DiffServ show commands to display configuration and status information for classes, policies, and services. You can display DiffServ information in summary or detailed formats. The status information is only shown when the DiffServ administrative mode is enabled.

show class-map

This command displays all configuration information for the specified class. The `class-map-name` is the name of an existing DiffServ class.

Format	show class-map *class-map-name*
Mode	Privileged EXEC

If the class-name is specified the following fields are displayed:

Parameter	Definition
Class Map Name	A case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying a DiffServ class.
Class Type	A class type of all means every match criterion defined for the class is evaluated simultaneously and must all be true to indicate a class match.
Match Rule Count	Number of match rules configured for the class-map.
Match Criteria	The Match Criteria fields are only displayed if they have been configured. Not all platforms support all match criteria values. They are displayed in the order entered by the user. The fields are evaluated in accordance with the class type. The possible Match Criteria fields are: Destination IP Address, Destination Layer 4 Port, Destination MAC Address, Ethertype, Source MAC Address, VLAN, Class of Service, Every, IP DSCP, IP Precedence, IP TOS, Protocol Keyword, Reference Class, Source IP Address, and Source Layer 4 Port.
Values	The values of the Match Criteria.

If you do not specify the Class Name, this command displays a list of all defined DiffServ classes. The following fields are displayed:

Parameter	Definition
Class Name	The name of this class. (Note that the order in which classes are displayed is not necessarily the same order in which they were created.)
Class Type	A class type of all means every match criterion defined for the class is evaluated simultaneously and must all be true to indicate a class match.
ACL ID or Ref Class Name	The name of an existing DiffServ class whose match conditions are being referenced by the specified class definition or access-group name/ID.

show diffserv

This command displays the DiffServ General Status Group information, which includes the current administrative mode setting as well as the current and maximum number of rows in each of the main DiffServ private MIB tables. This command takes no options.

Format show diffserv

Mode Privileged EXEC

Parameter	Definition
DiffServ Admin mode	The current value of the DiffServ administrative mode.
Class Table Size Current/Max	The current and maximum number of entries (rows) in the Class Table.
Class Rule Table Size Current/Max	The current and maximum number of entries (rows) in the Class Rule Table.
Policy Table Size Current/Max	The current and maximum number of entries (rows) in the Policy Table.
Policy Instance Table Size Current/Max	The current and maximum number of entries (rows) in the Policy Instance Table.
Policy Instance Table Max Current/Max	The current and maximum number of entries (rows) for the Policy Instance Table.
Policy Attribute Table Max Current/Max	The current and maximum number of entries (rows) for the Policy Attribute Table.
Service Table Size Current/Max	The current and maximum number of entries (rows) in the Service Table.

show policy-map

This command displays all configuration information for the specified policy. The `policyname` is the name of an existing DiffServ policy.

Format show policy-map *[policyname]*

Mode Privileged EXEC

If the Policy Name is specified the following fields are displayed:

Parameter	Definition
Policy Name	The name of this policy.
Policy Type	The policy type (only inbound policy definitions are supported for this platform.)
Class Members	The class that is a member of the policy.

The following information is repeated for each class associated with this policy (only those policy attributes actually configured are displayed):

Parameter	Definition
Assign Queue	Directs traffic stream to the specified QoS queue. This allows a traffic classifier to specify which one of the supported hardware queues are used for handling packets belonging to the class.
Class Name	The name of this class.
Committed Burst Size (KB)	The committed burst size, used in simple policing.
Committed Rate (Kb/s)	The committed rate, used in simple policing.

Parameter	Definition
Conform Action	The current setting for the action taken on a packet considered to conform to the policing parameters. This is not displayed if policing is not in use for the class under this policy.
Conform Color Mode	The current setting for the color mode. Policing uses either color blind or color aware mode. Color blind mode ignores the coloration (marking) of the incoming packet. Color aware mode takes into consideration the current packet marking when determining the policing outcome.
Conform COS	The CoS mark value if the conform action is set-cos-transmit.
Conform DSCP Value	The DSCP mark value if the conform action is set-dscp-transmit.
Conform IP Precedence Value	The IP Precedence mark value if the conform action is set-prec-transmit.
Drop	Drop a packet upon arrival. This is useful for emulating access control list operation using DiffServ, especially when DiffServ and ACL cannot co-exist on the same interface.
Exceed Action	The action taken on traffic that exceeds settings that the network administrator specifies.
Exceed Color Mode	The current setting for the color of exceeding traffic that the user may optionally specify.
Mark CoS	The class of service value that is set in the 802.1p header of inbound packets. This is not displayed if the mark cos was not specified.
Mark CoS as Secondary CoS	The secondary 802.1p priority value (second/inner VLAN tag. Same as CoS (802.1p) marking, but the dot1p value used for remarking is picked from the dot1p value in the secondary (i.e. inner) tag of a double-tagged packet.
Mark IP DSCP	The mark/re-mark value used as the DSCP for traffic matching this class. This is not displayed if mark ip description is not specified.
Mark IP Precedence	The mark/re-mark value used as the IP Precedence for traffic matching this class. This is not displayed if mark ip precedence is not specified.
Mirror	Copies a classified traffic stream to a specified egress port (physical port or LAG). This can occur in addition to any marking or policing action. It may also be specified along with a QoS queue assignment.
Non-Conform Action	The current setting for the action taken on a packet considered to not conform to the policing parameters. This is not displayed if policing not in use for the class under this policy.
Non-Conform COS	The CoS mark value if the non-conform action is set-cos-transmit.
Non-Conform DSCP Value	The DSCP mark value if the non-conform action is set-dscp-transmit.
Non-Conform IP Precedence Value	The IP Precedence mark value if the non-conform action is set-prec-transmit.
Peak Rate	Guarantees a committed rate for transmission, but also transmits excess traffic bursts up to a user-specified peak rate, with the understanding that a downstream network element (such as the next hop's policer) might drop this excess traffic. Traffic is held in queue until it is transmitted or dropped (per type of queue depth management.) Peak rate shaping can be configured for the outgoing transmission stream for an AF (Assured Forwarding) traffic class (although average rate shaping could also be used.)
Peak Burst Size	(PBS). The network administrator can set the PBS as a means to limit the damage expedited forwarding traffic could inflict on other traffic (e.g., a token bucket rate limiter) Traffic that exceeds this limit is discarded.
Policing Style	The style of policing, if any, used (simple).

Parameter	Definition
Redirect	Forces a classified traffic stream to a specified egress port (physical port or LAG). This can occur in addition to any marking or policing action. It may also be specified along with a QoS queue assignment.

If the Policy Name is not specified this command displays a list of all defined DiffServ policies. The following fields are displayed:

Parameter	Definition
Policy Name	The name of this policy. (The order in which the policies are displayed is not necessarily the same order in which they were created.)
Policy Type	The policy type (Only inbound is supported).
Class Members	List of all class names associated with this policy.

Example: The following shows example CLI display output including the mark-cos-as-sec-cos option specified in the policy action.

```
(Routing) #show policy-map p1
Policy Name.................................... p1
Policy Type.................................... In
Class Name..................................... c1
Mark CoS as Secondary CoS...................... Yes
```

Example: The following shows example CLI display output including the mark-cos-as-sec-cos action used in the policing (simple-police, police-single-rate, police two-rate) command.

```
(Routing) #show policy-map p2
Policy Name....................... p2
Policy Type....................... In
Class Name........................ c2
Policing Style.................... Police Two Rate
Committed Rate.................... 1
Committed Burst Size.............. 1
Peak Rate......................... 1
Peak Burst Size................... 1
Conform Action.................... Mark CoS as Secondary CoS
Exceed Action..................... Mark CoS as Secondary CoS
Non-Conform Action................ Mark CoS as Secondary CoS
Conform Color Mode................ Blind
Exceed Color Mode................. Blind
```

show diffserv service

This command displays policy service information for the specified interface and direction. The `unit/slot/port` parameter specifies a valid `unit/slot/port` number for the system.

Format	show diffserv service *unit/slot/port* in
Mode	Privileged EXEC

Parameter	Definition
DiffServ Admin Mode	The current setting of the DiffServ administrative mode. An attached policy is only in effect on an interface while DiffServ is in an enabled mode.
Interface	*unit/slot/port*

Parameter	Definition
Direction	The traffic direction of this interface service.
Operational Status	The current operational status of this DiffServ service interface.
Policy Name	The name of the policy attached to the interface in the indicated direction.
Policy Details	Attached policy details, whose content is identical to that described for the show policy-map `policymapname` command (content not repeated here for brevity).

show diffserv service brief

This command displays all interfaces in the system to which a DiffServ policy has been attached. The inbound direction parameter is optional.

Format	show diffserv service brief [in]
Mode	Privileged EXEC

Parameter	Definition
DiffServ Mode	The current setting of the DiffServ administrative mode. An attached policy is only active on an interface while DiffServ is in an enabled mode.

The following information is repeated for interface and direction (only those interfaces configured with an attached policy are shown):

Parameter	Definition
Interface	*unit/slot/port*
Direction	The traffic direction of this interface service.
OperStatus	The current operational status of this DiffServ service interface.
Policy Name	The name of the policy attached to the interface in the indicated direction.

show policy-map interface

This command displays policy-oriented statistics information for the specified interface and direction. The `unit/slot/port` parameter specifies a valid interface for the system. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.

Note: This command is only allowed while the DiffServ administrative mode is enabled.

Format	show policy-map interface *unit/slot/port* [in]
Mode	Privileged EXEC

Parameter	Definition
Interface	*unit/slot/port*
Direction	The traffic direction of this interface service.
Operational Status	The current operational status of this DiffServ service interface.

Parameter	Definition
Policy Name	The name of the policy attached to the interface in the indicated direction.

The following information is repeated for each class instance within this policy:

Parameter	Definition
Class Name	The name of this class instance.
In Discarded Packets	A count of the packets discarded for this class instance for any reason due to DiffServ treatment of the traffic class.

show service-policy

This command displays a summary of policy-oriented statistics information for all interfaces in the specified direction.

Format	show service-policy in
Mode	Privileged EXEC

The following information is repeated for each interface and direction (only those interfaces configured with an attached policy are shown):

Parameter	Definition
Interface	*unit/slot/port*
Operational Status	The current operational status of this DiffServ service interface.
Policy Name	The name of the policy attached to the interface.

MAC Access Control List Commands

This section describes the commands you use to configure MAC Access Control List (ACL) settings. MAC ACLs ensure that only authorized users have access to specific resources and block any unwarranted attempts to reach network resources.

The following rules apply to MAC ACLs:

- The maximum number of ACLs you can create is hardware dependent. The limit applies to all ACLs, regardless of type.
- The system supports only Ethernet II frame types.
- The maximum number of rules per MAC ACL is hardware dependent.

Note: CE0128XB/CE0152XB supports ACL counters for MAC, IPv4, and IPv6 access lists. For information about how to enable the counters, see "access-list counters enable" on page 890.

mac access-list extended

This command creates a MAC Access Control List (ACL) identified by *name*, consisting of classification fields defined for the Layer 2 header of an Ethernet frame. The *name* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the MAC access list. The rate-limit attribute configures the committed rate and the committed burst size.

If a MAC ACL by this name already exists, this command enters Mac-Access-List config mode to allow updating the existing MAC ACL.

Note: The CLI mode changes to Mac-Access-List Config mode when you successfully execute this command.

Format	mac access-list extended *name*
Mode	Global Config

no mac access-list extended

This command deletes a MAC ACL identified by *name* from the system.

Format	no mac access-list extended *name*
Mode	Global Config

mac access-list extended rename

This command changes the name of a MAC Access Control List (ACL). The *name* parameter is the name of an existing MAC ACL. The *newname* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the MAC access list.

This command fails if a MAC ACL by the name *newname* already exists.

Format	mac access-list extended rename *name newname*

Mode Global Config

mac access-list resequence

Use this command to renumber the sequence numbers of the entries for specified MAC access list with the given increment value starting from a particular sequence number. The command is used to edit the sequence numbers of ACL rules in the ACL and change the order in which entries are applied. This command is not saved in startup configuration and is not displayed in running configuration.

Note: If the generated sequence number exceeds the maximum sequence number, the ACL rule creation fails and an informational message is displayed.

Default 10

Format mac access-list resequence {*name*| *id* } *starting-sequence-number increment*

Mode Global Config

Parameter	Description
starting-sequence-number	The sequence number from which to start. The range is 1–2147483647. The default is 10.
increment	The amount to increment. The range is 1–2147483647. The default is 10.

{deny | permit} (MAC ACL)

This command creates a new rule for the current MAC access list. A rule may either deny or permit traffic according to the specified classification fields. At a minimum, the source and destination MAC value must be specified, each of which may be substituted using the keyword any to indicate a match on any value in that field. The remaining command parameters are all optional, but the most frequently used parameters appear in the same relative order as shown in the command format.

Format [*sequence-number*] {deny|permit} {*srcmac* | any} {*dstmac* | any} [*ethertypekey* | *0x0600-0xFFFF*] [vlan {eq *0-4095*}] [cos *0-7*] [[log] [time-range *time-range-name*] [assign-queue *queue-id*]] [{mirror | redirect} *unit/slot/port*][rate-limit *rate burst-size*] [sflow-remote-agent]

Mode Mac-Access-List Config

Note: Note the following:

- An implicit **deny all** MAC rule always terminates the access list.
- For BCM5630x and BCM5650x based systems, assign-queue, redirect, and mirror attributes are configurable for a deny rule, but they have no operational effect.

The *sequence-number* specifies the sequence number for the ACL rule. The sequence number is specified by the user or is generated by device.

If a sequence number is not specified for the rule, a sequence number that is 10 greater than the last sequence number in ACL is used and this rule is placed in the end of the list. If this is the first ACL rule in the given ACL, a sequence number of

10 is assigned. If the calculated sequence number exceeds the maximum sequence number value, the ACL rule creation fails. A rule cannot be created that duplicates an already existing one and a rule cannot be configured with a sequence number that is already used for another rule.

For example, if user adds new ACL rule to ACL without specifying a sequence number, it is placed at the bottom of the list. By changing the sequence number, the user can move the ACL rule to a different position in the ACL.

The Ethertype may be specified as either a keyword or a four-digit hexadecimal value from 0x0600-0xFFFF. The currently supported *`ethertypekey`* values are: appletalk, arp, ibmsna, ipv4, ipv6, ipx, mplsmcast, mplsucast, netbios, novell, pppoe, rarp. Each of these translates into its equivalent Ethertype value(s).

Table 16. *Ethertype Keyword and 4-digit Hexadecimal Value*

Ethertype Keyword	Corresponding Value
appletalk	0x809B
arp	0x0806
ibmsna	0x80D5
ipv4	0x0800
ipv6	0x86DD
ipx	0x8037
mplsmcast	0x8848
mplsucast	0x8847
netbios	0x8191
novell	0x8137, 0x8138
pppoe	0x8863, 0x8864
rarp	0x8035

The `vlan` and `cos` parameters refer to the VLAN identifier and 802.1p user priority fields, respectively, of the VLAN tag. For packets containing a double VLAN tag, this is the first (or outer) tag.

The `time-range` parameter allows imposing time limitation on the MAC ACL rule as defined by the parameter *time-range-name*. If a time range with the specified name does not exist and the MAC ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with specified name exists and the MAC ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive. For information about configuring time ranges, see "Time Range Commands for Time-Based ACLs" on page 915.

The `assign-queue` parameter allows specification of a particular hardware queue for handling traffic that matches this rule. The allowed *`queue-id`* value is 0-(n-1), where n is the number of user configurable queues available for the hardware platform. The *`assign-queue`* parameter is valid only for a `permit` rule.

Note: The special command form `{deny | permit} any any` is used to match all Ethernet layer 2 packets, and is the equivalent of the IP access list "match every" rule.

The `permit` command's optional attribute `rate-limit` allows you to permit only the allowed rate of traffic as per the configured rate in Kb/s, and burst-size in kbytes.

The `sflow-remote-agent` parameter configures the sFlow sampling action. This action, if configured, copies the packet matching the rule to the remote sFlow agent.

Example: The following shows an example of the command.

```
(Routing) (Config)#mac access-list extended mac1
(Routing) (Config-mac-access-list)#permit 00:00:00:00:aa:bb ff:ff:ff:ff:00:00 any rate-limit 32 16
(Routing) (Config-mac-access-list)#exit
```

no *sequence-number*

Use this command to remove the ACL rule with the specified sequence number from the ACL.

Format	no *sequence-number*
Mode	MAC-Access-List Config

mac access-group

This command either attaches a specific MAC Access Control List (ACL) identified by `name` to an interface or range of interfaces, or associates it with a VLAN ID, in a given direction. The `name` parameter must be the name of an existing MAC ACL.

An optional sequence number may be specified to indicate the order of this mac access list relative to other mac access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specified mac access list replaces the currently attached mac access list using that sequence number. If the sequence number is not specified for this command, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used.

This command specified in Interface Config mode only affects a single interface, whereas the Global Config mode setting is applied to all interfaces. The VLAN keyword is only valid in the Global Config mode. The Interface Config mode command is only available on platforms that support independent per-port class of service queue configuration.

An optional *control-plane* is specified to apply the MAC ACL on CPU port. The control packets like BPDU are also dropped because of the implicit deny all rule added to the end of the list. To overcome this, permit rules must be added to allow the control packets.

Note: Note the following:

- The keyword *control-plane* is only available in Global Config mode.
- You should be aware that the `out` option may or may not be available, depending on the platform.

Format	mac access-group *name* {{*control-plane*|in|out} vlan *vlan-id* {in|out}} [sequence *1–4294967295*]

Modes
- Global Config
- Interface Config

Parameter	Description
name	The name of the Access Control List.
sequence	A optional sequence number that indicates the order of this IP access list relative to the other IP access lists already assigned to this interface and direction. The range is 1 to 4294967295.
vlan-id	A VLAN ID associated with a specific IP ACL in a given direction.

Example: The following shows an example of the command.

```
(Routing)(Config)#mac access-group mac1 control-plane
```

no mac access-group

This command removes a MAC ACL identified by `name` from the interface in a given direction.

Format no mac access-group *name* {{*control-plane*|in|out} vlan *vlan-id* {in|out}}

Modes
- Global Config
- Interface Config

Example: The following shows an example of the command.

```
(Routing)(Config)#no mac access-group mac1 control-plane
```

remark

This command adds a new comment to the ACL rule.

Use the remark keyword to add comments (remarks) to ACL rule entries belonging to an IPv4, IPv6, MAC, or ARP ACL. Up to L7_ACL_MAX_RULES_PER_LIST*10 remarks per ACL and up to 10 remarks per ACL rule can be configured. Also, up to L7_ACL_MAX_RULES*2 remarks for all QOS ACLs(IPv4/IPv6/MAC) for device can be configured. The total length of the remark cannot exceed 100 characters. A remark can contain characters in the range A-Z, a-z, 0-9, and special characters like space, hyphen, underscore. Remarks are associated to the ACL rule that is immediately created after the remarks are created. If the ACL rule is removed, the associated remarks are also deleted. Remarks are shown only in `show running-config` and are not displayed in `show ip access-lists`.

Remarks can only be added before creating the rule. If a user creates up to 10 remarks, each of them is linked to the next created rule.

Default none

Format remark *comment*

Mode
- IPv4-Access-List Config
- IPv6-Access-List-Config
- MAC-Access-List Config
- ARP-Access-List Config

Example:

```
(Config)#arp access-list new
(Config-arp-access-list)#remark “test1”
(Config-arp-access-list)#permit ip host 1.1.1.1 mac host 00:01:02:03:04:05
(Config-arp-access-list)#remark “test1”
(Config-arp-access-list)#remark “test2”
(Config-arp-access-list)#remark “test3”
(Config-arp-access-list)#permit ip host 1.1.1.2 mac host 00:03:04:05:06:07
(Config-arp-access-list)#permit ip host 2.1.1.2 mac host 00:03:04:05:06:08
(Config-arp-access-list)#remark “test4”
(Config-arp-access-list)#remark “test5”
(Config-arp-access-list)#permit ip host 2.1.1.3 mac host 00:03:04:05:06:01
```

no remark

Use this command to remove a remark from an ACL access-list. When the first occurrence of the remark in ACL is found, the remark is deleted. Repeated execution of this command with the same remark removes the remark from the next ACL rule that has the remark associated with it (if there is any rule configured with the same remark). If there are no more rules with this remark, an error message is displayed. If there is no such remark associated with any rule and such remark is among not associated remarks, it is removed.

Default	none
Format	no remark *comment*
Mode	• IPv4-Access-List Config • IPv6-Access-List-Config • MAC-Access-List Config • ARP-Access-List Config

show mac access-lists

This command displays summary information for all Mac Access lists and ACL rule hit count of packets matching the configured ACL rule within an ACL. This counter value rolls-over on reaching the maximum value. There is a dedicated counter for each ACL rule. ACL counters do not interact with PBR counters.

For ACL with multiple rules, once a match occurs at any one specific rule, counters associated with this rule only get incremented (for example, consider an ACL with three rules, after matching rule two, counters for rule three would not be incremented).

For ACL counters, If an ACL rule is configured without RATE-LIMIT, the counter value is count of forwarded/discarded packets. (For example: For a burst of 100 packets, the Counter value is 100).

If the ACL rule is configured with RATE LIMIT, the counter value is the MATCHED packet count. If the sent traffic rate exceeds the configured limit, the counters still display matched packet count (despite getting dropped beyond the configured limit since match criteria is met) which would equal the sent rate. For example, if rate limit is set to 10 Kb/s and *matching* traffic is sent at 100 Kb/s, counters reflect a 100 Kb/s value. If the sent traffic rate is less than the configured limit, counters display only the matched packet count. Either way, only the matched packet count is reflected in the counters, irrespective of whether they get dropped or forwarded. ACL counters do not interact with diffserv policies.

Use the access list name to display detailed information of a specific MAC ACL.

Note: The command output varies based on the match criteria configured within the rules of an ACL.

Format	show mac access-lists *[name]*
Mode	Privileged EXEC

Parameter	Definition
ACL Name	The user-configured name of the ACL.
ACL Counters	Identifies whether the ACL counters are enabled or disabled.
Interface(s)	The inbound or outbound interfaces to which the ACL is applied.
Sequence Number	The ordered rule number identifier defined within the MAC ACL.
Action	The action associated with each rule. The possible values are Permit or Deny.
Source MAC Address	The source MAC address for this rule.
Source MAC Mask	The source MAC mask for this rule.
Committed Rate	The committed rate defined by the rate-limit attribute.
Committed Burst Size	The committed burst size defined by the rate-limit attribute.
Destination MAC Address	The destination MAC address for this rule.
Ethertype	The Ethertype keyword or custom value for this rule.
VLAN ID	The VLAN identifier value or range for this rule.
COS	The COS (802.1p) value for this rule.
Log	Displays when you enable logging for the rule.
Assign Queue	The queue identifier to which packets matching this rule are assigned.
Mirror Interface	The unit/slot/port to which a copy of the packet is sent.
Redirect Interface	The `unit/slot/port` to which the packet is forwarded, overriding the normal destination lookup.
sFlow Remote Agent	Indicates whether the sFlow sampling action is configured. This action, if configured, copies the packet matching the rule to the remote sFlow agent.
Time Range Name	Displays the name of the time-range if the MAC ACL rule has referenced a time range.
Rule Status	Status (Active/Inactive) of the MAC ACL rule.
ACL Hit Count	The ACL rule hit count of packets matching the configured ACL rule within an ACL.

Example: The following shows example CLI display output for the command.

```
(Routing) #show mac access-lists mac1

ACL Name: mac1
ACL Counters: Enabled

Outbound Interface(s): control-plane

Sequence Number: 10
```

```
Action............................permit
Source MAC Address................ 00:00:00:00:AA:BB
Source MAC Mask....................FF:FF:FF:FF:00:00
Committed Rate.....................32
Committed Burst Size...............16
ACL hit count .....................0

Sequence Number: 25
Action............................permit
Source MAC Address................ 00:00:00:00:AA:BB
Source MAC Mask....................FF:FF:FF:FF:00:00
Destination MAC Address........... 01:80:C2:00:00:00
Destination MAC Mask..............00:00:00:FF:FF:FF
Ethertype.........................ipv6
VLAN..............................36
CoS Value.........................7
Assign Queue......................4
Redirect Interface................0/34
sflow-remote-agent.................TRUE
Committed Rate.....................32
Committed Burst Size...............16
ACL hit count .....................0
```

IP Access Control List Commands

This section describes the commands you use to configure IP Access Control List (ACL) settings. IP ACLs ensure that only authorized users have access to specific resources and block any unwarranted attempts to reach network resources.

The following rules apply to IP ACLs:

- CE0128XB/CE0152XB software does not support IP ACL configuration for IP packet fragments.
- The maximum number of ACLs you can create is hardware dependent. The limit applies to all ACLs, regardless of type.
- The maximum number of rules per IP ACL is hardware dependent.
- Wildcard masking for ACLs operates differently from a subnet mask. A wildcard mask is in essence the inverse of a subnet mask. With a subnet mask, the mask has ones (1's) in the bit positions that are used for the network address, and has zeros (0's) for the bit positions that are not used. In contrast, a wildcard mask has (0’s) in a bit position that must be checked. A **1** in a bit position of the ACL mask indicates the corresponding bit can be ignored.

access-list

This command creates an IP Access Control List (ACL) that is identified by the access list number, which is 1-99 for standard ACLs or 100-199 for extended ACLs. Table 17, “ACL Command Parameters,” on page 887 describes the parameters for the `access-list` command.

IP Standard ACL:

Format access-list *1-99* {remark *comment*} | {[*sequence-number*]}] {deny | permit} {every | *srcip srcmask* | host *srcip*} [time-range *time-range-name*] [log] [assign-queue *queue-id*] [{mirror | redirect} *unit/slot/port*] [rate-limit *rate burst-size*]

Mode Global Config

IP Extended ACL:

Format access-list *100-199* {remark *comment*} | {[*sequence-number*]} [rule *1-1023*] {deny | permit} {every | {{eigrp | gre | icmp | igmp | ip | ipinip | ospf | pim | tcp | udp | *0- 255*} {*srcip* srcmask|any|host *srcip*}[range {*portkey*|*startport*} {*portkey*|*endport*} {eq|neq|lt|gt} {*portkey*|*0-65535*}{*dstipdstmask*|any|host*dstip*}[{range{*portkey*|*startport*}{*portkey*|*endport*}| {eq | neq | lt | gt} {*portkey* | *0-65535*}] [flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]] [icmp-type *icmp-type* [icmp-code *icmp-code*] | icmp-message*icmp-message*][igmp-type*igmp-type*][fragments][precedence*precedence*|tos *tos* [tosmask] | dscp *dscp*]}} [time-range *time-range-name*] [log] [assign-queue *queue-id*] [{mirror | redirect} *unit/slot/port*] [rate-limit *rate burst-size*] [sflow-remote-agent]

Mode Global Config

Note: IPv4 extended ACLs have the following limitations for egress ACLs:

- Match on port ranges is not supported.
- The rate-limit command is not supported.

Table 17. *ACL Command Parameters*

Parameter	Description
remark *comment*	Use the remark keyword to add a comment (remark) to an IP standard or IP extended ACL. The remarks make the ACL easier to understand and scan. Each remark is limited to 100 characters. A remark can consist of characters in the range A-Z, a-z, 0-9, and special characters: space, hyphen, underscore. Remarks are displayed only in show running configuration. One remark per rule can be added for IP standard or IP extended ACL. User can remove only remarks that are not associated with a rule. Remarks associated with a rule are removed when the rule is removed
sequence-number	Specifies a sequence number for the ACL rule. Every rule receives a sequence number. A sequence number is specified by the user or is generated by the device. If a sequence number is not specified for the rule, a sequence number that is 10 greater than the last sequence number in the ACL is used and this rule is located in the end of the list. If this is the first ACL rule in the given ACL, a sequence number of 10 is assigned. If the calculated sequence number exceeds the maximum sequence number value, the ACL rule creation fails. It is not allowed to create a rule that duplicates an already existing one and a rule cannot be configured with a sequence number that is already used for another rule. For example, if user adds new ACL rule to ACL without specifying a sequence number, it is placed at the bottom of the list. By changing the sequence number, user can move the ACL rule to a different position in the ACL.
1-99 or *100-199*	Range 1 to 99 is the access list number for an IP standard ACL. Range 100 to 199 is the access list number for an IP extended ACL.
[rule *1-1023*]	Specifies the IP access list rule.
{deny | permit}	Specifies whether the IP ACL rule permits or denies an action. **NOTE:** For 5630x and 5650x-based systems, assign-queue, redirect, and mirror attributes are configurable for a deny rule, but they have no operational effect.
every	Match every packet.
{eigrp | gre | icmp | igmp | ip | ipinip | ospf | pim | tcp | udp | *0 -255*}	Specifies the protocol to filter for an extended IP ACL rule.
srcip srcmask|any|host *scrip*	Specifies a source IP address and source netmask for match condition of the IP ACL rule. Specifying any specifies *srcip* as 0.0.0.0 and *srcmask* as 255.255.255.255. Specifying host *A.B.C.D* specifies *srcip* as A.B.C.D and *srcmask* as 0.0.0.0.

Table 17. *ACL Command Parameters*

Parameter	Description
{{range{portkey|startport}{portkey|endport}|{eq|neq|lt|gt}{*portkey | 0-65535*}]	**NOTE:** This option is available only if the protocol is TCP or UDP. Specifies the source layer 4 port match condition for the IP ACL rule. You can use the port number, which ranges from 0-65535, or you specify the ***`portkey`***, which can be one of the following keywords: ● For TCP: *domain*, *echo*, *ftp*, *ftp-data*, *http*, *smtp*, *telnet*, *www*, *pop2*, *pop3*. ● For UDP: `domain, echo, ntp, rip, snmp, tftp,` *time*, and `who`. For both TCP and UDP, each of these keywords translates into its equivalent port number, which is used as both the start and end of a port range. If *range* is specified, the IP ACL rule matches only if the layer 4 port number falls within the specified portrange. The *startport* and *endport* parameters identify the first and last ports that are part of the port range. They have values from 0 to 65535. The ending port must have a value equal or greater than the starting port. The starting port, ending port, and all ports in between will be part of the layer 4 port range. When *eq* is specified, the IP ACL rule matches only if the layer 4 port number is equal to the specified port number or portkey. When *lt* is specified, IP ACL rule matches if the layer 4 port number is less than the specified port number or portkey. It is equivalent to specifying the range as 0 to <specified port number – 1>. When *gt* is specified, the IP ACL rule matches if the layer 4 port number is greater than the specified port number or portkey. It is equivalent to specifying the range as <specified port number + 1> to 65535. When *neq* is specified, IP ACL rule matches only if the layer 4 port number is not equal to the specified port number or portkey. Two rules are added in the hardware one with range equal to 0 to <specified port number _- 1> and one with range equal to <<specified port number _+ 1 to 65535>> **NOTE:** Port number matches only apply to unfragmented or first fragments.
dstip dstmask|any|host *dstip*	Specifies a destination IP address and netmask for match condition of the IP ACL rule. Specifying any implies specifying *dstip* as 0.0.0.0 and *dstmask* as 255.255.255.255. Specifying host A.B.C.D implies *dstip* as A.B.C.D and *dstmask* as 0.0.0.0.
[precedence *precedence* | tos *tos* [*tosmask*] | dscp *dscp*]	Specifies the TOS for an IP ACL rule depending on a match of precedence or DSCP values using the parameters *`dscp`*, *`precedence`*, *`tos/tosmask`*. **NOTE:** *tosmask* is an optional parameter.

Table 17. *ACL Command Parameters*

Parameter	Description
flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]	**NOTE:** This option is available only if the protocol is tcp. Specifies that the IP ACL rule matches on the TCP flags. When +<tcpflagname> is specified, a match occurs if the specified <tcpflagname> flag is set in the TCP header. When -<tcpflagname> is specified, a match occurs if the specified <tcpflagname> flag is *NOT* set in the TCP header. When established is specified, a match occurs if the specified RST or ACK bits are set in the TCP header. Two rules are installed in the hardware when the established option is specified.
[icmp-type*icmp-type*[icmp-code *icmp-code*] | icmp-message *icmp-message*]	**NOTE:** This option is available only if the protocol is icmp. Specifies a match condition for ICMP packets. When *icmp-type* is specified, the IP ACL rule matches on the specified ICMP message type, a number from 0 to 255. When *icmp-code* is specified, the IP ACL rule matches on the specified ICMP message code, a number from 0 to 255. Specifying *icmp-message* implies that both *icmp-type* and *icmp-code* are specified. The following icmp-messages are supported: *echo*, *echo-reply*, *host-redirect*, *mobile-redirect*, *net-redirect*, *net-unreachable*, *redirect*, *packet-too-big*, *port-unreachable*, *source-quench*, *router-solicitation*, *router-advertisement*, *time-exceeded*, *ttl-exceeded* and *unreachable*.
igmp-type *igmp-type*	This option is available only if the protocol is igmp. When *igmp-type* is specified, the IP ACL rule matches on the specified IGMP message type, a number from 0 to 255.
fragments	Specifies that the IP ACL rule matches on fragmented IP packets.
[log]	Specifies that this rule is to be logged.
[time-range *time-range-name*]	Allows imposing time limitation on the ACL rule as defined by the parameter *time-range-name*. If a time range with the specified name does not exist and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with specified name exists and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive. For information about configuring time ranges, see "Time Range Commands for Time-Based ACLs" on page 915.
[assign-queue *queue-id*]	Specifies the assign-queue, which is the queue identifier to which packets matching this rule are assigned.
[{mirror | redirect} *unit/slot/port*]	Specifies the mirror or redirect interface which is the `unit/slot/port` to which packets matching this rule are copied or forwarded, respectively.
[rate-limit *rate burst-size*]	Specifies the allowed rate of traffic as per the configured rate in Kb/s, and burst-size in kbytes.
[sflow-remote-agent]	Configures the sFlow sampling action. This action, if configured, copies the packet matching the rule to the remote sFlow agent.

no access-list

This command deletes an IP ACL that is identified by the parameter `accesslistnumber` from the system. The range for `accesslistnumber` 1-99 for standard access lists and 100-199 for extended access lists.

Format	no access-list *accesslistnumber* [rule *1-1023*]
Mode	Global Config

access-list counters enable

Use this command to enable ACL counters for IPv4, IPv6, and MAC access lists.

Default	enabled
Format	access-list *counters enable*
Mode	Global Config

no access-list counters enable

Use this command to disable ACL counters for IPv4, IPv6, and MAC access lists.

Format	no access-list *counters enable*
Mode	Global Config

ip access-list

This command creates an extended IP Access Control List (ACL) identified by *name*, consisting of classification fields defined for the IP header of an IPv4 frame. The *name* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the IP access list. The rate-limit attribute configures the committed rate and the committed burst size.

If an IP ACL by this name already exists, this command enters IPv4-Access_List config mode to allow updating the existing IP ACL.

Note: The CLI mode changes to IPv4-Access-List Config mode when you successfully execute this command.

Format	ip access-list *name*
Mode	Global Config

no ip access-list

This command deletes the IP ACL identified by name from the system.

Format	no ip access-list *name*
Mode	Global Config

ip access-list rename

This command changes the name of an IP Access Control List (ACL). The *name* parameter is the names of an existing IP ACL. The new*name* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the IP access list.

This command fails is an IP ACL by the name new*name* already exists.

Format	ip access-list rename *name newname*
Mode	Global Config

ip access-list resequence

Use this command to renumber the sequence numbers of the entries for specified IP access list with the given increment value starting from a particular sequence number. The command is used to edit the sequence numbers of ACL rules in the ACL and change the order in which entries are applied. This command is not saved in startup configuration and is not displayed in running configuration.

Note: If the generated sequence number exceeds the maximum sequence number, the ACL rule creation fails and an informational message is displayed.

Default	10
Format	ip access-list resequence {*name*| *id* } *starting-sequence-number increment*
Mode	Global Config

Parameter	Description
starting-sequence-number	The sequence number from which to start. The range is 1–2147483647. The default is 10.
increment	The amount to increment. The range is 1–2147483647. The default is 10.

{deny | permit} (IP ACL)

This command creates a new rule for the current IP access list. A rule may either deny or permit traffic according to the specified classification fields. At a minimum, either the every keyword or the protocol, source address, and destination address values must be specified. The source and destination IP address fields may be specified using the keyword any to indicate a match on any value in that field. The remaining command parameters are all optional, but the most frequently used parameters appear in the same relative order as shown in the command format.

Format [*sequence-number*]{deny | permit}{every | {{eigrp | gre | icmp | igmp | ip | ipinip | ospf | pim | tcp | udp | *0 -255*} {srcip *srcmask* | any | host *srcip*} [{range {*portkey* | *startport*} {*portkey* | *endport*} | {eq | neq | lt | gt} {*portkey* | *0-65535*}] {*dstip dstmask* | any | host *dstip*} [{range {*portkey* | *startport*} {*portkey* | *endport*} | {eq | neq | lt | gt} {*portkey* | *0-65535*}] [flag [+fin | -fin][+syn | -syn][+rst | -rst][+psh | -psh][+ack | -ack][+urg | -urg][established]][icmp-type *icmp-type* [icmp-code icmp-code] | icmp-message icmp-message] [igmp-type igmp-type] [fragments] [precedence *precedence* | tos *tos* [*tosmask*] | dscp *dscp*] | [ttl eq *0-255*]}} [time-range *time-range-name*] [log] [assign-queue *queue-id*] [{mirror | redirect} *unit/slot/port*] [rate-limit *rate burst-size*] [sflow-remote-agent]

Mode Ipv4-Access-List Config

Note: Note the following:

- An implicit **deny all** IP rule always terminates the access list.
- For BCM5630x-based systems, the *`mirror`* and *`redirect`* parameters are not available.
- For BCM5650x-based systems, the *`mirror`* parameter allows the traffic matching this rule to be copied to the specified *`unit/slot/port`*, while the redirect parameter allows the traffic matching this rule to be forwarded to the specified *`unit/slot/port`*. The *`assign-queue`* and *`redirect`* parameters are only valid for a `permit` rule.

Note: For IPv4, the following are not supported for egress ACLs:

- A match on port ranges.
- A match on port ranges.

The `time-range` parameter allows imposing time limitation on the IP ACL rule as defined by the specified time range. If a time range with the specified name does not exist and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with specified name exists and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive. For information about configuring time ranges, see "Time Range Commands for Time-Based ACLs" on page 915.

The `assign-queue` parameter allows specification of a particular hardware queue for handling traffic that matches this rule. The allowed *`queue-id`* value is 0-(n-1), where n is the number of user configurable queues available for the hardware platform. The *`assign-queue`* parameter is valid only for a `permit` rule.

The `permit` command's optional attribute `rate-limit` allows you to permit only the allowed rate of traffic as per the configured rate in Kb/s, and burst-size in kbytes.

Parameter	Description
sequence-number	The *sequence-number* specifies the sequence number for the ACL rule. The sequence number is specified by the user or is generated by device. If a sequence number is not specified for the rule, a sequence number that is 10 greater than the last sequence number in ACL is used and this rule is placed at the end of the list. If this is the first ACL rule in the given ACL, a sequence number of 10 is assigned. If the calculated sequence number exceeds the maximum sequence number value, the ACL rule creation fails. A rule cannot be created that duplicates an already existing one and a rule cannot be configured with a sequence number that is already used for another rule. For example, if user adds new ACL rule to ACL without specifying a sequence number, it is placed at the bottom of the list. By changing the sequence number, the user can move the ACL rule to a different position in the ACL.
{deny | permit}	Specifies whether the IP ACL rule permits or denies the matching traffic.
Every	Match every packet.
{`eigrp | gre | icmp | igmp | ip | ipinip | ospf | pim | tcp | udp |` *`0 -255`*}	Specifies the protocol to match for the IP ACL rule.
srcip srcmask | any | host *srcip*	Specifies a source IP address and source netmask to match for the IP ACL rule. Specifying “any” implies specifying *srcip* as “0.0.0.0” and *srcmask* as “255.255.255.255”. Specifying “host A.B.C.D” implies *srcip* as “A.B.C.D” and *srcmask* as “0.0.0.0”.

Parameter	Description
[{range {*portkey* | *startport*} {*portkey* | *endport*} | {eq | neq | lt | gt} {*portkey* | *0-65535*}]	This option is available only if the protocol is tcp or udp. Specifies the layer 4 port match condition for the IP ACL rule. Port number can be used, which ranges from 0-65535, or the portkey, which can be one of the following keywords: For tcp protocol: domain, echo, ftp, ftp-data, http, smtp, telnet, www, pop2, pop3 For udp protocol: domain, echo, ntp, rip, snmp, tftp, time, who Each of these keywords translates into its equivalent port number. When range is specified, the IP ACL rule matches only if the layer 4 port number falls within the specified port range. The startport and endport parameters identify the first and last ports that are part of the port range. They have values from 0 to 65535. The ending port must have a value equal to or greater than the starting port. The starting port, ending port, and all ports in between will be part of the layer 4 port range. When eq is specified, IP ACL rule matches only if the layer 4 port number is equal to the specified port number or portkey. When lt is specified, IP ACL rule matches if the layer 4 port number is less than the specified port number or portkey. It is equivalent to specifying the range as 0 to <specified port number – 1>. When gt is specified, IP ACL rule matches if the layer 4 port number is greater than the specified port number or portkey. It is equivalent to specifying the range as <specified port number + 1> to 65535. When neq is specified, IP ACL rule matches only if the layer 4 port number is not equal to the specified port number or port key. Two rules are added in the hardware one with range equal to 0 to <specified port number _- 1> and one with range equal to <<specified port number _+ 1 to 65535>>. Port number matches only apply to unfragmented or first fragments.
dstip dstmask | any | host *dstip*	Specifies a destination IP address and netmask for match condition of the IP ACL rule. Specifying any implies specifying dstip as 0.0.0.0 and dstmask as 255.255.255.255. Specifying host A.B.C.D implies dstip as A.B.C.D and dstmask as 0.0.0.0.
[precedence *precedence* | tos *tos* [*tosmask*] | dscp *dscp*]	Specifies the TOS for an IP ACL rule depending on a match of precedence or DSCP values using the parameters *dscp*, *precedence*, *tos*/*tosmask.* tosmask is an optional parameter.

Parameter	Description
flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]	Specifies that the IP ACL rule matches on the tcp flags. When +<tcpflagname> is specified, a match occurs if specified <tcpflagname> flag is set in the TCP header. When -<tcpflagname> is specified, a match occurs if specified <tcpflagname> flag is NOT set in the TCP header. When established is specified, a match occurs if either the specified RST or ACK bits are set in the TCP header. Two rules are installed in hardware to when the established option is specified. This option is available only if protocol is tcp.
[icmp-type *icmp-type* [icmp-code *icmp-code*] | icmp-message *icmp-message*]	This option is available only if the protocol is ICMP. Specifies a match condition for ICMP packets. When *icmp-type* is specified, IP ACL rule matches on the specified ICMP message type, a number from 0 to 255. When *icmp-code* is specified, IP ACL rule matches on the specified ICMP message code, a number from 0 to 255. Specifying *icmp-message* implies both *icmp-type* and *icmp-code* are specified. The following icmp-messages are supported: echo, echo-reply, host-redirect, mobile-redirect, net-redirect, net-unreachable, redirect, packet-too-big, port-unreachable, source-quench, router-solicitation, router-advertisement, time-exceeded, ttl-exceeded and unreachable. The ICMP message is decoded into corresponding ICMP type and ICMP code within that ICMP type.
igmp-type *igmp-type*	This option is visible only if the protocol is IGMP. When *igmp-type* is specified, the IP ACL rule matches on the specified IGMP message type, a number from 0 to 255.
fragments	Specifies that IP ACL rule matches on fragmented IP packets.
ttl eq	Specifies that the IP ACL rule matches on packets with the specified Time To Live (TTL) value.
log	Specifies that this rule is to be logged.
time-range *time-range-name*	Allows imposing a time limitation on the ACL rule as defined by the parameter time-range-name. If a time range with the specified name does not exist and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, the ACL rule is applied immediately. If a time range with specified name exists and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive.

Parameter	Description
assign-queue *queue-id*	Specifies the assign-queue, which is the queue identifier to which packets matching this rule are assigned.
{mirror | redirect} *unit/slot/ port*	Specifies the mirror or redirect interface which is the unit/slot/port to which packets matching this rule are copied or forwarded, respectively.
rate-limit *rate burst-size*	Specifies the allowed rate of traffic as per the configured rate in Kb/s, and burst-size in kbytes.
sflow-remote-agent	Configures the sFlow sampling action. This action, if configured, copies the packet matching the rule to the remote sFlow agent.

Example: The following shows an example of the command.

```
(Routing) (Config)#ip access-list ip1

(Routing) (Config-ipv4-acl)#permit icmp any any rate-limit 32 16

(Routing) (Config-ipv4-acl)#exit
```

no *sequence-number*

Use this command to remove the ACL rule with the specified sequence number from the ACL.

Format	no *sequence-number*
Mode	Ipv4-Access-List Config

ip access-group

This command either attaches a specific IP Access Control List (ACL) identified by `accesslistnumber` or `name` to an interface (including VLAN routing interfaces), range of interfaces, or all interfaces; or associates it with a VLAN ID in a given direction. The parameter `name` is the name of the Access Control List.

An optional sequence number may be specified to indicate the order of this IP access list relative to other IP access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specified access list replaces the currently attached IP access list using that sequence number. If the sequence number is not specified for this command, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used.

An optional *control-plane* is specified to apply the ACL on CPU port. The IPv4 control packets like RADIUS and TACACS+ are also dropped because of the implicit **deny all** rule added at the end of the list. To overcome this, permit rules must be added to allow the IPv4 control packets.

Note: Note the following:

- The keyword *control-plane* is only available in Global Config mode.
- You should be aware that the `out` option may or may not be available, depending on the platform.

Default none

Format ip access-group {*accesslistnumber*|*name*} {{*control-plane*|*in*|*out*}|vlan *vlan-id* {in|out}} [sequence *1-4294967295*]

Modes
- Interface Config
- Global Config

Parameter	Description
accesslistnumber	Identifies a specific IP ACL. The range is 1 to 199.
sequence	A optional sequence number that indicates the order of this IP access list relative to the other IP access lists already assigned to this interface and direction. The range is 1 to 4,294,967,295.
vlan-id	A VLAN ID associated with a specific IP ACL in a given direction.
name	The name of the Access Control List.

Example: The following shows an example of the command.

```
(Routing) (Config)#ip access-group ip1 control-plane
```

no ip access-group

This command removes a specified IP ACL from an interface.

Default none

Format no ip access-group {*accesslistnumber*|*name*} {{*control-plane*|*in*|*out*}|vlan *vlan-id* {in|out}}

Mode
- Interface Config
- Global Config

Example: The following shows an example of the command.

```
(Routing)(Config)#no ip access-group ip1 control-plane
```

acl-trapflags

This command enables the ACL trap mode.

Default disabled

Format acl-trapflags

Mode Global Config

no acl-trapflags

This command disables the ACL trap mode.

Format no acl-trapflags

Mode Global Config

show ip access-lists

Use this command to view summary information about all IP ACLs configured on the switch. To view more detailed information about a specific access list, specify the ACL number or name that is used to identify the IP ACL. It displays committed rate, committed burst size, and ACL rule hit count of packets matching the configured ACL rule within an ACL. This counter value rolls-over on reaching the maximum value. There is a dedicated counter for each ACL rule. ACL counters do not interact with PBR counters.

For ACL with multiple rules, once a match occurs at any one specific rule, counters associated with this rule only get incremented for example, consider an ACL with three rules, after matching rule two, counters for rule three would not be incremented).

For ACL counters, if an ACL rule is configured without RATE-LIMIT, the counter value is count of forwarded/discarded packets (for example: If burst of 100 packets sent from IXIA, the Counter value is 100).

If an ACL rule is configured with RATE LIMIT, the counter value will be the MATCHED packet count. If the sent traffic rate exceeds the configured limit, counters will still display matched packet count (despite getting dropped beyond the configured limit since match criteria is met) that would equal the sent rate. For example, if rate limit is set to 10 Kb/s and *matching* traffic is sent at 100 Kb/s, counters would reflect 100 Kb/s value. If the sent traffic rate is less than the configured limit, counters would display only matched packet count. Either way, only matched packet count is reflected in the counters, irrespective of whether they get dropped or forwarded. ACL counters do not interact with diffserv policies.

Format	show ip access-lists [*accesslistnumber* | *name*]
Mode	Privileged EXEC

Parameter	Definition
ACL Counters	Shows whether ACL counters are enabled or disabled.
Current number of ACLs	The number of ACLs of any type currently configured on the system.
Maximum number of ACLs	The maximum number of ACLs of any type that can be configured on the system.
ACL ID/Name	Identifies the configured ACL number or name.
Rules	Identifies the number of rules configured for the ACL.
Direction	Shows whether the ACL is applied to traffic coming into the interface (inbound/ingress) or leaving the interface (outbound/egress).
Interface(s)	The interface(s) to which the ACL is applied (ACL interface bindings).
VLAN(s)	The VLANs to which the ACL is applied (ACL VLAN bindings).

If you specify an IP ACL number or name, the following information displays:

Note: Only the access list fields that you configure are displayed. Thus, the command output varies based on the match criteria configured within the rules of an ACL.

Parameter	Definition
ACL ID	The user-configured ACL identifier.
ACL Counters	Identifies whether the ACL counters are enabled or disabled.
Interface(s)	The inbound or outbound interfaces to which the ACL is applied.
Sequence Number	The number identifier for each rule that is defined for the IP ACL.
Action	The action associated with each rule. The possible values are Permit or Deny.
Match All	Indicates whether this access list applies to every packet. Possible values are True or False.
Protocol	The protocol to filter for this rule.
ICMP Type	**NOTE:** This is shown only if the protocol is ICMP. The ICMP message type for this rule.
Starting Source L4 port	The starting source layer 4 port.
Ending Source L4 port	The ending source layer 4 port.
Starting Destination L4 port	The starting destination layer 4 port.
Ending Destination L4 port	The ending destination layer 4 port.
ICMP Code	**NOTE:** This is shown only if the protocol is ICMP. The ICMP message code for this rule.
Fragments	If the ACL rule matches on fragmented IP packets.
Committed Rate	The committed rate defined by the rate-limit attribute.
Committed Burst Size	The committed burst size defined by the rate-limit attribute.
Source IP Address	The source IP address for this rule.
Source IP Mask	The source IP Mask for this rule.
Source L4 Port Keyword	The source port for this rule.
Destination IP Address	The destination IP address for this rule.
Destination IP Mask	The destination IP Mask for this rule.
Destination L4 Port Keyword	The destination port for this rule.
IP DSCP	The value specified for IP DSCP.
IP Precedence	The value specified IP Precedence.
IP TOS	The value specified for IP TOS.
Fragments	Specifies whether the IP ACL rule matches on fragmented IP packets is enabled.
sFlow Remote Agent	Indicates whether the sFlow sampling action is configured. This action, if configured, copies the packet matching the rule to the remote sFlow agent.
TTL Field Value	The value specified for the TTL.
Log	Displays when you enable logging for the rule.
Assign Queue	The queue identifier to which packets matching this rule are assigned.
Mirror Interface	The unit/slot/port to which packets matching this rule are copied.
Redirect Interface	The unit/slot/port to which packets matching this rule are forwarded.
Time Range Name	Displays the name of the time-range if the IP ACL rule has referenced a time range.
Rule Status	Status (Active/Inactive) of the IP ACL rule.

Parameter	Definition
ACL Hit Count	The ACL rule hit count of packets matching the configured ACL rule within an ACL.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip access-lists ip1

ACL Name: ip1
ACL Counters: Enabled
Inbound Interface(s): 1/0/30


Sequence Number: 1
Action......................................... permit
Match All...................................... FALSE
Protocol....................................... 1(icmp)
ICMP Type.......................................3(Destination Unreachable)
Starting Source L4 port.........................80
Ending Source L4 port...........................85
Starting Destination L4 port....................180
Ending Destination L4 port......................185
ICMP Code.......................................0
Fragments.......................................FALSE
sflow-remote- agent............................ TRUE
Committed Rate................................. 32
Committed Burst Size........................... 16
ACL hit count ..................................0
```

show access-lists

This command displays IP ACLs, IPv6 ACLs, and MAC access control lists information for a designated interface and direction. Instead of `unit/slot/port`, `lag lag-intf-num` can be used as an alternate way to specify the LAG interface. `lag lag-intf-num` can also be used to specify the LAG interface where `lag-intf-num` is the LAG port number.Use the `control-plane` keyword to display the ACLs applied on the CPU port.

Format show access-lists interface {*unit/slot/port* in|out | control-plane}

Mode Privileged EXEC

Parameter	Definition
ACL Type	Type of access list (IP, IPv6, or MAC).
ACL ID	Access List name for a MAC or IPv6 access list or the numeric identifier for an IP access list.
Sequence Number	An optional sequence number may be specified to indicate the order of this access list relative to other access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specified access list replaces the currently attached access list using that sequence number. If the sequence number is not specified by the user, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used. Valid range is (1 to 4294967295).
in|out	• in – Display Access List information for a particular interface and the in direction. • out – Display Access List information for a particular interface and the out direction.

Example: The following shows an example of the command.

```
(Routing) #show access-lists interface control-plane

ACL Type          ACL ID                 Sequence Number
--------       -------------------------------  ---------------
IPv6         ip61                              1
```

show access-lists vlan

This command displays Access List information for a particular VLAN ID. The `vlan-id` parameter is the VLAN ID of the VLAN with the information to view. The `{in | out}` options specifies the direction of the VLAN ACL information to view.

Format show access-lists vlan *vlan-id* in|out

Mode Privileged EXEC

Parameter	Definition
ACL Type	Type of access list (IP, IPv6, or MAC).
ACL ID	Access List name for a MAC or IPv6 access list or the numeric identifier for an IP access list.
Sequence Number	An optional sequence number may be specified to indicate the order of this access list relative to other access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specified access list replaces the currently attached access list using that sequence number. If the sequence number is not specified by the user, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used. Valid range is (1 to 4294967295).

IPv6 Access Control List Commands

This section describes the commands you use to configure IPv6 Access Control List (ACL) settings. IPv6 ACLs ensure that only authorized users have access to specific resources and block any unwarranted attempts to reach network resources.

The following rules apply to IPv6 ACLs:

- The maximum number of ACLs you create is 100, regardless of type.
- The system supports only Ethernet II frame types.
- The maximum number of rules per IPv6 ACL is hardware dependent.

Note: CE0128XB/CE0152XB supports ACL counters for MAC, IPv4, and IPv6 access lists. For information about how to enable the counters, see "access-list counters enable" on page 890.

ipv6 access-list

This command creates an IPv6 Access Control List (ACL) identified by `name`, consisting of classification fields defined for the IP header of an IPv6 frame. The *name* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the IPv6 access list. The rate-limit attribute configures the committed rate and the committed burst size.

If an IPv6 ACL by this name already exists, this command enters IPv6-Access-List config mode to allow updating the existing IPv6 ACL.

Note: The CLI mode changes to IPv6-Access-List Config mode when you successfully execute this command.

Format	ipv6 access-list *name*
Mode	Global Config

no ipv6 access-list

This command deletes the IPv6 ACL identified by `name` from the system.

Format	no ipv6 access-list *name*
Mode	Global Config

ipv6 access-list rename

This command changes the name of an IPv6 ACL. The `name` parameter is the name of an existing IPv6 ACL. The *newname* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the IPv6 access list.

This command fails is an IPv6 ACL by the name *newname* already exists.

Format	ipv6 access-list rename *name newname*
Mode	Global Config

ipv6 access-list resequence

Use this command to renumber the sequence numbers of the entries for specified IPv6 access list with the given increment value starting from a particular sequence number. The command is used to edit the sequence numbers of ACL rules in the ACL and change the order in which entries are applied. This command is not saved in startup configuration and is not displayed in running configuration.

Note: If the generated sequence number exceeds the maximum sequence number, the ACL rule creation fails and an informational message is displayed.

Default 10

Format ipv6 access-list resequence {*name*| *id* } *starting-sequence-number increment*

Mode Global Config

Parameter	Description
starting-sequence-number	The sequence number from which to start. The range is 1–2147483647. The default is 10.
increment	The amount to increment. The range is 1–2147483647. The default is 10.

{deny | permit} (IPv6)

This command creates a new rule for the current IPv6 access list. A rule may either deny or permit traffic according to the specified classification fields. At a minimum, either the `every` keyword or the protocol, source address, and destination address values must be specified. The source and destination IPv6 address fields may be specified using the keyword `any` to indicate a match on any value in that field. The remaining command parameters are all optional, but the most frequently used parameters appear in the same relative order as shown in the command format.

Format {deny | permit}{every | {{icmpv6 | ipv6 | tcp | udp | 0-255}{*source-ipv6-prefix/prefix-length* | any | *host source-ipv6-address*} [{range {*portkey* | *startport*} {*portkey* | *endport*} | {eq | neq | lt | gt} {*portkey* | *0-65535*}] {*destination-ipv6-prefix/prefix-length* | any | *host destination-ipv6-address*} [{range {*portkey* | *startport*} {*portkey* | *endport*} | {eq | neq | lt | gt} {*portkey* | *0-65535*}][flag[+fin | -fin][+syn | -syn][+rst | -rst][+psh | -psh][+ack | -ack][+urg | -urg] [established]] [flow-label value] [icmp-type *icmp-type* [icmp-code *icmp-code*] | icmp-message*icmp-message*][routing][fragments][sequence*sequence-number*][dscp*dscp*]}} [log] [assign-queue *queue-id*] [{mirror | redirect} unit/slot/port] [rate-limit *rate burst-size*] [sflow-remote-agent]

Mode IPv6-Access-List Config

Note: An implicit **deny all IPv6** rule always terminates the access list.

The `time-range` parameter allows imposing time limitation on the IPv6 ACL rule as defined by the parameter *`time-range-name`*. If a time range with the specified name does not exist and the IPv6 ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with specified name exists and the IPv6 ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive. For information about configuring time ranges, see “Time Range Commands for Time-Based ACLs” on page 915.

The assign-queue parameter allows specification of a particular hardware queue for handling traffic that matches this rule. The allowed `queue-id` value is 0-(n-1), where `n` is the number of user configurable queues available for the hardware platform. The `assign-queue` parameter is valid only for a permit rule.

The `permit` command’s optional attribute `rate-limit` allows you to permit only the allowed rate of traffic as per the configured rate in Kb/s, and burst-size in kbytes.

IPv6 ACLs have the following limitations:

- Port ranges are not supported for egress IPv6 ACLs.
- For BCM5684X and BCM5685x platforms, The IPv6 ACL *routing* keyword is not supported when an IPv6 address is specified.
- For BCM5684X, BCM5685x, and BCM5644X platforms, the IPv6 ACL *fragment* keyword matches only on the first two IPv6 extension headers for the fragment header (next header code 44). If the fragment header appears in the third or subsequent header, it is not matched.
- For platforms other than BCM5684X, BCM5685x, and BCM5644X, the IPv6 ACL *fragment* keyword matches only on the first IPv6 extension header (next header code 44). If the fragment header appears in the second or subsequent header, it is not matched.
- For platforms other than the BCM5644X, the IPv6 ACL *routing* keyword matches only on the first IPv6 extension header (next header code 43). If the fragment header appears in the second or subsequent header, it is not matched.
- The rate-limit command is not supported for egress IPv6 ACLs.

Parameter	Description
{deny | permit}	Specifies whether the IPv6 ACL rule permits or denies the matching traffic.
Every	Specifies to match every packet.
{*protocolkey* | *number*}	Specifies the protocol to match for the IPv6 ACL rule. The current list is: *icmpv6*, *ipv6*, *tcp*, and *udp.*
source-ipv6-prefix/prefix-length | any | *host source-ipv6-address*	Specifies a source IPv6 source address and prefix length to match for the IPv6 ACL rule. Specifying any implies specifying “::/0 “ Specifying *host source-ipv6-address* implies matching the specified IPv6 address. This *source-ipv6-address* argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons.

Parameter	Description
[{range {*portkey* | *startport*} {*portkey* | *endport*} | {eq | neq | lt | gt} {*portkey* | *0-65535*}]	This option is available only if the protocol is TCP or UDP. Specifies the layer 4 port match condition for the IPv6 ACL rule. A port number can be used, in the range 0-65535, or the *portkey*, which can be one of the following keywords: For TCP: *domain*, *echo*, *ftp*, *ftp-data*, *http*, *smtp*, *telnet*, *www*, *pop2*, *pop3* For UDP: *domain*, *echo*, *ntp*, *rip*, *snmp*, *tftp*, *time*, *who*. Each of these keywords translates into its equivalent port number. When range is specified, IPv6 ACL rule matches only if the layer 4 port number falls within the specified portrange. The *startport* and *endport* parameters identify the first and last ports that are part of the port range. They have values from 0 to 65535. The ending port must have a value equal or greater than the starting port. The starting port, ending port, and all ports in between are part of the layer 4 port range. When eq is specified, IPv6 ACL rule matches only if the layer 4 port number is equal to the specified port number or portkey. When lt is specified, IPv6 ACL rule matches if the layer 4 port number is less than the specified port number or portkey. It is equivalent to specifying the range as 0 to <specified port number – 1>. When gt is specified, IPv6 ACL rule matches if the layer 4 port number is greater than the specified port number or portkey. It is equivalent to specifying the range as <specified port number + 1> to 65535. When neq is specified, IPv6 ACL rule matches only if the layer 4 port number is not equal to the specified port number or portkey. Two rules are added in the hardware one with range equal to 0 to <specified port number - 1> and one with range equal to <<specified port number + 1 to 65535>>
destination-ipv6-prefix/prefix-length | any | *host destination-ipv6-address*	Specifies a destination IPv6 source address and prefix length to match for the IPv6 ACL rule. Specifying any implies specifying "::/0 " Specifying *host destination-ipv6-address* implies matching the specified IPv6 address. This *destination-ipv6-address* argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons.

Parameter	Description
sequence *sequence-number*	Specifies a sequence number for the ACL rule. Every rule receives a sequence number. The sequence number is specified by the user or is generated by the device. If a sequence number is not specified for the rule, a sequence number that is 10 greater than the last sequence number in ACL is used and this rule is placed at the end of the list. If this is the first ACL rule in the given ACL, a sequence number of 10 is assigned. If the calculated sequence number exceeds the maximum sequence number value, the ACL rule creation fails. It is not allowed to create a rule that duplicates an already existing one. A rule cannot be configured with a sequence number that is already used for another rule. For example, if a user adds new ACL rule to ACL without specifying a sequence number, it is placed at the bottom of the list. By changing the sequence number, user can move the ACL rule to a different position in the ACL
[dscp *dscp*]	Specifies the dscp value to match for the IPv6 rule.
flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]	Specifies that the IPv6 ACL rule matches on the tcp flags. When +<tcpflagname> is specified, a match occurs if specified <tcpflagname> flag is set in the TCP header. When "-<tcpflagname>" is specified, a match occurs if specified <tcpflagname> flag is *NOT* set in the TCP header. When established is specified, a match occurs if specified either RST or ACK bits are set in the TCP header. Two rules are installed in hardware to when "established" option is specified. This option is visible only if protocol is "tcp".

Parameter	Description
[icmp-type *icmp-type [*icmp-code *icmp-code] |* icmp-message *icmp-message*]	This option is available only if the protocol is icmpv6. Specifies a match condition for ICMP packets. When *icmp-type* is specified, IPv6 ACL rule matches on the specified ICMP message type, a number from 0 to 255. When *icmp-code* is specified, IPv6 ACL rule matches on the specified ICMP message code, a number from 0 to 255. Specifying *icmp-message* implies both icmp-type and icmp-code are specified. The following icmp-messages are supported: *destination-unreachable*, *echo-reply*, *echo-request*, *header*, *hop-limit*, *mld-query*, *mld-reduction*, *mld-report*, *nd-na*, *nd-ns*, *next-header*, *no-admin*, *no-route*, *packet-too-big*, *port-unreachable*, *router-solicitation*, *router-advertisement*, *router-renumbering*, *time-exceeded*, and *unreachable*. The ICMP message is decoded into the corresponding ICMP type and ICMP code within that ICMP type.
Fragments	Specifies that IPv6 ACL rule matches on fragmented IPv6 packets (Packets that have the next header field is set to 44).
Routing	Specifies that IPv6 ACL rule matches on IPv6 packets that have routing extension headers (the next header field is set to 43).
Log	Specifies that this rule is to be logged.
time-range *time-range-name*	Allows imposing a time limitation on the ACL rule as defined by the parameter *time-range-name*. If a time range with the specified name does not exist and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, the ACL rule is applied immediately. If a time range with the specified name exists and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, the ACL rule is applied when the time-range with the specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive.
assign-queue *queue-id*	Specifies the assign-queue, which is the queue identifier to which packets matching this rule are assigned.
{mirror | redirect} *unit/slot/ port*	Specifies the mirror or redirect interface which is the unit/slot/port to which packets matching this rule are copied or forwarded, respectively.
rate-limit *rate burst-size*	Specifies the allowed rate of traffic as per the configured rate in Kb/s, and burst-size in kbytes.
sflow-remote-agent	Configures the sFlow sampling action. This action, if configured, copies the packet matching the rule to the remote sFlow agent.

Example: The following shows an example of the command.

```
(Routing) (Config)#ipv6 access-list ip61

(Routing) (Config-ipv6-acl)#permit udp any any rate-limit 32 16

(Routing) (Config-ipv6-acl)#exit
```

no *sequence-number*

Use this command to remove the ACL rule with the specified sequence number from the ACL.

Format	no *sequence-number*
Mode	Ipv6-Access-List Config

ipv6 traffic-filter

This command either attaches a specific IPv6 ACL identified by `name` to an interface or range of interfaces, or associates it with a VLAN ID in a given direction. The `name` parameter must be the name of an existing IPv6 ACL.

An optional sequence number may be specified to indicate the order of this mac access list relative to other IPv6 access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specifiedIPv6 access list replaces the currently attached IPv6 access list using that sequence number. If the sequence number is not specified for this command, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used.

This command specified in Interface Config mode only affects a single interface, whereas the Global Config mode setting is applied to all interfaces. The `vlan` keyword is only valid in the Global Config mode. The Interface Config mode command is only available on platforms that support independent per-port class of service queue configuration.

An optional *control-plane* is specified to apply the ACL on CPU port. The IPv6 control packets like IGMPv6 are also dropped because of the implicit *deny all* rule added at the end of the list. To overcome this, permit rules must be added to allow the IPv6 control packets.

Note: Note the following:

- The keyword *control-plane* is only available in Global Config mode.
- You should be aware that the `out` option may or may not be available, depending on the platform.

Format	ipv6 traffic-filter *name* {{control-plane |in|out}|vlan *vlan-id* {in|out}} [sequence *1-4294967295*]
Modes	• Global Config • Interface Config

Example: The following shows an example of the command.

```
(Routing)(Config)#ipv6 traffic-filter ip61 control-plane
```

no ipv6 traffic-filter

This command removes an IPv6 ACL identified by `name` from the interface(s) in a given direction.

Format	*no* ipv6 traffic-filter <*name{{control-plane* | *in* | *out}* | *vlan <vlan-id> {in|out}}*
Modes	• Global Config • Interface Config

Example: The following shows an example of the command.

```
(Routing) (Config)#no ipv6 traffic-filter ip61 control-plane
```

show ipv6 access-lists

This command displays summary information of all the IPv6 Access lists. Use the access list *name* to display detailed information of a specific IPv6 ACL.

This command displays information about the attributes icmp-type, icmp-code, fragments, routing, tcp flags, and source and destination L4 port ranges. It displays committed rate, committed burst size, and ACL rule hit count of packets matching the configured ACL rule within an ACL. This counter value rolls-over on reaching the maximum value. There is a dedicated counter for each ACL rule. ACL counters do not interact with PBR counters.

For ACL with multiple rules, once a match occurs at any one specific rule, counters associated with this rule only get incremented (for example, consider an ACL with three rules, after matching rule two, counters for rule three would not be incremented).

For ACL counters, If an ACL rule is configured without RATE-LIMIT, the counter value is a count of the forwarded/discarded packets. (For example: for a burst of 100 packets, the Counter value is 100).

If an ACL rule is configured with RATE LIMIT, the counter value is that of the MATCHED packet count. If the sent traffic rate exceeds the configured limit, the counters still display matched packet count (despite getting dropped beyond the configured limit since match criteria is met) that equals the sent rate. For example, if the rate limit is set to 10 kilobits per second (Kb/s) and *matching* traffic is sent at 100 Kb/s, counters would reflect 100 Kb/s value. If the sent traffic rate is less than the configured limit, the counters display only the matched packet count. Either way, only the matched packet count is reflected in the counters, irrespective of whether they get dropped or forwarded. ACL counters do not interact with DiffServ policies.

Format	show ipv6 access-lists *[name]*
Mode	Privileged EXEC

Parameter	Definition
ACL Counters	Shows whether ACL counters are enabled or disabled.
Current number of all ACLs	The number of ACLs of any type currently configured on the system.

Parameter	Definition
Maximum number of all ACLs	The number of ACLs of any type that can be configured on the system.
IPv6 ACL Name	The configured ACL name.
Rules	The number of rules configured for the ACL.
Direction	Shows whether the ACL is applied to traffic coming into the interface (inbound/ingress) or leaving the interface (outbound/egress).
Interface(s)	Identifies the interface(s) to which the ACL is applied (ACL interface bindings).
VLAN(s)	Identifies the VLANs to which the ACL is applied (ACL VLAN bindings).

If you specify an IPv6 ACL name, the following information displays:

Note: Only the access list fields that you configure are displayed. Thus, the command output varies based on the match criteria configured within the rules of an ACL.

Parameter	Definition
ACL Name	The user-configured name of the ACL.
ACL Counters	Identifies whether the ACL counters are enabled or disabled.
Interface(s)	The inbound and/or outbound interfaces to which the ACL is applied.
Sequence Number	The ordered rule number identifier defined within the IPv6 ACL.
Action	The action associated with each rule. The possible values are Permit or Deny.
Match Every	Indicates whether this access list applies to every packet. Possible values are True or False.
Protocol	The protocol to filter for this rule.
Committed Rate	The committed rate defined by the rate-limit attribute.
Committed Burst Size	The committed burst size defined by the rate-limit attribute.
Source IP Address	The source IP address for this rule.
Source L4 Port Keyword	The source port for this rule.
Destination IP Address	The destination IP address for this rule.
Destination L4 Port Keyword	The destination port for this rule.
IP DSCP	The value specified for IP DSCP.
Flow Label	The value specified for IPv6 Flow Label.
Log	Displays when you enable logging for the rule.
Assign Queue	The queue identifier to which packets matching this rule are assigned.
Mirror Interface	The *`unit/slot/port`* to which packets matching this rule are copied.
Redirect Interface	The *`unit/slot/port`* to which packets matching this rule are forwarded.
Time Range Name	Displays the name of the time-range if the IPv6 ACL rule has referenced a time range.
Rule Status	Status (Active/Inactive) of the IPv6 ACL rule.

Parameter	Definition
sFlow Remote Agent	Indicates whether the sFlow sampling action is configured. This action, if configured, copies the packet matching the rule to the remote sFlow agent.
ACL Hit Count	The ACL rule hit count of packets matching the configured ACL rule within an ACL.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 access-lists ip61

ACL Name: ip61
ACL Counters: Enabled

Outbound Interface(s): control-plane

Rule Number: 1
Action......................................... permit
Match Every................................... FALSE
Protocol...................................... 17(udp)
Committed Rate................................ 32
Committed Burst Size.......................... 16
ACL hit count .................................0
```

Management Access Control and Administration List

In order to ensure the security of the switch management features, the administrator may elect to configure a management access control list. The Management Access Control and Administration List (MACAL) feature is used to ensure that only known and trusted devices are allowed to remotely manage the switch via TCP/IP.

MACALs can be applied only to in-band ports and cannot be applied to the service port.

management access-list

Use this command to create a management access list and to enter access-list configuration mode, where you must define the denied or permitted access conditions with the `deny` and `permit` commands. If no match criteria are defined, the default is `deny`. If you reenter to an access- list context, the new rules would be entered at the end of the access-list. Use the `management access-class` command to choose the active access-list. The active management list cannot be updated or removed. The ***name*** value can be up to 32 characters.

Format	management access-list *name*
Mode	Global Config

no management access-list

This command deletes the MACAL identified by ***name*** from the system.

Format	no management access-list *name*
Mode	Global Config

{deny | permit} (Management ACAL)

This command creates a new rule for the current management access list. A rule may either deny or permit traffic according to the specified classification fields. Rules with `ethernet`, `vlan` and `port-channel` parameters will be valid only if an IP address is defined on the appropriate interface. Each rule should have a unique priority.

Format	*{deny | permit} [ethernet interface-number | vlan vlan-id | port-channel number] [service service] [priority priority-value]* *{deny | permit} ip-source ip-address [mask mask | prefix-length] [ethernet interface-number | vlan vlan-id | port-channel number] [service service] [priority priority-value]*
Mode	Management-ACAL Config

Parameter	Description
ethernet	Ethernet port number.
ip-source	Source IP address
port-channel	Port-channel number.

Parameter	Description
priority	Priority for rule.
service	Service type condition, which can be one of the following key words: • java • tftp • telnet • ssh • http • https • snmp • sntp • any
vlan	VLAN number.
mask	The network mask of the source IP address (0 to 32)
prefix-length	The number of bits that comprise the source IP address prefix. prefix length must be preceded by a forward slash (/).

Example: The following example shows how to configure two management interfaces:

```
ethernet 0/1 and ethernet 0/9.
(Routing) (Config)#management access-list mlist
(Routing) (config-macal)#permit ethernet 0/1 priority 63
(Routing) (config-macal)#permit ethernet 0/9 priority 64
(Routing) (config-macal)#exit
(Routing) (Config)#management access-class mlist
```

Example: The following example shows how to configure all the interfaces to be management interfaces except for two interfaces: ethernet 0/1 and ethernet 0/9.

```
(Routing) (Config)#management access-list mlist
(Routing) (config-macal)#deny ethernet 0/1 priority 62
(Routing) (config-macal)#deny ethernet 0/9 priority 63
(Routing) (config-macal)#permit priority 64
(Routing) (config-macal)#exit
```

management access-class

Use this command to restrict management connections. The `console-only` keyword specifies that the device can be managed only from the console.

Format	management access-class {console-only | *name*}
Mode	Global Config

no management access-class

This command disables the management restrictions

Format	no management access-class
Mode	Global Config

show management access-list

This command displays management access-lists.

Format	show management access-list [*name]*
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) #show management access-list

List Name...................................... mlist
List Admin Mode................................ Disabled
Packets Filtered............................... 0

Rules:

permit ethernet 0/1 priority 63
permit ethernet 0/9 priority 64

NOTE: All other access is implicitly denied.
```

show management access-class

This command displays information about the active management access list.

Format	show management access-class [*name]*
Mode	Privileged EXEC

Example: The following shows example CLI display output for the command.

```
(Routing) # show management access-class

Management access-class is enabled, using access list mlist
```

Time Range Commands for Time-Based ACLs

Time-based ACLs allow one or more rules within an ACL to be based on time. Each ACL rule within an ACL except for the implicit *deny all* rule can be configured to be active and operational only during a specific time period. The time range commands allow you to define specific times of the day and week in order to implement time-based ACLs. The time range is identified by a name and can then be referenced by an ACL rule defined with in an ACL.

time-range

Use this command to create a time range identified by *name*, consisting of one absolute time entry and/or one or more periodic time entries. The *name* parameter is a case-sensitive, alphanumeric string from 1 to 31 characters that uniquely identifies the time range. An alpha-numeric string is defined as consisting of only alphabetic, numeric, dash, underscore, or space characters.

If a time range by this name already exists, this command enters Time-Range config mode to allow updating the time range entries

Note: When you successfully execute this command, the CLI mode changes to Time-Range Config mode.

.

Format	time-range *name*
Mode	Global Config

no time-range

This command deletes a time-range identified by *name*.

Format	no time-range *name*
Mode	Global Config

absolute

Use this command to add an absolute time entry to a time range. Only one absolute time entry is allowed per time-range. The *time* parameter is based on the currently configured time zone.

The `[start time date]` parameters indicate the time and date at which the configuration that referenced the time range starts going into effect. The time is expressed in a 24-hour clock, in the form of hours:minutes. For example, 8:00 is 8:00 am and 20:00 is 8:00 pm. The date is expressed in the format day month year. If no start time and date are specified, the configuration statement is in effect immediately.

The `[end time date]` parameters indicate the time and date at which the configuration that referenced the time range is no longer in effect. The end time and date must be after the start time and date. If no end time and date are specified, the configuration statement is in effect indefinitely.

Format	absolute [start *time date*] [end *time date*]

Mode	Time-Range Config

no absolute

This command deletes the absolute time entry in the time range.

Format	no absolute
Mode	Time-Range Config

periodic

Use this command to add a periodic time entry to a time range. The *time* parameter is based off of the currently configured time zone.

The first occurrence of the `days-of-the-week` argument is the starting day(s) from which the configuration that referenced the time range starts going into effect. The second occurrence is the ending day or days from which the configuration that referenced the time range is no longer in effect. If the end days-of-the-week are the same as the start, they can be omitted

This argument can be any single day or combinations of days: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday. Other possible values are:

- daily — Monday through Sunday
- weekdays — Monday through Friday
- weekend — Saturday and Sunday

If the ending days of the week are the same as the starting days of the week, they can be omitted.

The first occurrence of the `time` argument is the starting hours:minutes which the configuration that referenced the time range starts going into effect. The second occurrence is the ending hours:minutes at which the configuration that referenced the time range is no longer in effect.

The hours:minutes are expressed in a 24-hour clock. For example, 8:00 is 8:00 am and 20:00 is 8:00 pm.

Format	*periodic days-of-the-week time to time*
Mode	Time-Range Config

no periodic

This command deletes a periodic time entry from a time range

Format	*no periodic days-of-the-week time to time*
Mode	Time-Range Config

show time-range

Use this command to display a time range and all the absolute/periodic time entries that are defined for the time range. Use the `name` parameter to identify a specific time range to display. When `name` is not specified, all the time ranges defined in the system are displayed.

Format	show time-range [*name*]
Mode	Privileged EXEC

The information in the following table displays when no time range name is specified.

Parameter	Definition
Admin Mode	The administrative mode of the time range feature on the switch
Current number of all Time Ranges	The number of time ranges currently configured in the system.
Maximum number of all Time Ranges	The maximum number of time ranges that can be configured in the system.
Time Range Name	Name of the time range.
Status	Status of the time range (active/inactive)
Periodic Entry count	The number of periodic entries configured for the time range.
Absolute Entry	Indicates whether an absolute entry has been configured for the time range (Exists).

Chapter 10. IP Multicast Commands

This chapter describes the IP Multicast commands available in the CE0128XB/CE0152XB CLI.

Note: The commands in this chapter are in one of two functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.

Multicast Commands

This section describes the commands you use to configure IP Multicast and to view IP Multicast settings and statistics.

ip mcast boundary

This command adds an administrative scope multicast boundary specified by `groupipaddr` and `mask` for which this multicast administrative boundary is applicable. `groupipaddr` is a group IP address and `mask` is a group IP mask. This command can be used to configure a single interface or a range of interfaces.

Format	ip mcast boundary *groupipaddr mask*
Mode	Interface Config

no ip mcast boundary

This command deletes an administrative scope multicast boundary specified by `groupipaddr` and `mask` for which this multicast administrative boundary is applicable. `groupipaddr` is a group IP address and `mask` is a group IP mask.

Format	no ip mcast boundary *groupipaddr mask*
Mode	Interface Config

ip mroute

This command configures an IPv4 Multicast Static Route for a source.

Default	No MRoute is configured on the system.
Format	ip mroute *src-ip-addr src-mask rpf-addr preference*
Mode	Global Config

Parameter	Description
src-ip-addr	The IP address of the multicast source network.
src-mask	The IP mask of the multicast data source.
rpf-ip-addr	The IP address of the RPF next-hop router toward the source.

Parameter	Description
preference	The administrative distance for this Static MRoute, that is, the preference value. The range is 1 to 255.

no ip mroute

This command removes the configured IPv4 Multicast Static Route.

Format	no ip mroute *src-ip-addr*
Mode	Global Config

ip multicast

This command sets the administrative mode of the IP multicast forwarder in the router to active. This command also enables the administrative mode of IPv6 multicast routing.

Default	disabled
Format	ip multicast
Mode	Global Config

no ip multicast

This command sets the administrative mode of the IP multicast forwarder in the router to inactive.

Format	no ip multicast
Mode	Global Config

ip multicast ttl-threshold

This command is specific to IPv4. Use this command to apply the given Time-to-Live threshold value to a routing interface or range of interfaces. The `ttl-threshold` is the TTL threshold which is to be applied to the multicast Data packets which are to be forwarded from the interface. This command sets the Time-to-Live threshold value such that any data packets forwarded over the interface having TTL value above the configured value are dropped. The value for `ttl-threshold` ranges from 0 to 255.

Default	1
Format	ip multicast ttl-threshold *ttlvalue*
Mode	Interface Config

no ip multicast ttl-threshold

This command applies the default `ttl-threshold` to a routing interface. The `ttl-threshold` is the TTL threshold which is to be applied to the multicast Data packets which are to be forwarded from the interface.

Format	no ip multicast ttl-threshold

Mode Interface Config

show ip mcast

This command displays the system-wide multicast information.

Format show ip mcast

Modes
- Privileged EXEC
- User EXEC

Parameter	**Definition**
Admin Mode	The administrative status of multicast. Possible values are enabled or disabled.
Protocol State	The current state of the multicast protocol. Possible values are Operational or Non-Operational.
Table Max Size	The maximum number of entries allowed in the multicast table.
Protocol	The multicast protocol running on the router. Possible values are PIMDM, PIMSM, or DVMRP.
Multicast Forwarding Cache Entry Count	The number of entries in the multicast forwarding cache.

show ip mcast boundary

This command displays all the configured administrative scoped multicast boundaries. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Format show ip mcast boundary {*unit/slot/port*|vlan *1-4093*|all}

Modes
- Privileged EXEC
- User EXEC

Parameter	**Definition**
Interface	*unit/slot/port*
Group Ip	The group IP address.
Mask	The group IP mask.

show ip mcast interface

This command displays the multicast information for the specified interface. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Format show ip mcast interface {*unit/slot/port*|vlan *1-4093*}

Modes	- Privileged EXEC - User EXEC

Parameter	Definition
Interface	*unit/slot/port*
TTL	The time-to-live value for this interface.

show ip mroute

This command displays a summary or all the details of the multicast table.

Note: This command replaces the `show ip mcast mroute` command.

Format	show ip mroute {detail | summary | group *group-address* | source *source-address*}
Modes	- Privileged EXEC - User EXEC

If you use the `detail, group`, or `source` parameters in PIM Sparse mode, the command displays the following fields:

Parameter	Description
Flags	• F: Register flag. Indicates that the source connected router is sending registers to RP. This flag can be seen only on Designated Router connected to source. • T: SPT-bit set. Indicates that packets have been received on the shortest path source tree. • R: RP-bit set. Indicates that the (S, G) entry is pointing toward the RP. This flag typically indicates a prune state along the shared tree for a particular source.
Outgoing interface flags	• C: Connected. A member of the multicast group is directly connected to the interface. • J: Received PIM (*,G) Join on this interface.
Timers:Uptime/Expires	• Uptime: Indicates per interface how long (in hours, minutes, and seconds) the entry has been in the IP multicast routing table. • Expires: Indicates per interface how long (in seconds) until the entry will be removed from the IP multicast routing table
Counters	• Joins: Indicates the number of (*,G) or (S,G) joins received for the given entry. • Prunes: Indicates the number of (*,G) or (S,G) prunes received for the given entry. • Registers: Indicates the number of register messages received for the given (S,G) entry. • Register Stops: Indicates the number of register stop messages received for the given (S,G) entry.
RPF Address	IP address of the upstream router to the source.
Outgoing interface list	List of outgoing Interfaces.
Protocol	The current operating multicast routing protocol.
RP	Address of the RP router.
Incoming interface	Expected interface for a multicast packet from the source. If the packet is not received on this interface, it is discarded.

If you use the `detail` parameter in any mode other than PIM sparse mode, the command displays the following fields:

Parameter	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Expiry Time	The time of expiry of this entry in seconds.
Up Time	The time elapsed since the entry was created in seconds.
RPF Neighbor	The IP address of the RPF neighbor.
Flags	The flags associated with this entry.

If you use the `summary` parameter in PIM Sparse mode, the command displays the following fields:

Parameter	Description
Source IP	Source address of the multicast route entry.

Parameter	Description
Group IP	Group address of the multicast route entry.
Protocol	The current operating multicast routing protocol.
Incoming Interface	Expected interface for a multicast packet from the source. If the packet is not received on this interface, it is discarded.
Outgoing Interface List	List of outgoing Interfaces.

If you use the `summary` parameter, the command displays the following fields:

Parameter	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which the entry was created.
Incoming Interface	The interface on which the packet for the source/group arrives.
Outgoing Interface List	The list of outgoing interfaces on which the packet is forwarded.

Example: This example shows the output for the summary parameter in PIM Sparse mode.

```
(Routing) #show  ip mroute summary

               Multicast route table summary
                                   Incoming  Outgoing
Source IP      Group IP      Protocol   Interface Interface List
--------------- --------------- ---------- --------- ---------------
192.168.10.1   225.1.1.1      PIMSM     Vl10     Vl20, Vl30
```

Example: This example shows the output for the detail parameter in PIM Sparse mode.

```
IP Multicast Routing Table
Flags: C - Connected, J - Received Pim (*,G) Join,
R - RP-bit set, F - Register flag, T - SPT-bit set
Timers: Uptime/Expires    Protocol: PIMSM

( *,225.6.6.6)
00:00:41/000    RP: 1.1.1.1
Joins/Prunes: 0/0
Incoming interface:          RPF nbr: 0.0.0.0
Outgoing interface list:
4/1       00:00:41/218    Joins:        0    Flags:   C

( *,225.7.7.7)
00:00:36/000    RP: 1.1.1.1
Joins/Prunes: 0/0
Incoming interface:          RPF nbr: 0.0.0.0
Outgoing interface list:
4/1       00:00:36/224    Joins:        0    Flags:   C

(3.3.3.11,225.6.6.6)
00:00:51/158    Flags:   T
Joins/Prunes: 0/0    Reg/Reg-stop: 0/0
Incoming interface: 4/2       RPF nbr: 3.3.3.11
Outgoing interface list:
```

```
4/1       00:00:41/000    Joins:        0

(3.3.3.11,225.7.7.7)
00:17:42/201    Flags:   T
Joins/Prunes: 0/0    Reg/Reg-stop: 0/0
Incoming interface: 4/2       RPF nbr: 3.3.3.11
Outgoing interface list:
4/1       00:00:36/000    Joins:        0
```

Example: This example shows the output for the detail parameter in PIM Dense mode when a multicast routing protocol other than PIMSM is enabled.

```
(Routing) (Config)#show ip mroute detail

IP Multicast Routing Table
                         Expiry Time   Up Time
Source IP       Group IP        (hh:mm:ss)    (hh:mm:ss)    RPF Neighbor    Flags
--------------- --------------- ------------- ------------- --------------- -----
192.168.10.1    225.1.1.1       00:02:45      05:37:09      192.168.20.5    SPT
```

Example: This example shows IPv6 output for the detail parameter in PIM Sparse mode.

```
#show ipv6 mroute detail

IP Multicast Routing Table
Flags: C - Connected, J - Received Pim (*,G) Join,
R - RP-bit set, F - Register flag, T - SPT-bit set
Timers: Uptime/Expires    Protocol: PIMSM

( *,ff43::3)
00:00:41/000    RP: 2001::1
Joins/Prunes: 0/0
Incoming interface:          RPF nbr: ::
Outgoing interface list:
4/1       00:00:41/219    Joins:        0    Flags:   C

( *,ff24::6)
00:00:22/000    RP: 2001::1
Joins/Prunes: 0/0
Incoming interface:          RPF nbr: ::
Outgoing interface list:
4/1       00:00:41/219    Joins:        0    Flags:   C

(3001::10,ff43::3)
00:00:07/203    Flags:   T
Joins/Prunes: 0/0    Reg/Reg-stop: 0/0
Incoming interface: 4/2       RPF nbr: 3001::10
Outgoing interface list:
4/1       00:00:07/000    Joins:        0

(4001::33,ff22::3)
00:00:55/108    Flags:   T
Joins/Prunes: 0/0    Reg/Reg-stop: 0/0
Incoming interface: 4/1       RPF nbr: 3001::10
Outgoing interface list:
4/2       00:00:66/000    Joins:        0

(3001::10,ff43::3)
00:00:07/203    Flags:   T
Joins/Prunes: 0/0    Reg/Reg-stop: 0/0
Incoming interface: 4/1       RPF nbr: 3001::10
Outgoing interface list:
```

```
4/2        00:00:77/000    Joins:          0
```

Example: This example shows output for the group parameter in PIM Sparse mode.

```
(U16)# show ip mroute group 229.10.0.1
IP Multicast Routing Table

Flags: C - Connected,J - Received PIM (*,G) Join,
      R - RP-bit set, F - Register flag, T - SPT-bit set
Timers: Uptime(HH:MM:SS)/Expiry(SSS)
Protocol: PIMSM

(*, 229.10.0.1), 00:04:35/179, RP: 192.0.2.20
Joins/Prunes: 20/1
Incoming interface: Null, RPF Address: 0.0.0.0
Outgoing interface list:
   VLAN 6    00:00:30/150  Joins:15  Flags: C
   VLAN 5    00:04:35/150  Joins:10  Flags: C
   VLAN 2    00:01:28/0    Joins:20  Flags: J

(192.0.2.20, 229.10.0.1), 00:04:35/177, Flags: T
Joins/Prunes:20/1 , Reg/Reg-Stop:100/0
Incoming interface: VLAN 2, RPF Address: 0.0.0.0
Outgoing interface list:
   VLAN 5    00:03:25/0    Joins:20
   VLAN 6    00:00:10/0    Joins:5
```

Example: The following example shows output for the source parameter in PIM Sparse mode.

```
(U16)# show ip mroute source 192.0.2.20
IP Multicast Routing Table

Flags: C - Connected,J - Received PIM (*,G) Join,
      R - RP-bit set, F - Register flag, T - SPT-bit set
Timers: Uptime(HH:MM:SS)/Expiry(SSS)
Protocol: PIMSM

(192.0.2.20, 229.10.0.1), 00:04:35/177, Flags: T
Joins/Prunes:20/1 , Reg/Reg-Stop:100/0
Incoming interface: VLAN 2, RPF Address: 0.0.0.0
Outgoing interface list:
   VLAN 5    00:03:25/0    Joins:20
   VLAN 6    00:00:10/0    Joins:5
```

show ip mcast mroute group

This command displays the multicast configuration settings such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the given `groupipaddr`.

Format	show ip mcast mroute group *groupipaddr* {detail | summary}
Modes	- Privileged EXEC - User EXEC

Parameter	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.

Parameter	Definition
Protocol	The multicast routing protocol by which this entry was created.
Incoming Interface	The interface on which the packet for this group arrives.
Outgoing Interface List	The list of outgoing interfaces on which this packet is forwarded.

show ip mcast mroute source

This command displays the multicast configuration settings such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the given source IP address or source IP address and group IP address pair.

Format	show ip mcast mroute source *sourceipaddr* {summary | *groupipaddr*}
Modes	• Privileged EXEC • User EXEC

If you use the `groupipaddr` parameter, the command displays the following column headings in the output table:

Parameter	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Expiry Time	The time of expiry of this entry in seconds.
Up Time	The time elapsed since the entry was created in seconds.
RPF Neighbor	The IP address of the RPF neighbor.
Flags	The flags associated with this entry.

If you use the `summary` parameter, the command displays the following column headings in the output table:

Parameter	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which this entry was created.
Incoming Interface	The interface on which the packet for this source arrives.
Outgoing Interface List	The list of outgoing interfaces on which this packet is forwarded.

show ip mcast mroute static

Use the `show ip mcast mroute static` command in Privileged EXEC or User EXEC mode to display all the static routes configured in the static mcast table, if it is specified, or display the static route associated with the particular *sourceipaddr*.

Format show ip mcast mroute static [*sourceipaddr*]

Modes
- Privileged EXEC
- User EXEC

Parameter	Description
Source IP	IP address of the multicast source network.
Source Mask	The subnetwork mask pertaining to the sourceIP.
RPF Address	The IP address of the RPF next-hop router toward the source.
Preference	The administrative distance for this Static MRoute.

Example: The following shows example CLI display output for the command.

```
console#show ip mcast mroute static

               MULTICAST STATIC ROUTES
Source IP                                           Source Mask   RPF Address     Preference
--------------- --------------- --------------- ----------
1.1.1.1        255.255.255.0   2.2.2.2        23
```

clear ip mroute

This command deletes all or the specified IP multicast route entries.

Note: This command only clears dynamic mroute entries. It does not clear static mroutes.

Format clear ip mroute {*|group-address[source-address]}

Modes Privileged EXEC

Parameter	Description
*	Deletes all IPv4 entries from the IP multicast routing table.
group-address	IP address of the multicast group.
source-addres s	The IP address of a multicast source that is sending multicast traffic to the group.

Example: The following deletes all entries from the IP multicast routing table:

```
(Routing) # clear ip mroute *
```

Example: The following deletes all entries from the IP multicast routing table that match the given multicast group address (224.1.2.1), irrespective of which source is sending for this group:

```
(Routing) # clear ip mroute 224.1.2.1
```

Example: The following deletes all entries from the IP multicast routing table that match the given multicast group address (224.1.2.1) and the multicast source address (192.168.10.10):

```
(Routing) # clear ip mroute 224.1.2.1 192.168.10.10
```

DVMRP Commands

This section describes the Distance Vector Multicast Routing Protocol (DVMRP) commands.

ip dvmrp

This command sets administrative mode of DVMRP in the router to active.

Default	disabled
Format	ip dvmrp
Mode	Global Config

no ip dvmrp

This command sets administrative mode of DVMRP in the router to inactive.

Format	no ip dvmrp
Mode	Global Config

ip dvmrp trapflags

This command enables the DVMRP trap mode.

Default	disabled
Format	ip dvmrp trapflags
Mode	Global Config

no ip dvmrp trapflags

This command disables the DVMRP trap mode.

Format	no ip dvmrp trapflags
Mode	Global Config

ip dvmrp

This command sets the administrative mode of DVMRP on an interface or range of interfaces to active.

Default	disabled
Format	ip dvmrp
Mode	Interface Config

no ip dvmrp

This command sets the administrative mode of DVMRP on an interface to inactive.

Format	no ip dvmrp
Mode	Interface Config

show ip dvmrp

This command displays the system-wide information for DVMRP.

Format	show ip dvmrp
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Admin Mode	Indicates whether DVMRP is enabled or disabled.
Version String	The version of DVMRP being used.
Number of Routes	The number of routes in the DVMRP routing table.
Reachable Routes	The number of entries in the routing table with non-infinite metrics.

The following fields are displayed for each interface.

Field	Definition
Interface	*unit/slot/port*
Interface Mode	The mode of this interface. Possible values are Enabled and Disabled.
State	The current state of DVMRP on this interface. Possible values are Operational or Non-Operational.

show ip dvmrp interface

This command displays the interface information for DVMRP on the specified interface. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Format	show ip dvmrp interface {*unit/slot/port*|*vlan 1-4093*}
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Interface Mode	Indicates whether DVMRP is enabled or disabled on the specified interface.
Metric	The metric of this interface. This is a configured value.
Local Address	The IP address of the interface.

The following field is displayed only when DVMRP is operational on the interface.

Parameter	Definition
Generation ID	The Generation ID value for the interface. This is used by the neighboring routers to detect that the DVMRP table should be resent.

The following fields are displayed only if DVMRP is enabled on this interface.

Parameter	Definition
Received Bad Packets	The number of invalid packets received.
Received Bad Routes	The number of invalid routes received.
Sent Routes	The number of routes that have been sent on this interface.

show ip dvmrp neighbor

This command displays the neighbor information for DVMRP.

Format	show ip dvmrp neighbor
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
IfIndex	The value of the interface used to reach the neighbor.
Nbr IP Addr	The IP address of the DVMRP neighbor for which this entry contains information.
State	The state of the neighboring router. The possible value for this field are ACTIVE or DOWN.
Up Time	The time since this neighboring router was learned.
Expiry Time	The time remaining for the neighbor to age out. This field is not applicable if the State is DOWN.
Generation ID	The Generation ID value for the neighbor.
Major Version	The major version of DVMRP protocol of neighbor.
Minor Version	The minor version of DVMRP protocol of neighbor.
Capabilities	The capabilities of neighbor.
Received Routes	The number of routes received from the neighbor.
Rcvd Bad Pkts	The number of invalid packets received from this neighbor.
Rcvd Bad Routes	The number of correct packets received with invalid routes.

show ip dvmrp nexthop

This command displays the next hop information on outgoing interfaces for routing multicast datagrams.

Format	show ip dvmrp nexthop
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Source IP	The sources for which this entry specifies a next hop on an outgoing interface.
Source Mask	The IP Mask for the sources for which this entry specifies a next hop on an outgoing interface.

Parameter	Definition
Next Hop Interface	The interface in `unit/slot/port` format for the outgoing interface for this next hop.
Type	The network is a LEAF or a BRANCH.

show ip dvmrp prune

This command displays the table listing the router's upstream prune information.

Format	show ip dvmrp prune
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Group IP	The multicast Address that is pruned.
Source IP	The IP address of the source that has pruned.
Source Mask	The network Mask for the prune source. It should be all 1s or both the prune source and prune mask must match.
Expiry Time (secs)	The expiry time in seconds. This is the time remaining for this prune to age out.

show ip dvmrp route

This command displays the multicast routing information for DVMRP.

Format	show ip dvmrp route
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Source Address	The multicast address of the source group.
Source Mask	The IP Mask for the source group.
Upstream Neighbor	The IP address of the neighbor which is the source for the packets for a specified multicast address.
Interface	The interface used to receive the packets sent by the sources.
Metric	The distance in hops to the source subnet. This field has a different meaning than the Interface Metric field.
Expiry Time (secs)	The expiry time in seconds, which is the time left for this route to age out.
Up Time (secs)	The time when a specified route was learned, in seconds.

PIM Commands

This section describes the commands you use to configure Protocol Independent Multicast -Dense Mode (PIM-DM) and Protocol Independent Multicast - Sparse Mode (PIM-SM). PIM-DM and PIM-SM are multicast routing protocols that provides scalable inter-domain multicast routing across the Internet, independent of the mechanisms provided by any particular unicast routing protocol. Only one PIM mode can be operational at a time.

ip pim dense

This command administratively enables the PIM Dense mode across the router.

Default	disabled
Format	ip pim dense
Mode	Global Config

Example: The following shows an example of the command.

```
(Routing)(Config) #ip pim dense
```

no ip pim dense

This command administratively disables the PIM Dense mode across the router.

Format	no ip pim dense
Mode	Global Config

ip pim sparse

This command administratively enables the PIM Sparse mode across the router.

Default	disabled
Format	ip pim sparse
Mode	Global Config

Example: The following shows an example of the command.

```
(Routing) (Config) #ip pim sparse
```

no ip pim sparse

This command administratively disables the PIM Sparse mode across the router.

Format	no ip pim sparse
Mode	Global Config

ip pim

Use this command to administratively enable PIM on the specified interface.

Default	disabled
Format	ip pim
Mode	Interface Config

Example: The following shows example CLI display output for the command.

```
(Routing)(Interface 1/0/1) #ip pim
```

no ip pim

Use this command to disable PIM on the specified interface.

Format	no ip pim
Mode	Interface Config

ip pim hello-interval

This command configures the transmission frequency of PIM hello messages the specified interface. This field has a range of 0 to 18000 seconds.

Default	30
Format	ip pim hello-interval *seconds*
Mode	Interface Config

Example: The following shows an example of the command.

```
(Routing)(Interface 1/0/1) #ip pim hello-interval 50
```

no ip pim hello-interval

This command resets the transmission frequency of hello messages between PIM enabled neighbors to the default value.

Format	no ip pim hello-interval
Mode	Interface Config

ip pim bsr-border

Use this command to prevent bootstrap router (BSR) messages from being sent or received on the specified interface.

Note: This command takes effect only when Sparse mode in enabled in the Global mode.

Default	disabled
Format	ip pim bsr-border
Mode	Interface Config

Example: The following shows an example of the command.

```
(Routing)(Interface 1/0/1) #ip pim bsr-border
```

no ip pim bsr-border

Use this command to disable the specified interface from being the BSR border.

Format	no ip pim bsr-border
Mode	Interface Config

ip pim bsr-candidate

This command is used to configure the router to announce its candidacy as a bootstrap router (BSR). The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Note: This command takes effect only when PIM-SM is configured as the PIM mode.

Default	disabled
Format	ip pim bsr-candidate interface {*unit/slot/port|vlan 1-4093} hash-mask-length [bsr-priority] [interval interval]*
Mode	Global Config

Parameters	Description
unit/slot/port	Interface number on this router from which the BSR address is derived, to make it a candidate. This interface must be enabled with PIM.
hash-mask-length	Length of a mask (32 bits maximum) that is to be ANDed with the group address before the hash function is called. All groups with the same seed hash correspond to the same RP. For example, if this value is 24, only the first 24 bits of the group addresses matter. This allows you to get one RP for multiple groups.
bsr-priority	Priority of the candidate BSR. The range is an integer from 0 to 255. The BSR with the larger priority is preferred. If the priority values are the same, the router with the larger IP address is the BSR. The default value is 0.
interval	[Optional] Indicates the BSR candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.

Example: The following shows examples of the command.

```
(Routing)(Config) #ip pim bsr-candidate interface 1/0/1 32 5
(Routing)(Config) #ip pim bsr-candidate interface 1/0/1 32 5 interval 100
```

no ip pim bsr-candidate

Use this command to remove the configured PIM Candidate BSR router.

Format	no ip pim bsr-candidate interface {*unit/slot/port|vlan 1-4093}*
Mode	Global Config

ip pim dr-priority

Use this command to set the priority value for which a router is elected as the designated router (DR).

Note: This command takes effect only when Sparse mode is enabled in the Global mode.

Default	1
Format	ip pim dr-priority *0-2147483647*
Mode	Interface Config

Example: The following shows example CLI display output for the command.

```
(Routing)(Interface 1/0/1) #ip pim dr-priority 10
```

no ip pim dr-priority

Use this command to return the DR Priority on the specified interface to its default value.

Format	no ip pim dr-priority
Mode	Interface Config

ip pim join-prune-interval

Use this command to configure the frequency of PIM Join/Prune messages on a specified interface. The join/prune interval is specified in seconds. This parameter can be configured to a value from 0 to 18000.

Note: This command takes effect only when is configured as the PIM mode.

Default	60
Format	ip pim join-prune-interval *0-18000*
Mode	Interface Config

Example: The following shows examples of the command.

```
(Routing)(Interface 1/0/1) #ip pim join-prune-interval 90
```

no ip pim join-prune-interval

Use this command to set the join/prune interval on the specified interface to the default value.

Format	no ip pim join-prune-interval
Mode	Interface Config

ip pim rp-address

This command defines the address of a PIM Rendezvous point (RP) for a specific multicast group range.

Note: This command takes effect only when PIM-SM is configured as the PIM mode.

Default	0
Format	ip pim rp-address *rp-address group-address group-mask* [override]

Mode Global Config

Parameter	Description
rp-address	The IP address of the RP.
group-address	The group address supported by the RP.
group-mask	The group mask for the group address.
override	[Optional] Indicates that if there is a conflict, the RP configured with this command prevails over the RP learned by BSR.

Example: The following shows an example of the command.

```
(Routing)(Config) #ip pim rp-address 192.168.10.1
  224.1.2.0 255.255.255.0
```

no ip pim rp-address

Use this command to remove the address of the configured PIM Rendezvous point (RP) for the specified multicast group range.

Format no ip pim rp-address *rp-address group-address group-mask* [override]

Mode Global Config

ip pim rp-candidate

Use this command to configure the router to advertise itself as a PIM candidate rendezvous point (RP) to the bootstrap router (BSR) for a specific multicast group range. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Note: This command takes effect only when PIM-SM is configured as the PIM mode.

Default disabled

Format ip pim rp-candidate interface {*unit/slot/port|vlan 1-4093} group-address group-mask [interval interval]*

Mode Global Config

Parameter	Description
unit/slot/port	The IP address associated with this interface type and number is advertised as a candidate RP address. This interface must be enabled with PIM.
group-address	The multicast group address that is advertised in association with the RP address.
group-mask	The multicast group prefix that is advertised in association with the RP address.
interval	[Optional] Indicates the RP candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.

Example: The following shows examples of the command.

```
(Routing)(Config) #ip pim rp-candidate interface 1/0/1 224.1.2.0 255.255.255.0
(Routing)(Config) #ip pim rp-candidate interface 1/0/1 224.1.2.0 255.255.255.0 interval 200
```

no ip pim rp-candidate

Use this command to remove the configured PIM candidate Rendezvous point (RP) for a specific multicast group range.

Format	no ip pim rp-candidate interface {*unit/slot/port*|*vlan 1-4093}* *group-address group-mask*
Mode	Global Config

ip pim ssm

Use this command to define the Source Specific Multicast (SSM) range of IP multicast addresses on the router.

Note: This command takes effect only when PIM-SM is configured as the PIM mode.

Default	disabled
Format	ip pim ssm {default | *group-address group-mask*}
Mode	Global Config

Parameter	Description
default-range	Defines the SSM range access list to 232/8.

Example: The following shows an example of the command.

```
(Routing)(Config) #ip pim ssm default
(Routing)(Config) #ip pim ssm 232.1.2.0 255.255.255.0
```

no ip pim ssm

Use this command to remove the Source Specific Multicast (SSM) range of IP multicast addresses on the router.

Format	no ip pim ssm {default | *group-address group-mask*}
Mode	Global Config

ip pim-trapflags

This command enables the PIM trap mode for both Sparse Mode (SM) and Dense Mode. (DM).

Default	disabled
Format	ip pim-trapflags
Mode	Global Config

no ip pim-trapflags

This command sets the PIM trap mode to the default.

Format	no ip pim-trapflags
Mode	Global Config

ip pim spt-threshold

Use this command to configure the Data Threshold rate for the last-hop router to switch to the shortest path on the router. The rate is specified in Kilobits per second. The possible values are 0 to 2000.

Note: Some CE0128XB/CE0152XB platforms do not support a non-zero data threshold rate. For these platforms, only a *Switch on First Packet* policy is supported.

Note: This command takes effect only when PIM-SM is configured as the PIM mode.

Default	0
Format	ip pim spt-threshold *0-2000*
Modes	Global Config

Example: The following shows an example of the command.

```
((Routing)) (Config) #ip pim spt-threshold 100
```

no ip pim spt-threshold

This command is used to set the data threshold rate for the RP router to the default value.

Format	no ip pim-spt-threshold
Mode	Global Config

show ip mfc

This command displays mroute entries in the multicast forwarding (MFC) database.

Format	show ip mfc
Modes	• Privileged EXEC • User EXEC

Terms	Parameters
MFC IPv4 Mode	Enabled when IPv4 Multicast routing is operational.
MFC IPv6 Mode	Enabled when IPv6 Multicast routing is operational.
MFC Entry Count	The number of entries present in MFC.
Current multicast IPv4 Protocol	The current operating IPv4 multicast routing protocol.
Current multicast IPv6 Protocol	The current operating multicast IPv6 routing protocol.
Total Software Forwarded packets	Total Number of multicast packets forwarded in software.
Source Address	Source address of the multicast route entry.
Group Address	Group address of the multicast route entry.

Terms	Parameters
Packets Forwarded in Softwareforthisentry	Number of multicast packets that are forwarded in software for a specific multicast route entry,
Protocol	Multicast Routing Protocol that has added a specific entry
Expiry Time (secs)	Expiry time for a specific Multicast Route entry in seconds.
Up Time (secs)	Up Time in seconds for a specific Multicast Routing entry.
Incoming interface	Incoming interface for a specific Multicast Route entry.
Outgoing interface list	Outgoing interface list for a specific Multicast Route entry.

Example:

```
(Routing) (Config)#show ip mfc

MFC IPv4 Mode................................. Enabled
MFC IPv6 Mode................................. Disabled
MFC Entry Count .............................. 1
Current multicast IPv4 protocol................ PIMSM
Current multicast IPv6 protocol................ No protocol enabled.
Total software forwarded packets ............. 0

Source address: 192.168.10.5
Group address: 225.1.1.1
Packets forwarded in software for this entry: 0          Protocol: PIM-SM
Expiry Time (secs): 206       Up Time (secs): 4
Incoming interface: 1/0/10    Outgoing interface list: None
```

show ip pim

This command displays the system-wide information for PIM-DM or PIM-SM.

Format	show ip pim
Modes	• Privileged EXEC • User EXEC

Note: If the PIM mode is PIM-DM (dense), some of the fields in the following table do not display in the command output because they are applicable only to PIM-SM.

Parameter	Definition
PIM Mode	Indicates the configured mode of the PIM protocol as dense (PIM-DM) or sparse (PIM-SM)
Interface	*unit/slot/port*
Interface Mode	Indicates whether PIM is enabled or disabled on this interface.
Operational Status	The current state of PIM on this interface: Operational or Non-Operational.

Example: The following shows example CLI display output for the command.

Example #1: PIM Mode - Dense

```
(Routing)#show ip pim

PIM Mode                                                    Dense

Interface                                                   Interface-ModeOperational-Status
```

```
---------   --------------    ------------------
1/0/1       Enabled           Operational
1/0/3       Disabled          Non-Operational
```

Example #2: PIM Mode - Sparse

```
(Routing)#show ip pim

PIM Mode                                     Sparse

Interface                                    Interface-ModeOperational-Status
---------   --------------    ------------------
1/0/1       Enabled           Operational
1/0/3       Disabled          Non-Operational
```

Example #3: PIM Mode - None

```
(Routing)#show ip pim

PIM Mode                                     None

None of the routing interfaces are enabled for PIM.
```

show ip pim ssm

This command displays the configured source specific IP multicast addresses. If no SSM Group range is configured, this command output is `No SSM address range is configured`.

Format show ip pim ssm

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Group Address	The IP multicast address of the SSM group.
Prefix Length	The network prefix length.

Example: The following shows example CLI display output for the command.

```
(Routing)#show ip pim ssm

Group Address/Prefix Length
----------------------------
232.0.0.0/8
```

If no SSM Group range is configured, this command displays the following message:

```
No SSM address range is configured.
```

show ip pim interface

This command displays the PIM interface status parameters. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format. If no interface is specified, the command displays the status parameters of all PIM-enabled interfaces.

Format	show ip pim interface [*unit/slot/port*|*vlan 1-4093}*]
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	*unit/slot/port The interface number.*
Mode	Indicates the active PIM mode enabled on the interface is dense or sparse.
Hello Interval	The frequency at which PIM hello messages are transmitted on this interface. By default, the value is 30 seconds.
Join Prune Interval	The join/prune interval value for the PIM router. The interval is in seconds.
DR Priority	The priority of the Designated Router configured on the interface. This field is not applicable if the interface mode is Dense.
BSR Border	Identifies whether this interface is configured as a bootstrap router border interface.
Neighbor Count	The number of PIM neighbors learned on this interface. This is a dynamic value and is shown only when a PIM interface is operational.
Designated Router	The IP address of the elected Designated Router for this interface. This is a dynamic value and will only be shown when a PIM interface is operational. This field is not applicable if the interface mode is Dense.

Example: The following shows example CLI display output for the command.

```
(Routing)#show ip pim interface

Interface........................................1/0/1
 Mode...........................................Sparse
 Hello Interval (secs)..........................          30
 Join Prune Interval (secs)......................60
 DR Priority                                              .....................................1
 BSR Border                                               ......................................Disabled
 Neighbor Count                                           ..................................1
 Designated Router..............................          192.168.10.1

Interface..................................               ......1/0/2
 Mode...........................................          Sparse
 Hello Interval (secs)                                    ...........................30
 Join Prune Interval (secs).....................          60
 DR Priority                                              .....................................1
 BSR Border                                               ......................................Disabled
 Neighbor Count                                           ..................................1
 Designated Router..............................          192.168.10.1
```

If none of the interfaces are enabled for PIM, the following message is displayed:

```
None of the routing interfaces are enabled for PIM.
```

show ip pim neighbor

This command displays PIM neighbors discovered by PIMv2 Hello messages. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format. If the interface number is not specified, the command displays the status parameters of all PIM-enabled interfaces.

Format	show ip pim neighbor [{*unit/slot/port* | *vlan 1-4093*}]
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Neighbor Address	The IP address of the PIM neighbor on an interface.
Interface	*unit/slot/port*
Up Time	The time since this neighbor has become active on this interface.
Expiry Time	Time remaining for the neighbor to expire.
DR Priority	The DR Priority configured on this Interface (PIM-SM only). **NOTE:** DR Priority is applicable only when sparse-mode configured routers are neighbors. Otherwise, NA is displayed in this field. **NOTE:** DR indicates that the neighbor is the PIM Designated Router in that subnet.

Example: The following shows example CLI display output for the command.

```
(Routing)#show ip pim neighbor 1/0/1

Neighbor Addr   Interface Uptime      Expiry Time DR
                (hh:mm:ss) (hh:mm:ss)   Priority
--------------- --------- ----------- ----------- --------
192.168.10.2    1/0/1     00:02:55     00:01:15   10 (DR)


(Routing)#show ip pim neighbor

Neighbor Addr   Interface  Uptime      Expiry Time DR
                 (hh:mm:ss) (hh:mm:ss)   Priority
--------------- ---------  ----------- ----------- --------
192.168.10.2    1/0/1      00:02:55     00:01:15   10 (DR)
192.168.20.2    1/0/2      00:03:50     00:02:10   1
```

If no neighbors have been learned on any of the interfaces, the following message is displayed:

```
No neighbors exist on the router.
```

show ip pim bsr-router

This command displays the bootstrap router (BSR) information.

Format	show ip pim bsr-router {candidate | elected}
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
BSR Address	IP address of the BSR.
BSR Priority	Priority as configured in the `ip pim bsr-candidate` command.
BSR Hash Mask Length	Length of a mask (maximum 32 bits) that is to be ANDed with the group address before the hash function is called. This value is configured in the `ip pim bsr-candidate` command.
C-BSR Advertisement Interval	Indicates the configured C-BSR Advertisement interval with which the router, acting as a C-BSR, will periodically send the C-BSR advertisement messages.
Next Bootstrap Message	Time (in hours, minutes, and seconds) in which the next bootstrap message is due from this BSR.

Example: The following shows example CLI display output for the command.

Example #1:

```
(Routing)#show ip pim bsr-router elected

BSR Address.................................. 192.168.10.1
  BSR Priority............................... 0
  BSR Hash Mask Length....................... 30
  Next Bootstrap message (hh:mm:ss).......... 00:00:24
```

Example #2:

```
(Routing)#show ip pim bsr-router candidate

BSR Address.................................. 192.168.10.1
  BSR Priority............................... 0
  BSR Hash Mask Length....................... 30
  C-BSR Advertisement Interval (secs)........ 60
  Next Bootstrap message (hh:mm:ss).......... NA
```

If no configured or elected BSRs exist on the router, the following message is displayed:

```
No BSR's exist/learned on this router.
```

show ip pim rp-hash

This command displays the rendezvous point (RP) selected for the specified group address.

Format	show ip pim rp-hash *group-address*
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
RP Address	The IP address of the RP for the group specified.
Type	Indicates the mechanism (BSR or static) by which the RP was selected.

Example: The following shows example CLI display output for the command.

```
(Routing)#show ip pim rp-hash 224.1.2.0

RP Address                                  192.168.10.1
  Type                                      Static
```

If no RP Group mapping exist on the router, the following message is displayed:

```
No RP-Group mappings exist/learned on this router.
```

show ip pim rp mapping

Use this command to display the mapping for the PIM group to the active Rendezvous points (RP) of which the router is a aware (either configured or learned from the bootstrap router (BSR)). Use the optional parameters to limit the display to a specific RP address or to view group-to-candidate RP or group to Static RP mapping information.

.

Format show ip pim rp mapping [{*rp-address*|candidate|static}]

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
RP Address	The IP address of the RP for the group specified.
Group Address	The IP address of the multicast group.
Group Mask	The subnet mask associated with the group.
Origin	Indicates the mechanism (BSR or static) by which the RP was selected.
C-RP Advertisement Interval	Indicates the configured C-RP Advertisement interval with which the router acting as a Candidate RP will periodically send the C-RP advertisement messages to the elected BSR.

Example: The following show examples of CLI display output for the command.

Example #1:

```
(Routing)#show ip pim rp mapping 192.168.10.1

RP Address                                    192.168.10.1
  Group Address                               224.1.2.1
  Group Mask                                  255.255.255.0
  Origin                                      Static
```

Example #2:

```
(Routing)#show ip pim rp mapping

RP Address                                    192.168.10.1
  Group Address                               224.1.2.1
  Group Mask                                  255.255.255.0
  Origin                                      Static

RP Address                                    192.168.20.1
  Group Address                               229.2.0.0
  Group Mask                                  255.255.0.0
  Origin                                      Static
```

Example #3:

```
(Routing)# show ip pim rp mapping candidate

RP Address.................................... 192.168.10.1
  Group Address.............................. 224.1.2.1
  Group Mask................................. 255.255.0.0
```

```
Origin.................................... BSR
C-RP Advertisement Interval (secs)......... 60
Next Candidate RP Advertisement (hh:mm:ss). 00:00:15
```

If no RP Group mapping exist on the router, the following message is displayed:

```
No RP-Group mappings exist on this router.
```

show ip pim statistics

This command displays statistics for the received PIM control packets per interface. This command displays statistics only if PIM sparse mode is enabled.

.

Format show ip pim statistics

Modes
- Privileged EXEC
- User EXEC

The following information is displayed.

Parameters	Description
Stat	RX: Packets received Tx: Packets transmitted
Interface	The PIM-enabled routing interface
Hello	The number of PIM Hello messages
Register	The number of PIM Register messages
Reg-Stop	The number of PIM Register-stop messages
Join/Pru	The number of PIM Join/Prune messages
BSR	The number of PIM Boot Strap messages
Assert	The number of PIM Assert messages
CRP	The number of PIM Candidate RP Advertisement messages.

Example:

Example 1:

```
(Routing) #show ip pim statistics
=====================================================================
Interface  Stat   Hello Register Reg-Stop Join/Pru  BSR  Assert  CRP
=====================================================================
Vl10       Rx      0       0       0       0    0    0    0
           Tx      2       0       0       0    0    0    0

    Invalid Packets Received - 0
---------------------------------------------------------------------
Vl20       Rx      0       0       0       5    0    0    0
           Tx      8       7       0       0    0    0    0

    Invalid Packets Received - 0
---------------------------------------------------------------------
1/0/5      Rx      0       0       6       5    0    0    0
           Tx      10      9       0       0    0    0    0

    Invalid Packets Received - 0
---------------------------------------------------------------------
```

Example 2:

```
(Routing) #show ip pim statistics vlan 10
=====================================================================
Interface  Stat   Hello Register Reg-Stop Join/Pru  BSR  Assert  CRP
=====================================================================
Vl10       Rx      0       0       0       0    0    0    0
           Tx      2       0       0       0    0    0    0

    Invalid Packets Received - 0
---------------------------------------------------------------------
```

Example 3:

```
(Routing) #show ip pim statistics 1/0/5
=====================================================================
Interface  Stat   Hello Register Reg-Stop Join/Pru  BSR  Assert  CRP
=====================================================================
1/0/5      Rx      0       0       6       5    0    0    0
           Tx      10      9       0       0    0    0    0

    Invalid Packets Received - 0
```

Note: For ipv6 statistics, use the key word ipv6.

Internet Group Message Protocol Commands

This section describes the commands you use to view and configure Internet Group Message Protocol (IGMP) settings.

ip igmp

This command sets the administrative mode of IGMP in the system to active on an interface, range of interfaces, or on all interfaces.

Default	disabled
Format	ip igmp
Modes	• Global Config • Interface Config

no ip igmp

This command sets the administrative mode of IGMP in the system to inactive.

Format	no ip igmp
Modes	• Global Config • Interface Config

ip igmp header-validation

Use this command to enable header validation for IGMP messages.

Default	disabled
Format	ip igmp header-validation
Mode	Global Config

no ip igmp header-validation

This command disables header validation for IGMP messages.

Format	no ip igmp header-validation
Mode	Global Config

ip igmp version

This command configures the version of IGMP for an interface or range of interfaces. The value for `version` is either 1, 2 or 3.

Default	3
Format	ip igmp version *version*
Modes	Interface Config

no ip igmp version

This command resets the version of IGMP to the default value.

Format	no ip igmp version
Modes	Interface Config

ip igmp last-member-query-count

This command sets the number of Group-Specific Queries sent by the interface or range of interfaces before the router assumes that there are no local members on the interface. The range for `count` is 1 to 20.

Format	ip igmp last-member-query-count *count*
Modes	Interface Config

no ip igmp last-member-query-count

This command resets the number of Group-Specific Queries to the default value.

Format	no ip igmp last-member-query-count
Modes	Interface Config

ip igmp last-member-query-interval

This command configures the Maximum Response Time inserted in Group-Specific Queries which are sent in response to Leave Group messages. The range for `seconds` is 0 to 255 tenths of a second. This value can be configured on one interface or a range of interfaces

Default	10 tenths of a second (1 second)
Format	ip igmp last-member-query-interval *seconds*
Modes	Interface Config

no ip igmp last-member-query-interval

This command resets the Maximum Response Time to the default value.

Format	no ip igmp last-member-query-interval
Modes	Interface Config

ip igmp query-interval

This command configures the query interval for the specified interface or range of interfaces. The query interval determines how fast IGMP Host-Query packets are transmitted on this interface. The range for `query-interval` is 1 to 3600 seconds.

Default	125 seconds
Format	ip igmp query-interval *seconds*
Modes	Interface Config

no ip igmp query-interval

This command resets the query interval for the specified interface to the default value. This is the frequency at which IGMP Host-Query packets are transmitted on this interface.

Format	no ip igmp query-interval
Modes	Interface Config

ip igmp query-max-response-time

This command configures the maximum response time interval for the specified interface or range of interfaces, which is the maximum query response time advertised in IGMPv2 queries on this interface.The time interval is specified in tenths of a second. The range for `gmp query-max-response-time` is 0 to 255 tenths of a second.

Default	100
Format	ip igmp query-max-response-time *0-255*
Mode	Interface Config

no ip igmp query-max-response-time

This command resets the maximum response time interval for the specified interface, which is the maximum query response time advertised in IGMPv2 queries on this interface to the default value. The maximum response time interval is reset to the default time.

Format	no ip igmp query-max-response-time
Mode	Interface Config

ip igmp robustness

This command configures the robustness that allows tuning of the interface or range of interfaces. The robustness is the tuning for the expected packet loss on a subnet. If a subnet is expected to have a lot of loss, the Robustness variable may be increased for the interface. The range for *`robustness`* is 1 to 255.

Default	2
Format	ip igmp robustness *1-255*
Mode	Interface Config

no ip igmp robustness

This command sets the robustness value to default.

Format	no ip igmp robustness
Mode	Interface Config

ip igmp startup-query-count

This command sets the number of Queries sent out on startup, separated by the Startup Query Interval on the interface or range of interfaces. The range for `count` is 1 to 20.

Default	2
Format	ip igmp startup-query-count *1-20*
Mode	Interface Config

no ip igmp startup-query-count

This command resets the number of Queries sent out on startup, separated by the Startup Query Interval on the interface to the default value.

Format	no ip igmp startup-query-count
Mode	Interface Config

ip igmp startup-query-interval

This command sets the interval between General Queries sent on startup on the interface or range of interfaces. The time interval value is in seconds. The range for `interval` is 1 to 300 seconds.

Default	31
Format	ip igmp startup-query-interval *1-300*
Mode	Interface Config

no ip igmp startup-query-interval

This command resets the interval between General Queries sent on startup on the interface to the default value.

Format	no ip igmp startup-query-interval
Mode	Interface Config

show ip igmp

This command displays the system-wide IGMP information.

Format	show ip igmp
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
IGMP Admin Mode	The administrative status of IGMP. This is a configured value.
Interface	*unit/slot/port*
Interface Mode	Indicates whether IGMP is enabled or disabled on the interface. This is a configured value.

Parameter	Definition
Protocol State	The current state of IGMP on this interface. Possible values are Operational or Non-Operational.

show ip igmp groups

This command displays the registered multicast groups on the interface. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format. If `[detail]` is specified this command displays the registered multicast groups on the interface in detail.

Format	show ip igmp groups {*unit/slot/port*|*vlan 1-4093* [detail]}
Mode	Privileged EXEC

If you do not use the `detail` keyword, the following fields appear:

Field	Definition
IP Address	The IP address of the interface participating in the multicast group.
Subnet Mask	The subnet mask of the interface participating in the multicast group.
Interface Mode	This displays whether IGMP is enabled or disabled on this interface.

The following fields are not displayed if the interface is not enabled:

Field	Definition
Querier Status	This displays whether the interface has IGMP in Querier mode or Non-Querier mode.
Groups	The list of multicast groups that are registered on this interface.

If you use the `detail` keyword, the following fields appear:

Field	Definition
Multicast IP Address	The IP address of the registered multicast group on this interface.
Last Reporter	The IP address of the source of the last membership report received for the specified multicast group address on this interface.
Up Time	The time elapsed since the entry was created for the specified multicast group address on this interface.
Expiry Time	The amount of time remaining to remove this entry before it is aged out.
Version1 Host Timer	The time remaining until the local router assumes that there are no longer any IGMP version 1 multicast members on the IP subnet attached to this interface. This could be an integer value or “-----” if there is no Version 1 host present.
Version2 Host Timer	The time remaining until the local router assumes that there are no longer any IGMP version 2 multicast members on the IP subnet attached to this interface. This could be an integer value or “-----” if there is no Version 2 host present.
Group Compatibility Mode	The group compatibility mode (v1, v2 or v3) for this group on the specified interface.

show ip igmp interface

This command displays the IGMP information for the interface. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Format	show ip igmp interface {*unit/slot/port* | *vlan 1-4093}*
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	*unit/slot/port*
IGMP Admin Mode	The administrative status of IGMP.
Interface Mode	Indicates whether IGMP is enabled or disabled on the interface.
IGMP Version	The version of IGMP running on the interface. This value can be configured to create a router capable of running either IGMP version 1 or 2.
Query Interval	The frequency at which IGMP Host-Query packets are transmitted on this interface.
Query Max Response Time	The maximum query response time advertised in IGMPv2 queries on this interface.
Robustness	The tuning for the expected packet loss on a subnet. If a subnet is expected to be have a lot of loss, the Robustness variable may be increased for that interface.
Startup Query Interval	The interval between General Queries sent by a Querier on startup.
Startup Query Count	The number of Queries sent out on startup, separated by the Startup Query Interval.
Last Member Query Interval	The Maximum Response Time inserted into Group-Specific Queries sent in response to Leave Group messages.
Last Member Query Count	The number of Group-Specific Queries sent before the router assumes that there are no local members.

show ip igmp interface membership

This command displays the list of interfaces that have registered in the multicast group.

Format	show ip igmp interface membership *multiipaddr* [detail]
Mode	Privileged EXEC

Parameter	Definition
Interface	Valid unit, slot and port number separated by forward slashes.
Interface IP	The IP address of the interface participating in the multicast group.
State	The interface that has IGMP in Querier mode or Non-Querier mode.
Group Compatibility Mode	The group compatibility mode (v1, v2 or v3) for the specified group on this interface.

Parameter	Definition
Source Filter Mode	The source filter mode (Include/Exclude) for the specified group on this interface. This is “-----” for IGMPv1 and IGMPv2 Membership Reports.

If you use the `detail` keyword, the following fields appear:

Parameter	Definition
Interface	Valid unit, slot and port number separated by forward slashes.
Group Compatibility Mode	The group compatibility mode (v1, v2 or v3) for the specified group on this interface.
Source Filter Mode	The source filter mode (Include/Exclude) for the specified group on this interface. This is “-----” for IGMPv1 and IGMPv2 Membership Reports.
Source Hosts	The list of unicast source IP addresses in the group record of the IGMPv3 Membership Report with the specified multicast group IP address. This is “-----” for IGMPv1 and IGMPv2 Membership Reports.
Expiry Time	The amount of time remaining to remove this entry before it is aged out. This is “-----” for IGMPv1 and IGMPv2 Membership Reports.

show ip igmp interface stats

This command displays the IGMP statistical information for the interface. The statistics are only displayed when the interface is enabled for IGMP. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Format	show ip igmp interface stats [*unit/slot/port*|*vlan 1-4093]*
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Querier Status	The status of the IGMP router, whether it is running in Querier mode or Non-Querier mode.
Querier IP Address	The IP address of the IGMP Querier on the IP subnet to which this interface is attached.
Querier Up Time	The time since the interface Querier was last changed.
Querier Expiry Time	The amount of time remaining before the Other Querier Present Timer expires. If the local system is the querier, the value of this object is zero.
Wrong Version Queries	The number of queries received whose IGMP version does not match the IGMP version of the interface.
Number of Joins	The number of times a group membership has been added on this interface.
Number of Groups	The current number of membership entries for this interface.

IGMP Proxy Commands

The IGMP Proxy is used by IGMP Router (IPv4 system) to enable the system to issue IGMP host messages on behalf of hosts that the system discovered through standard IGMP router interfaces. With IGMP Proxy enabled, the system acts as proxy to all the hosts residing on its router interfaces.

ip igmp-proxy

This command enables the IGMP Proxy on the an interface or range of interfaces. To enable the IGMP Proxy on an interface, you must enable multicast forwarding. Also, make sure that there are no multicast routing protocols enabled on the router.

Format	ip igmp-proxy
Mode	Interface Config

no ip igmp-proxy

This command disables the IGMP Proxy on the router.

Format	no ip igmp-proxy
Mode	Interface Config

ip igmp-proxy unsolicit-rprt-interval

This command sets the unsolicited report interval for the IGMP Proxy interface or range of interfaces. This command is valid only when you enable IGMP Proxy on the interface or range of interfaces. The value of *interval* can be 1-260 seconds.

Default	1
Format	ip igmp-proxy unsolicit-rprt-interval *1-260*
Mode	Interface Config

no ip igmp-proxy unsolicit-rprt-interval

This command resets the unsolicited report interval of the IGMP Proxy router to the default value.

Format	no ip igmp-proxy unsolicit-rprt-interval
Mode	Interface Config

ip igmp-proxy reset-status

This command resets the host interface status parameters of the IGMP Proxy interface (or range of interfaces). This command is valid only when you enable IGMP Proxy on the interface.

Format	ip igmp-proxy reset-status
Mode	Interface Config

show ip igmp-proxy

This command displays a summary of the host interface status parameters. It displays the following parameters only when you enable IGMP Proxy.

Format show ip igmp-proxy

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Interface index	The interface number of the IGMP Proxy.
Admin Mode	States whether the IGMP Proxy is enabled or not. This is a configured value.
Operational Mode	States whether the IGMP Proxy is operationally enabled or not. This is a status parameter.
Version	The present IGMP host version that is operational on the proxy interface.
Number of Multicast Groups	The number of multicast groups that are associated with the IGMP Proxy interface.
Unsolicited Report Interval	The time interval at which the IGMP Proxy interface sends unsolicited group membership report.
Querier IP Address on Proxy Interface	The IP address of the Querier, if any, in the network attached to the upstream interface (IGMP-Proxy interface).
Older Version 1 Querier Timeout	The interval used to timeout the older version 1 queriers.
Older Version 2 Querier Timeout	The interval used to timeout the older version 2 queriers.
Proxy Start Frequency	The number of times the IGMP Proxy has been stopped and started.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip igmp-proxy

Interface Index............................................ 1/0/1
Admin Mode............................................... Enable
Operational Mode........................................ Enable
Version......................................................... 3
Num of Multicast Groups............................ 0
Unsolicited Report Interval.......................... 1
Querier IP Address on Proxy Interface........ 5.5.5.50
Older Version 1 Querier Timeout................ 0
Older Version 2 Querier Timeout................ 00::00:00
Proxy Start Frequency................................. 1
```

show ip igmp-proxy interface

This command displays a detailed list of the host interface status parameters. It displays the following parameters only when you enable IGMP Proxy.

Format show ip igmp-proxy interface

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Interface Index	The `unit/slot/port` of the IGMP proxy.

The column headings of the table associated with the interface are as follows:

Parameter	Definition
Ver	The IGMP version.
Query Rcvd	Number of IGMP queries received.
Report Rcvd	Number of IGMP reports received.
Report Sent	Number of IGMP reports sent.
Leaves Rcvd	Number of IGMP leaves received. Valid for version 2 only.
Leaves Sent	Number of IGMP leaves sent on the Proxy interface. Valid for version 2 only.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip igmp-proxy interface

Interface Index............................... 1/0/1

Ver  Query Rcvd  Report Rcvd  Report Sent  Leave Rcvd  Leave Sent
-----------------------------------------------------------------
1                                                                  0 0 0 ----- -----
2                                                                  0 0 0  0 0
3                                                                  0 0 0 ----- -----
```

show ip igmp-proxy groups

This command displays information about the subscribed multicast groups that IGMP Proxy reported. It displays a table of entries with the following as the fields of each column.

Format show ip igmp-proxy groups

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Interface	The interface number of the IGMP Proxy.
Group Address	The IP address of the multicast group.
Last Reporter	The IP address of host that last sent a membership report for the current group on the network attached to the IGMP Proxy interface (upstream interface).
Up Time (in secs)	The time elapsed since last created.

Parameter	Definition
Member State	The status of the entry. Possible values are IDLE_MEMBER or DELAY_MEMBER. • IDLE_MEMBER - interface has responded to the latest group membership query for this group. • DELAY_MEMBER - interface is going to send a group membership report to respond to a group membership query for this group.
Filter Mode	Possible values are **Include** or **Exclude**.
Sources	The number of sources attached to the multicast group.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip igmp-proxy groups

Interface Index................................ 1/0/1

Group Address    Last Reporter    Up Time   Member State  Filter Mode  Sources
-------------                                   -------------- ---------- ------------- ------------- -------
225.4.4.4                                       5.5.5.48 00:02:21  DELAY_MEMBER Include 3

226.4.4.4                                       5.5.5.48 00:02:21  DELAY_MEMBER Include3

227.4.4.4                                       5.5.5.48 00:02:21  DELAY_MEMBER Exclude 0

228.4.4.4                                       5.5.5.48 00:02:21  DELAY_MEMBER Include 3
```

show ip igmp-proxy groups detail

This command displays complete information about multicast groups that IGMP Proxy reported. It displays a table of entries with the following as the fields of each column.

Format	show ip igmp-proxy groups detail
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Interface	The interface number of the IGMP Proxy.
Group Address	The IP address of the multicast group.
Last Reporter	The IP address of host that last sent a membership report for the current group, on the network attached to the IGMP-Proxy interface (upstream interface).
Up Time (in secs)	The time elapsed since last created.
Member State	The status of the entry. Possible values are IDLE_MEMBER or DELAY_MEMBER. • IDLE_MEMBER - interface has responded to the latest group membership query for this group. • DELAY_MEMBER - interface is going to send a group membership report to respond to a group membership query for this group.
Filter Mode	Possible values are **Include** or **Exclude**.
Sources	The number of sources attached to the multicast group.

Parameter	Definition
Group Source List	The list of IP addresses of the sources attached to the multicast group.
Expiry Time	Time left before a source is deleted.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ip igmp-proxy groups

Interface Index................................ 1/0/1

Group Address    Last Reporter    Up Time   Member State Filter Mode  Sources
-------------                                 -------------- ----------- ------------ ------------ ---------
225.4.4.4                                     5.5.5.48 00:02:21  DELAY_MEMBER Include        3

Group Source List          Expiry Time
-----------------                             -----------------
5.1.2.3                                       00:02:21
6.1.2.3                                       00:02:21
7.1.2.3                                       00:02:21

226.4.4.4                                     5.5.5.48 00:02:21  DELAY_MEMBERInclude        3

Group Source List          Expiry Time
------------------                             ---------------
2.1.2.3                                       00:02:21
6.1.2.3                                       00:01:44
8.1.2.3                                       00:01:44

227.4.4.4                                     5.5.5.48 00:02:21  DELAY_MEMBER Exclude        0



228.4.4.4                                     5.5.5.48 00:03:21  DELAY_MEMBERInclude        3

Group Source List          Expiry Time
------------------                             ---------------
9.1.2.3                                       00:03:21
6.1.2.3                                       00:03:21
7.1.2.3                                       00:03:21
```

Chapter 11. IPv6 Multicast Commands

The entire IPv6 Multicast commands section is Enterprise-only. This chapter describes the IPv6 Multicast commands available in the CE0128XB/CE0152XB CLI.

Note: There is no specific IP multicast enable for IPv6. Enabling of multicast at global config is common for both IPv4 and IPv6.

Note: The commands in this chapter are in one of three functional groups:

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Clear commands clear some or all of the settings to factory defaults.

IPv6 Multicast Forwarder

ipv6 mroute

This command configures an IPv6 Multicast Static Route for a source.

Default	No MRoute is configured on the system.
Format	ipv6 mroute *src-ip-addr src-mask rpf-addr* [interface] *preference*
Mode	Global Config

Parameter	Description
src-ip-addr	The IP address of the multicast source network.
src-mask	The IP mask of the multicast data source.
rpf-ip-addr	The IP address of the RPF next-hop router toward the source.
interface	Specify the interface if the RPF Address is a link-local address.
preference	The administrative distance for this Static MRoute, that is, the preference value. The range is 1 to 255.

no ipv6 mroute

This command removes the configured IPv6 Multicast Static Route.

Format	no ip mroute *src-ip-addr*
Mode	Global Config

show ipv6 mroute

Note: There is no specific IP multicast enable for IPv6. Enabling of multicast at global config is common for both IPv4 and IPv6.

Use this command to show the mroute entries specific for IPv6. (This command is the IPv6 equivalent of the IPv4 `show ip mroute` command.)

Format showipv6mroute{[detail]|[summary]|[group{*group-address*}[detail|summary]]|[source {*source-address*} [*grpaddr* | summary]]}

Modes
- Privileged EXEC
- User EXEC

If you use the `detail` parameter, the command displays the following Multicast Route Table fields:

Parameter	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Expiry Time	The time of expiry of this entry in seconds.
Up Time	The time elapsed since the entry was created in seconds.
RPF Neighbor	The IP address of the RPF neighbor.
Flags	The flags associated with this entry.

If you use the `summary` parameter, the command displays the following fields:

Parameter	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which the entry was created.
Incoming Interface	The interface on which the packet for the source/group arrives.
Outgoing Interface List	The list of outgoing interfaces on which the packet is forwarded.

show ipv6 mroute group

This command displays the multicast configuration settings specific to IPv6 such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the given group IPv6 address `group-address`.

Format show ipv6 mroute group *group-address* {detail | summary}

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which this entry was created.
Incoming Interface	The interface on which the packet for this group arrives.
Outgoing Interface List	The list of outgoing interfaces on which this packet is forwarded.

show ipv6 mroute source

This command displays the multicast configuration settings specific to IPv6 such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the given source IP address or source IP address and group IP address pair.

Format	show ipv6 mroute source *source-address* {*grpaddr* | summary}
Modes	• Privileged EXEC • User EXEC

If you use the `groupipaddr` parameter, the command displays the following column headings in the output table:

Parameter	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Expiry Time	The time of expiry of this entry in seconds.
Up Time	The time elapsed since the entry was created in seconds.
RPF Neighbor	The IP address of the RPF neighbor.
Flags	The flags associated with this entry.

If you use the `summary` parameter, the command displays the following column headings in the output table:

Parameter	Definition
Source IP Addr	The IP address of the multicast data source.
Group IP Addr	The IP address of the destination of the multicast packet.
Protocol	The multicast routing protocol by which this entry was created.
Incoming Interface	The interface on which the packet for this source arrives.
Outgoing Interface List	The list of outgoing interfaces on which this packet is forwarded.

show ipv6 mroute static

Use the `show ipv6 mroute static` command in Privileged EXEC or User EXEC mode to display all the configured IPv6 multicast static routes.

Format	show ipv6 mroute static [*source-address*]
Modes	• Privileged EXEC • User EXEC

Parameter	Description
Source Address	IP address of the multicast source network.
Source Mask	The subnetwork mask pertaining to the sourceIP.

Parameter	Description
RPF Address	The IP address of the RPF next-hop router toward the source.
Interface	The interface that is used to reach the RPF next-hop. This is valid if the RPF address is a link-local address.
Preference	The administrative distance for this Static MRoute.

clear ipv6 mroute

This command deletes all or the specified IPv6 multicast route entries.

Note: This command only clears dynamic mroute entries. It does not clear static mroutes.

Format	clear ipv6 mroute {*|group-address[source-address]}
Modes	Privileged EXEC

Parameter	Description
*	Deletes all IPv6 entries from the IPv6 multicast routing table.
group-address	IPv6 address of the multicast group.
source-address	The IPv6 address of a multicast source that is sending multicast traffic to the group.

Example: The following deletes all entries from the IPv6 multicast routing table:

```
(Routing) # clear ipv6 mroute *
```

Example: The following deletes all entries from the IPv6 multicast routing table that match the given multicast group address (FF4E::1), irrespective of which source is sending for this group:

```
(Routing) # clear ipv6 mroute FF4E::1
```

Example: The following deletes all entries from the IPv6 multicast routing table that match the given multicast group address (FF4E::1) and the multicast source address (2001::2):

```
(Routing) # clear ip mroute FF4E::1 2001::2
```

IPv6 PIM Commands

This section describes the commands you use to configure Protocol Independent Multicast -Dense Mode (PIM-DM) and Protocol Independent Multicast - Sparse Mode (PIM-SM) for IPv6 multicast routing. PIM-DM and PIM-SM are multicast routing protocols that provides scalable inter-domain multicast routing across the Internet, independent of the mechanisms provided by any particular unicast routing protocol. Only one PIM mode can be operational at a time.

ipv6 pim dense

This command enables the administrative mode of PIM-DM in the router.

Default	disabled
Format	ipv6 pim dense
Mode	Global Config

Example: The following shows an example of the command.

```
(Routing)(Config) #ipv6 pim dense
```

no ipv6 pim dense

This command disables the administrative mode of PIM-DM in the router.

Format	no ipv6 pim dense
Mode	Global Config

ipv6 pim sparse

This command enables the administrative mode of PIM-SM in the router.

Default	disabled
Format	ipv6 pim sparse
Mode	Global Config

Example: The following shows an example of the command.

```
(Routing)(Config) #ipv6 pim sparse
```

no ipv6 pim sparse

This command disables the administrative mode of PIM-SM in the router.

Format	no ipv6 pim sparse
Mode	Global Config

ipv6 pim

This command administratively enables PIM on an interface or range of interfaces.

Default	disabled

Format	ipv6 pim
Mode	Interface Config

Example: The following shows example CLI display output for the command.

```
(Routing)(Interface 1/0/1) #ipv6 pim
```

no ipv6 pim

This command sets the administrative mode of PIM on an interface to disabled.

Format	no ipv6 pim
Mode	Interface Config

ipv6 pim hello-interval

Use this command to configure the PIM hello interval for the specified router interface or range of interfaces. The hello-interval is specified in seconds and is in the range 0–18000.

Default	30
Format	ipv6 pim hello-interval *0–18000*
Mode	Interface Config

Example: The following shows an example of the command.

```
(Routing)(Interface 1/0/1) #ipv6 pim hello-interval 50
```

no ipv6 pim hello-interval

Use this command to set the PIM hello interval to the default value.

Format	no ipv6 pim hello-interval
Mode	Interface Config

ipv6 pim bsr-border

Use this command to prevent bootstrap router (BSR) messages from being sent or received on the specified interface.

Note: This command takes effect only when PIM-SM is enabled in the Global mode.

Default	disabled
Format	ipv6 pim bsr-border
Mode	Interface Config

Example: The following shows an example of the command.

```
(Routing)(Interface 1/0/1) #ipv6 pim bsr-border
```

no ipv6 pim bsr-border

Use this command to disable the setting of BSR border on the specified interface.

Format	no ipv6 pim bsr-border
Mode	Interface Config

ipv6 pim bsr-candidate

This command is used to configure the router to announce its candidacy as a bootstrap router (BSR). The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Note: This command takes effect only when PIM-SM is configured as the PIM mode.

Default	disabled
Format	ipv6 pim bsr-candidate interface {*unit/slot/port*|*vlan 1-4093} hash-mask-length [bsr-priority] [interval interval]*
Mode	Global Config

Parameters	Description
unit/slot/port	Interface number on this router from which the BSR address is derived, to make it a candidate. This interface must be enabled with PIM.
hash-mask-length	Length of a mask (32 bits maximum) that is to be ANDed with the group address before the hash function is called. All groups with the same seed hash correspond to the same RP. For example, if this value was 24, only the first 24 bits of the group addresses matter. This allows you to get one RP for multiple groups.
bsr-priority	Priority of the candidate BSR. The range is an integer from 0 to 255. The BSR with the larger priority is preferred. If the priority values are the same, the router with the larger IPv6 address is the BSR. The default value is 0.
interval	[Optional] Indicates the BSR candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.

Example: The following shows examples of the command.

```
(Routing) (Config)#ipv6 pim bsr-candidate interface 0/1 32 5
(Routing) (Config)#ipv6 pim bsr-candidate interface 0/1 32 5 interval 100
```

no ipv6 pim bsr-candidate

This command is used to remove the configured PIM Candidate BSR router.

Format	no ipv6 pim bsr-candidate interface {*unit/slot/port*|*vlan 1-4093} hash-mask-length [priority]*
Mode	Global Config

ipv6 pim dr-priority

Use this command to set the priority value for which a router is elected as the designated router (DR).

Note: This command takes effect only when PIM-SM is enabled in the Global mode.

Default	1
Format	ipv6 pim dr-priority *0-2147483647*
Mode	Interface Config

Example: The following shows example CLI display output for the command.

```
(Routing)(Interface 1/0/1) #ipv6 pim dr-priority 10
```

no ipv6 pim dr-priority

Use this command to return the DR Priority on the specified interface to its default value.

Format	no ipv6 pim dr-priority
Mode	Interface Config

ipv6 pim join-prune-interval

This command is used to configure the join/prune interval for the PIM-SM router on an interface or range of interfaces. The join/prune interval is specified in seconds. This parameter can be configured to a value from 0 to 18000.

Note: This command takes effect only when PIM-SM is enabled in the Global mode.

Default	60
Format	ipv6 pim join-prune-interval *0-18000*
Mode	Interface Config

Example: The following shows examples of the command.

```
(Routing)(Interface 1/0/1) #ipv6 pim join-prune-interval 90
```

no ipv6 pim join-prune-interval

Use this command to set the join/prune interval on the specified interface to the default value.

Format	no ipv6 pim join-prune-interval
Mode	Interface Config

ipv6 pim rp-address

This command defines the address of a PIM Rendezvous point (RP) for a specific multicast group range.

Note: This command takes effect only when PIM-SM is configured as the PIM mode.

Default	0
Format	ipv6 pim rp-address {*rp-address* | *group-address/group-mask* } [override]
Mode	Global Config

Parameter	Description
rp-address	The IPv6 address of the RP.
group-address	The group address supported by the RP.
group-mask	The group mask for the group address.
override	[Optional] Indicates that if there is a conflict, the RP configured with this command prevails over the RP learned by BSR.

Example: The following shows an example of the command.

```
(Routing) (Config)#ipv6 pim rp-address 2001::1 ff1e::0/64
```

no ipv6 pim rp-address

This command is used to remove the address of the configured PIM Rendezvous point (RP) for the specified multicast group range.

Format	no ipv6 pim rp-address {*rp-address* | *group-address/group-mask* } [override]
Mode	Global Config

ipv6 pim rp-candidate

This command is used to configure the router to advertise itself as a PIM candidate rendezvous point (RP) to the bootstrap router (BSR) for a specific multicast group range. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Note: This command takes effect only when PIM-SM is configured as the PIM mode.

Default	disabled
Format	ipv6 pim rp-candidate interface {*unit/slot/port*|*vlan 1-4093}* *group-address group-mask [interval interval]*
Mode	Global Config

Parameter	Description
unit/slot/port	The IP address associated with this interface type and number is advertised as a candidate RP address. This interface must be enabled with PIM.
group-address	The multicast group address that is advertised in association with the RP address.
group-mask	The multicast group prefix that is advertised in association with the RP address.

Parameter	Description
interval	[Optional] Indicates the RP candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.

Example: The following shows examples of the command.

```
(Routing) (Config) ipv6 pim rp-candidate interface 0/1 ff1e::0/64
(Routing) (Config) ipv6 pim rp-candidate interface 0/1 ff1e::0/64 interval 200
```

no ipv6 pim rp-candidate

This command is used to disable the router to advertise itself as a PIM candidate rendezvous point (RP) to the bootstrap router (BSR).

Format	no ipv6 pim rp-candidate interface {*unit/slot/port*|*vlan 1-4093}* *group-address group-mask*
Mode	Global Config

ipv6 pim ssm

Use this command to define the Source Specific Multicast (SSM) range of IPv6 multicast addresses on the router.

Note: Note the following:

- This command takes effect only when PIM-SM is configured as the PIM mode.
- Some CE0128XB/CE0152XB platforms do not support a non-zero data threshold rate. For these platforms, only a *Switch on First Packet* policy is supported.

Default	disabled
Format	ipv6 pim ssm {default | *group-address group-mask*}
Mode	Global Config

Parameter	Description
default-range	Defines the SSM range access list FF3x::/32.

Example: The following shows an example of the command.

```
(Routing)(Config) #ipv6 pim ssm default
(Routing)(Config) #ipv6 pim ssm ff32::/32
```

no ipv6 pim ssm

Use this command to remove the Source Specific Multicast (SSM) range of IP multicast addresses on the router.

Format	no ipv6 pim ssm {default | *group-address group-mask*}
Mode	Global Config

show ipv6 pim

This command displays the system-wide information for PIM-DM or PIM-SM.

Format	show ipv6 pim
Modes	• Privileged EXEC • User EXEC

Note: If the PIM mode is PIM-DM (dense), some of the fields in the following table do not display in the command output because they are applicable only to PIM-SM.

Parameter	Definition
PIM Mode	Indicates whether the PIM mode is dense (PIM-DM) or sparse (PIM-SM)
Interface	*unit/slot/port*
Interface Mode	Indicates whether PIM is enabled or disabled on this interface.
Operational Status	The current state of PIM on this interface: Operational or Non-Operational.

Example: The following shows example CLI display output for the command.

Example #1: PIM Mode - Dense

```
(Routing) #show ipv6 pim
PIM Mode....................................... Dense

Interface  Interface-Mode  Operational-Status
---------  --------------  ------------------
0/1        Enabled         Non-Operational
0/3        Disabled        Non-Operational
0/21       Enabled         Operational
```

Example #2: PIM Mode - Sparse

```
(Routing) #show ipv6 pim
PIM Mode....................................... Sparse

Interface  Interface-Mode  Operational-Status
---------  --------------  ------------------
0/1        Enabled         Non-Operational
0/3        Disabled        Non-Operational
0/21       Enabled         Operational
```

Example #3: PIM Mode - None

```
(Routing) #show ipv6 pim

PIM Mode....................................... None

None of the routing interfaces are enabled for PIM.
```

show ipv6 pim ssm

This command displays the configured source specific IPv6 multicast addresses. If no SSM Group range is configured, this command output is `No SSM address range is configured`.

Format	show ipv6 pim ssm

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Group Address	The IPv6 multicast address of the SSM group.
Prefix Length	The network prefix length.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 pim ssm

Group Address/Prefix Length
----------------------------
ff32::/32
```

If no SSM Group range is configured, this command displays the following message:

```
No SSM address range is configured.
```

show ipv6 pim interface

This command displays the interface information for PIM on the specified interface. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format. If no interface is specified, the command displays the status parameters for all PIM-enabled interfaces.

Format show ipv6 pim interface [{*unit/slot/port*|*vlan 1-4093*}]

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Interface	*unit/slot/port*
Mode	Indicates whether the PIM mode enabled on the interface is dense or sparse.
Hello Interval	The frequency at which PIM hello messages are transmitted on this interface. By default, the value is 30 seconds.
Join Prune Interval	The join/prune interval for the PIM router. The interval is in seconds.
DR Priority	The priority of the Designated Router configured on the interface. This field is not applicable if the interface mode is Dense
BSR Border	Identifies whether this interface is configured as a bootstrap router border interface.
Neighbor Count	The number of PIM neighbors learned on this interface. This is a dynamic value and is shown only when a PIM interface is operational.
Designated Router	The IP address of the elected Designated Router for this interface. This is a dynamic value and will only be shown when a PIM interface is operational. This field is not applicable if the interface mode is Dense

Example: The following shows example CLI display output for the command.

```
(Routing)#show ipv6 pim interface
```

```
Interface...................................... 0/1
Mode........................................... Sparse
Hello Interval (secs).......................... 30
Join Prune Interval (secs)..................... 60
DR Priority.................................... 1
BSR Border..................................... Disabled

Interface...................................... 0/21
Mode........................................... Sparse
Hello Interval (secs).......................... 30
Join Prune Interval (secs)..................... 60
DR Priority.................................... 1
BSR Border..................................... Disabled
Neighbor Count ................................ 1
Designated Router.............................. fe80::20a:f7ff:fe81:8ad9
```

If none of the interfaces are enabled for PIM, the following message is displayed:

```
None of the routing interfaces are enabled for PIM.
```

show ipv6 pim neighbor

This command displays PIM neighbors discovered by PIMv2 Hello messages. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format. If the interface number is not specified, this command displays the neighbors discovered on all the PIM-enabled interfaces.

Format	show ipv6 pim neighbor [{*unit/slot/port*|*vlan 1-4093*}]
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
Neighbor Address	The IPv6 address of the PIM neighbor on an interface.
Interface	*unit/slot/port*
Up Time	The time since this neighbor has become active on this interface.
Expiry Time	Time remaining for the neighbor to expire.
DR Priority	The DR Priority configured on this Interface (PIM-SM only). **NOTE:** DR Priority is applicable only when sparse-mode configured routers are neighbors. Otherwise, NA is displayed in this field.

Example: The following shows example CLI display output for the command.

```
(Routing)#show ipv6 pim neighbor

Neighbor Addr                       Interface Up Time   Expiry Time DR
                                    hh:mm:ss  hh:mm:ss  Priority
----------------------------------- --------- --------- ----------- --------
fe80::200:52ff:feb7:58ac              0/21    00:00:03  00:01:43    0 (DR)
```

If no neighbors have been learned on any of the interfaces, the following message is displayed:

```
No neighbors are learned on any interface.
```

show ipv6 pim bsr-router

This command displays the bootstrap router (BSR) information.

Format	show ipv6 pim bsr-router {candidate | elected}
Mode	• Privileged EXEC • User EXEC

Parameter	Definition
BSR Address	IPv6 address of the BSR.
BSR Priority	Priority as configured in the `ipv6 pim bsr-candidate` command.
BSR Hash Mask Length	Length of a mask (maximum 32 bits) that is to be ANDed with the group address before the hash function is called. This value is configured in the `ipv6 pim bsr-candidate` command.
C-BSR Advertisement Interval	Indicates the configured C-BSR Advertisement interval with which the router, acting as a C-BSR, will periodically send the C-BSR advertisement messages.
Next Bootstrap Message	Time (in hours, minutes, and seconds) in which the next bootstrap message is due from this BSR.

Example: The following shows example CLI display output for the command.

Example #1:

```
(Routing) #show ipv6 pim bsr-router elected

BSR Address.................................... 3001::1
  BSR Priority................................ 150
  BSR Hash Mask Length......................... 120
  Next Bootstrap message (hh:mm:ss)............ 00:00:15

Example #2:
(Routing) #show ipv6 pim bsr-router candidate
BSR Address.................................... 3001::1
  BSR Priority................................ 150
  BSR Hash Mask Length......................... 120
  C-BSR Advertisement Interval (secs).......... 60
  Next Bootstrap message (hh:mm:ss)............ NA
```

If no configured or elected BSRs exist on the router, the following message is displayed:

```
No BSR's exist/learned on this router.
```

show ipv6 pim rp-hash

This command displays which rendezvous point (RP) is being used for a specified group.

Format	show ipv6 pim rp-hash *group-address*
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
RP Address	The IPv6 address of the RP for the group specified.
Type	Indicates the mechanism (BSR or static) by which the RP was selected.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 pim rp-hash ff1e::

RP Address.................................... 2001::1
  Type....................................... Static
```

If no RP Group mapping exist on the router, the following message is displayed:

```
No RP-Group mappings exist/learned on this router.
```

show ipv6 pim rp mapping

Use this command to display the mapping for the PIM group to the active Rendezvous points (RP) of which the router is a aware (either configured or learned from the bootstrap router (BSR)). Use the optional parameters to limit the display to a specific RP address or to view group-to-candidate RP or group to Static RP mapping information.

.

Format	show ipv6 pim rp mapping [{*rp-address* | candidate | static}]
Modes	• Privileged EXEC • User EXEC

Parameter	Definition
RP Address	The IPv6 address of the RP for the group specified.
Group Address	The IPv6 address and prefix length of the multicast group.
Origin	Indicates the mechanism (BSR or static) by which the RP was selected.
C-RP Advertisement Interval	Indicates the configured C-RP Advertisement interval with which the router acting as a Candidate RP will periodically send the C-RP advertisement messages to the elected BSR.

Example: The following show examples of CLI display output for the command.

Example #1:

```
(Routing) #show ipv6 pim rp mapping 2001::1

RP Address.................................... 2001::1
  Group Address.............................. ff1e::/64
  Origin..................................... Static
  Expiry Time (hh:mm:ss)...................... NA
  Next Candidate RP Advertisement (hh:mm:ss).. NA
```

Example #2:

```
(Routing)#show ipv6 pim rp mapping
RP Address.................................... 2001::1
  Group Address.............................. ff1e::/64
  Origin..................................... Static
  Expiry Time (hh:mm:ss)...................... NA
  Next Candidate RP Advertisement (hh:mm:ss).. NA
```

Example #3:

```
(Routing)# show ipv6 pim rp mapping candidate
RP Address..................................... 2001::1
  Group Address............................... ff1e::/64
  Origin...................................... BSR
  C-RP Advertisement Interval (secs).......... 200
```

If no RP Group mapping exist on the router, the following message is displayed:

```
No RP-Group mappings exist on this router.
```

IPv6 MLD Commands

IGMP/MLD Snooping is Layer 2 functionality but IGMP/MLD are Layer 3 multicast protocols. It requires that in a network setup there should be a multicast router (which can act as a querier) to be present to solicit the multicast group registrations. However some network setup does not need a multicast router as multicast traffic is destined to hosts within the same network. In this situation, CE0128XB/CE0152XB has an IGMP/MLD Snooping Querier running on one of the switches and Snooping enabled on all the switches. For more information, see "IGMP Snooping Configuration Commands" on page 519 and "MLD Snooping Commands" on page 532.

ipv6 mld router

Use this command, in the administrative mode of the router, to enable MLD in the router.

Default	disabled
Format	ipv6 mld router
Mode	Global Config

no ipv6 mld router

Use this command, in the administrative mode of the router, to disable MLD in the router.

Default	disabled
Format	no ipv6 mld router
Mode	Global Config

ipv6 mld query-interval

Use this command to set the MLD router's query interval for the interface or range of interfaces. The query-interval is the amount of time between the general queries sent when the router is the querier on that interface. The range for `query-interval` is 1 to 3600 seconds.

Default	125
Format	ipv6 mld query-interval *query-interval*
Mode	Interface Config

no ipv6 mld query-interval

Use this command to reset the MLD query interval to the default value for that interface.

Format	no ipv6 mld query-interval
Mode	Interface Config

ipv6 mld query-max-response-time

Use this command to set the MLD querier's maximum response time for the interface or range of interfaces and this value is used in assigning the maximum response time in the query messages that are sent on that interface. The range for `query-max-response-time` is 0 to 65535 milliseconds.

Default	10000 milliseconds
Format	ipv6 mld query-max-response-time *query-max-response-time*
Mode	Interface Config

no ipv6 mld query-max-response-time

This command resets the MLD query max response time for the interface to the default value.

Format	no ipv6 mld query-max-response-time
Mode	Interface Config

ipv6 mld last-member-query-interval

Use this command to set the last member query interval for an MLD interface or range of interfaces, which is the value of the maximum response time parameter in the group specific queries sent out of this interface. The range for `last-member-query-interval` is 0 to 65535 milliseconds.

Default	1000 milliseconds
Format	ipv6 mld last-member-query-interval *last-member-query-interval*
Mode	Interface Config

no ipv6 mld last-member-query-interval

Use this command to reset the `last-member-query-interval` parameter of the interface to the default value.

Format	no ipv6 mld last-member-query-interval
Mode	Interface Config

ipv6 mld last-member-query-count

Use this command to set the number of listener-specific queries sent before the router assumes that there are no local members on an interface or range of interfaces. The range for `last-member-query-count` is 1 to 20.

Default	2
Format	ipv6 mld last-member-query-count *last-member-query-count*
Mode	Interface Config

no ipv6 mld last-member-query-count

Use this command to reset the *last-member-query-count* parameter of the interface to the default value.

Format	no ipv6 mld last-member-query-count
Mode	Interface Config

ipv6 mld version

Use this command to configure the MLD version that the interface uses.

Default	2
Format	ipv6 mld version { 1 | 2 }
Mode	Interface Config

no ipv6 mld version

This command resets the MLD version used by the interface to the default value.

Format	no ipv6 mld
Mode	Interface Config

show ipv6 mld groups

Use this command to display information about multicast groups that MLD reported. The information is displayed only when MLD is enabled on at least one interface. If MLD was not enabled on even one interface, there is no group information to be displayed. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Format	show ipv6 mld groups {*unit/slot/port*|*vlan 1-4093*|*group-address*}
Mode	• Privileged EXEC • User EXEC

The following fields are displayed as a table when *unit/slot/port is*

Field	Description
Group Address	The address of the multicast group.
Interface	Interface through which the multicast group is reachable.
Up Time	Time elapsed in hours, minutes, and seconds since the multicast group has been known.
Expiry Time	Time left in hours, minutes, and seconds before the entry is removed from the MLD membership table.

specified.

When `group-address` is specified, the following fields are displayed for each multicast group and each interface.

Field	Description
Interface	Interface through which the multicast group is reachable.
Group Address	The address of the multicast group.
Last Reporter	The IP Address of the source of the last membership report received for this multicast group address on that interface.
Filter Mode	The filter mode of the multicast group on this interface. The values it can take are `include` and `exclude`.
Version 1 Host Timer	The time remaining until the router assumes there are no longer any MLD version-1 Hosts on the specified interface.
Group Compat Mode	The compatibility mode of the multicast group on this interface. The values it can take are `MLDv1` and `MLDv2`.

The following table is displayed to indicate all the sources associated with this group.

Field	Description
Source Address	The IP address of the source.
Uptime	Time elapsed in hours, minutes, and seconds since the source has been known.
Expiry Time	Time left in hours, minutes, and seconds before the entry is removed.

Example: The following shows examples of CLI display output for the commands.

```
(Routing) #show ipv6 mld groups ?

group-address        Enter Group Address Info.
<unit/slot/port>       Enter interface in unit/slot/port format.


(Routing) #show ipv6 mld groups 1/0/1

Group Address................................. FF43::3
Interface..................................... 1/0/1
Up Time (hh:mm:ss)............................ 00:03:04
Expiry Time (hh:mm:ss)........................ ------


(Routing) #show ipv6 mld groups ff43::3

Interface..................................... 1/0/1
Group Address................................. FF43::3
Last Reporter................................. FE80::200:FF:FE00:3
Up Time (hh:mm:ss)............................ 00:02:53
Expiry Time (hh:mm:ss)........................ ------
Filter Mode................................... Include
Version1 Host Timer........................... ------
Group compat mode............................. v2
Source Address    ExpiryTime
-----------------  -----------
  2003::10       00:04:17
  2003::20       00:04:17
```

show ipv6 mld interface

Use this command to display MLD-related information for the interface. The argument *unit/slot/port* corresponds to a physical routing interface or VLAN routing interface. The keyword `vlan` is used to specify the VLAN ID of the routing VLAN directly instead of in a *unit/slot/port* format.

Format	show ipv6 mld interface {*unit/slot/port*|*vlan 1-4093*}
Mode	• Privileged EXEC • User EXEC

The following information is displayed for each of the interfaces or for only the specified interface.

Field	Description
Interface	The interface number in `unit/slot/port` format.
MLD Mode	Displays the configured administrative status of MLD.
Operational Mode	The operational status of MLD on the interface.
MLD Version	Indicates the version of MLD configured on the interface.
Query Interval	Indicates the configured query interval for the interface.
Query Max Response Time	Indicates the configured maximum query response time (in seconds) advertised in MLD queries on this interface.
Robustness	Displays the configured value for the tuning for the expected packet loss on a subnet attached to the interface.
Startup Query interval	This valued indicates the configured interval between General Queries sent by a Querier on startup.
Startup Query Count	This value indicates the configured number of Queries sent out on startup, separated by the Startup Query Interval.
Last Member Query Interval	This value indicates the configured Maximum Response Time inserted into Group-Specific Queries sent in response to Leave Group messages.
Last Member Query Count	This value indicates the configured number of Group-Specific Queries sent before the router assumes that there are no local members.

The following information is displayed if the operational mode of the MLD interface is enabled.

Field	Description
Querier Status	This value indicates whether the interface is an MLD querier or non-querier on the subnet it is associated with.
Querier Address	The IP address of the MLD querier on the subnet the interface is associated with.
Querier Up Time	Time elapsed in seconds since the querier state has been updated.
Querier Expiry Time	Time left in seconds before the Querier loses its title as querier.
Wrong Version Queries	Indicates the number of queries received whose MLD version does not match the MLD version of the interface.
Number of Joins	The number of times a group membership has been added on this interface.
Number of Leaves	The number of times a group membership has been removed on this interface.

Field	Description
Number of Groups	The current number of membership entries for this interface.

show ipv6 mld traffic

Use this command to display MLD statistical information for the router.

Format show ipv6 mld traffic

Mode
- Privileged EXEC
- User EXEC

Field	Description
Valid MLD Packets Received	The number of valid MLD packets received by the router.
Valid MLD Packets Sent	The number of valid MLD packets sent by the router.
Queries Received	The number of valid MLD queries received by the router.
Queries Sent	The number of valid MLD queries sent by the router.
Reports Received	The number of valid MLD reports received by the router.
Reports Sent	The number of valid MLD reports sent by the router.
Leaves Received	The number of valid MLD leaves received by the router.
Leaves Sent	The number of valid MLD leaves sent by the router.
Bad Checksum MLD Packets	The number of bad checksum MLD packets received by the router.
Malformed MLD Packets	The number of malformed MLD packets received by the router.

clear ipv6 mld counters

Use this command to reset the MLD counters to zero on the specified interface.

Format clear ipv6 mld *unit/slot/port*

Mode Privileged EXEC

clear ipv6 mld traffic

Use this command to clear all entries in the MLD traffic database.

Format clear ipv6 mld *unit/slot/port*

Mode Privileged EXEC

IPv6 MLD-Proxy Commands

MLD-Proxy is the IPv6 equivalent of IGMP-Proxy. MLD-Proxy commands allow you to configure the network device as well as to view device settings and statistics using either serial interface or telnet session. The operation of MLD-Proxy commands is the same as for IGMP-Proxy: MLD is for IPv6 and IGMP is for IPv4.MGMD is a term used to refer to both IGMP and MLD.

ipv6 mld-proxy

Use this command to enable MLD-Proxy on the interface or range of interfaces. To enable MLD-Proxy on the interface, you must enable multicast forwarding. Also, make sure that there are no other multicast routing protocols enabled n the router.

Format	ipv6 mld-proxy
Mode	Interface Config

no ipv6 mld-proxy

Use this command to disable MLD-Proxy on the router.

Format	no ipv6 mld-proxy
Mode	Interface Config

ipv6 mld-proxy unsolicit-rprt-interval

Use this command to set the unsolicited report interval for the MLD-Proxy interface or range of interfaces. This command is only valid when you enable MLD-Proxy on the interface. The value of *interval* is 1-260 seconds.

Default	1
Format	ipv6 mld-proxy unsolicit-rprt-interval interval
Mode	Interface Config

no ipv6 mld-proxy unsolicited-report-interval

Use this command to reset the MLD-Proxy router’s unsolicited report interval to the default value.

Format	no ipv6 mld-proxy unsolicit-rprt-interval
Mode	Interface Config

ipv6 mld-proxy reset-status

Use this command to reset the host interface status parameters of the MLD-Proxy interface or range of interfaces. This command is only valid when you enable MLD-Proxy on the interface.

Format	ipv6 mld-proxy reset-status

Mode Interface Config

show ipv6 mld-proxy

Use this command to display a summary of the host interface status parameters.

Format `show ipv6 mld-proxy`

Mode
- Privileged EXEC
- User EXEC

The command displays the following parameters only when you enable MLD-Proxy.

Field	Description
Interface Index	The interface number of the MLD-Proxy.
Admin Mode	Indicates whether MLD-Proxy is enabled or disabled. This is a configured value.
Operational Mode	Indicates whether MLD-Proxy is operationally enabled or disabled. This is a status parameter.
Version	The present MLD host version that is operational on the proxy interface.
Number of Multicast Groups	The number of multicast groups that are associated with the MLD-Proxy interface.
Unsolicited Report Interval	The time interval at which the MLD-Proxy interface sends unsolicited group membership report.
Querier IP Address on Proxy Interface	The IP address of the Querier, if any, in the network attached to the upstream interface (MLD-Proxy interface).
Older Version 1 Querier Timeout	The interval used to timeout the older version 1 queriers.
Proxy Start Frequency	The number of times the MLD-Proxy has been stopped and started.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 mld-proxy
Interface Index............................................ 1/0/3
Admin Mode............................................... Enable
Operational Mode........................................ Enable
Version........................................................ 3
Num of Multicast Groups............................ 0
Unsolicited Report Interval......................... 1
Querier IP Address on Proxy Interface........ fe80::1:2:5
Older Version 1 Querier Timeout................ 00:00:00
Proxy Start Frequency................................
```

show ipv6 mld-proxy interface

This command displays a detailed list of the host interface status parameters. It displays the following parameters only when you enable MLD-Proxy.

Format `show ipv6 mld-proxy interface`

Modes
- Privileged EXEC
- User EXEC

Parameter	Definition
Interface Index	The *unit/slot/port* of the MLD-proxy.

The column headings of the table associated with the interface are as follows:

Parameter	Definition
Ver	The MLD version.
Query Rcvd	Number of MLD queries received.
Report Rcvd	Number of MLD reports received.
Report Sent	Number of MLD reports sent.
Leaves Rcvd	Number of MLD leaves received. Valid for version 2 only.
Leaves Sent	Number of MLD leaves sent on the Proxy interface. Valid for version 2 only.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 mld-proxy interface

Interface Index................................ 1/0/1

Ver  Query Rcvd  Report Rcvd  Report Sent  Leave Rcvd  Leave Sent
-------------------------------------------------------------------
1                                                               2       0 0 0 2
2                                                               3 0 4  ----- -----
```

show ipv6 mld-proxy groups

Use this command to display information about multicast groups that the MLD-Proxy reported.

Format	show ipv6 mld-proxy groups
Mode	• Privileged EXEC • User EXEC

Field	Description
Interface	The interface number of the MLD-Proxy.
Group Address	The IP address of the multicast group.
Last Reporter	The IP address of the host that last sent a membership report for the current group, on the network attached to the MLD-Proxy interface (upstream interface).
Up Time (in secs)	The time elapsed in seconds since last created.
Member State	Possible values are: • **Idle_Member**. The interface has responded to the latest group membership query for this group. • **Delay_Member**. The interface is going to send a group membership report to respond to a group membership query for this group.
Filter Mode	Possible values are **Include** or **Exclude.**
Sources	The number of sources attached to the multicast group.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 mld-proxy groups

Interface Index................................ 1/0/3

Group Address    Last Reporter    Up Time   Member State  Filter Mode  Sources
-------------    --------------                           ---------- ----------------- -------------- -------
FF1E::1                                                   FE80::100:2.3   00:01:40  DELAY_MEMBER Exclude
                                                           2

FF1E::2                                                   FE80::100:2.3    00:02:40  DELAY_MEMBER
Include                                                    1

FF1E::3                                                   FE80::100:2.3    00:01:40  DELAY_MEMBER
Exclude                                                    0

FF1E::4                                                   FE80::100:2.3    00:02:44  DELAY_MEMBER
Include                                                    4
```

show ipv6 mld-proxy groups detail

Use this command to display information about multicast groups that MLD-Proxy reported.

Format	show ipv6 mld-proxy groups detail
Mode	• Privileged EXEC • User EXEC

Field	Description
Interface	The interface number of the MLD-Proxy.
Group Address	The IP address of the multicast group.
Last Reporter	The IP address of the host that last sent a membership report for the current group, on the network attached to the MLD-Proxy interface (upstream interface).
Up Time (in secs)	The time elapsed in seconds since last created.
Member State	Possible values are: • **Idle_Member**. The interface has responded to the latest group membership query for this group. • **Delay_Member**. The interface is going to send a group membership report to respond to a group membership query for this group.
Filter Mode	Possible values are **Include** or **Exclude.**
Sources	The number of sources attached to the multicast group.
Group Source List	The list of IP addresses of the sources attached to the multicast group.
Expiry Time	The time left for a source to get deleted.

Example: The following shows example CLI display output for the command.

```
(Routing) #show ipv6 igmp-proxy groups

Interface Index................................ 1/0/3

Group Address    Last Reporter    Up Time   Member State  Filter Mode  Sources
-------------                                              ---------------- ----------- ----------------- -------------
-------
```

```
FF1E::1                                    FE80::100:2.3 244 DELAY_MEMBER   Exclude
2

Group Source List          Expiry Time
------------------                          ---------------
2001::1                                     00:02:40
2001::2                                     --------


FF1E::2                                    FE80::100:2.3       243     DELAY_MEMBER
Include        1

Group Source List          Expiry Time
------------------                          ---------------
3001::1                                     00:03:32
3002::2                                     00:03:32


FF1E::3                                    FE80::100:2.3       328     DELAY_MEMBER
Exclude        0

FF1E::4                                    FE80::100:2.3       255      DELAY_MEMBER
Include        4

Group Source List          Expiry Time
------------------                          ---------------
4001::1                    00:03:40
5002::2                    00:03:40
4001::2                    00:03:40
5002::2                    00:03:40
```

Chapter 12. CE0128XB/CE0152XB Log Messages

This chapter lists common log messages that are provided by CE0128XB/CE0152XB, along with information regarding the cause of each message. There is no specific action that can be taken per message. When there is a problem being diagnosed, a set of these messages in the event log, along with an understanding of the system configuration and details of the problem will assist Lenovo in determining the root cause of such a problem. The most recent log messages are displayed first.

Note: This chapter is not a complete list of all syslog messages.

Core

Table 18. *BSP Log Messages*

Component	Message	Cause
BSP	Event(0xaaaaaaaa)	Switch has restarted.
BSP	Starting code...	BSP initialization complete, starting CE0128XB/CE0152XB application.

Table 19. *NIM Log Messages*

Component	Message	Cause
NIM	NIM: L7_ATTACH out of order for interface unit x slot x port x	Interface creation out of order.
NIM	NIM: Failed to find interface at unit x slot x port x for event(x)	There is no mapping between the USP and Interface number.
NIM	NIM: L7_DETACH out of order for interface unit x slot x port x	Interface creation out of order.
NIM	NIM: L7_DELETE out of order for interface unit x slot x port x	Interface creation out of order.
NIM	NIM: event(x),intf(x),component(x), in wrong phase	An event was issued to NIM during the wrong configuration phase (probably Phase 1, 2, or WMU).
NIM	NIM: Failed to notify users of interface change	Event was not propagated to the system.
NIM	NIM: failed to send message to NIM message Queue.	NIM message queue full or non-existent.
NIM	NIM: Failed to notify the components of L7_CREATE event	Interface not created.
NIM	NIM: Attempted event (x), on USP x.x.x before phase 3	A component issued an interface event during the wrong initialization phase.
NIM	NIM: incorrect phase for operation	An API call was made during the wrong initialization phase.
NIM	NIM: Component(x) failed on event(x) for interface	A component responded with a fail indication for an interface event.
NIM	NIM: Timeout event(x), interface remainingMask = xxxx	A component did not respond before the NIM timeout occurred.

Table 20. *SIM Log Message*

Component	Message	Cause
SIM	IP address conflict on service port/network port for IP address x.x.x.x. Conflicting host MAC address is xx:xx:xx:xx:xx:xx	This message appears when an address conflict is detected in the LAN for the service port/network port IP.

Table 21. *System Log Messages*

Component	Message	Cause
SYSTEM	Configuration file fastpath.cfg size is 0 (zero) bytes	The configuration file could not be read. This message may occur on a system for which no configuration has ever been saved or for which configuration has been erased.
SYSTEM	could not separate SYSAPI_CONFIG_FILENAME	The configuration file could not be read. This message may occur on a system for which no configuration has ever been saved or for which configuration has been erased.
SYSTEM	Building defaults for file *file name* version *version num*	Configuration did not exist or could not be read for the specified feature or file. Default configuration values will be used. The file name and version are indicated.
SYSTEM	File *filename*: same version (*version num*) but the sizes (*version size* – *expected version size*) differ	The configuration file which was loaded was of a different size than expected for the version number. This message indicates the configuration file needed to be migrated to the version number appropriate for the code image. This message may appear after upgrading the code image to a more current release.
SYSTEM	Migrating config file *filename* from version *version num* to *version num*	The configuration file identified was migrated from a previous version number. Both the old and new version number are specified. This message may appear after upgrading the code image to a more current release.
SYSTEM	Building Defaults	Configuration did not exist or could not be read for the specified feature. Default configuration values will be used.
SYSTEM	sysapiCfgFileGet failed size = *expected size of file* version = *expected version*	Configuration did not exist or could not be read for the specified feature. This message is usually followed by a message indicating that default configuration values will be used.

Utilities

Table 22. *Trap Mgr Log Message*

Component	Message	Cause
Trap Mgr	Link Up/Down: unit/slot/port	An interface changed link state.

Table 23. *DHCP Filtering Log Messages*

Component	Message	Cause
DHCP Filtering	Unable to create r/w lock for DHCP Filtering	Unable to create semaphore used for dhcp filtering configuration structure.
DHCP Filtering	Failed to register with nv Store.	Unable to register save and restore functions for configuration save.
DHCP Filtering	Failed to register with NIM	Unable to register with NIM for interface callback functions.
DHCP Filtering	Error on call to sysapiCfgFileWrite file	Error on trying to save configuration.

Table 24. *NVStore Log Messages*

Component	Message	Cause
NVStore	Building defaults for file XXX	A component's configuration file does not exist or the file's checksum is incorrect so the component's default configuration file is built.
NVStore	Error on call to osapiFsWrite routine on file XXX	Either the file cannot be opened or the OS's file I/O returned an error trying to write to the file.
NVStore	File XXX corrupted from file system. Checksum mismatch.	The calculated checksum of a component's configuration file in the file system did not match the checksum of the file in memory.
NVStore	Migrating config file XXX from version Y to Z	A configuration file version mismatch was detected so a configuration file migration has started.

Table 25. *RADIUS Log Messages*

Component	Message	Cause
RADIUS	RADIUS: Invalid data length - xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Failed to send the request	A problem communicating with the RADIUS server.
RADIUS	RADIUS: Failed to send all of the request	A problem communicating with the RADIUS server during transmit.
RADIUS	RADIUS: Could not get the Task Sync semaphore!	Resource issue with RADIUS Client service.
RADIUS	RADIUS: Buffer is too small for response processing	RADIUS Client attempted to build a response larger than resources allow.

Table 25. *RADIUS Log Messages (continued)*

Component	Message	Cause
RADIUS	RADIUS: Could not allocate accounting requestInfo	Resource issue with RADIUS Client service.
RADIUS	RADIUS: Could not allocate requestInfo	Resource issue with RADIUS Client service.
RADIUS	RADIUS: osapiSocketRecvFrom returned error	Error while attempting to read data from the RADIUS server.
RADIUS	RADIUS: Accounting-Response failed to validate, id = xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: User (xxx) needs to respond for challenge	An unexpected challenge was received for a configured user.
RADIUS	RADIUS: Could not allocate a buffer for the packet	Resource issue with RADIUS Client service.
RADIUS	RADIUS: Access-Challenge failed to validate, id = xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Failed to validate Message-Authenticator, id = xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Access-Accept failed to validate, id = xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Invalid packet length – xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Response is missing Message-Authenticator, id = xxx	The RADIUS Client received an invalid message from the server.
RADIUS	RADIUS: Server address doesn't match configured server	RADIUS Client received a server response from an unconfigured server.

Table 26. *TACACS+ Log Messages*

Component	Message	Cause
TACACS+	TACACS+: authentication error, no server to contact	TACACS+ request needed, but no servers are configured.
TACACS+	TACACS+: connection failed to server x.x.x.x	TACACS+ request sent to server x.x.x.x but no response was received.
TACACS+	TACACS+: no key configured to encrypt packet for server x.x.x.x	No key configured for the specified server.
TACACS+	TACACS+: received invalid packet type from server.	Received packet type that is not supported.
TACACS+	TACACS+: invalid major version in received packet.	Major version mismatch.
TACACS+	TACACS+: invalid minor version in received packet.	Minor version mismatch.

Table 27. *LLDP Log Message*

Component	Message	Cause
LLDP	lldpTask(): invalid message type:xx. xxxxxx:xx	Unsupported LLDP packet received.

Table 28. *SNTP Log Message*

Component	Message	Cause
SNTP	SNTP: system clock synchronized on %s UTC	Indicates that SNTP has successfully synchronized the time of the box with the server.

Table 29. *DHCPv6 Client Log Messages*

Component	Message	Cause
DHCP6 Client	ip6Map dhcp add failed.	This message appears when the update of a DHCP leased IP address to IP6Map fails.
DHCP6 Client	osapiNetAddrV6Add failed on interface xxx.	This message appears when the update of a DHCP leased IP address to the kernel IP Stack fails.
DHCP6 Client	Failed to add DNS Server xxx to DNS Client.	This message appears when the update of a DNS6 Server address given by the DHCPv6 Server to the DNS6 Client fails.
DHCP6 Client	Failed to add Domain name xxx to DNS Client.	This message appears when the update of a DNS6 Domain name info given by the DHCPv6 Server to the DNS6 Client fails.

Table 30. *DHCPv4 Client Log Messages*

Component	Message	Cause
DHCP4 Client	Unsupported subOption (xxx) in Vendor Specific Option in received DHCP pkt	This message appears when a message is received from the DHCP Server that contains an un-supported Vendor Option.
DHCP4 Client	Failed to acquire an IP address on xxx; DHCP Server did not respond.	This message appears when the DHCP Client fails to lease an IP address from the DHCP Server.
DHCP4 Client	DNS name server entry add failed.	This message appears when the update of a DNS Domain name server info given by the DHCP Server to the DNS Client fails.
DHCP4 Client	DNS domain name list entry addition failed.	This message appears when the update of a DNS Domain name list info given by the DHCP Server to the DNS Client fails.
DHCP4 Client	Interface xxx Link State is Down. Connect the port and try again.	This message appears when the Network protocol is configured with DHCP without any active links in the Management VLAN.

Management

Table 31. *SNMP Log Message*

Component	Message	Cause
SNMP	EDB Callback: Unit Join: x.	A new unit has joined the stack.

Table 32. *EmWeb Log Messages*

Component	Message	Cause
EmWeb	EMWEB (Telnet): Max number of Telnet login sessions exceeded	A user attempted to connect via telnet when the maximum number of telnet sessions were already active.
EmWeb	EMWEB (SSH): Max number of SSH login sessions exceeded	A user attempted to connect via SSH when the maximum number of SSH sessions were already active.
EmWeb	Handle table overflow	All the available EmWeb connection handles are being used and the connection could not be made.
EmWeb	*ConnectionType* EmWeb socket accept() failed: errno	Socket accept failure for the specified connection type.
EmWeb	ewsNetHTTPReceive failure in NetReceiveLoop() - closing connection.	Socket receive failure.
EmWeb	EmWeb: connection allocation failed	Memory allocation failure for the new connection.
EmWeb	EMWEB TransmitPending: EWOULDBLOCK error sending data	Socket error on send.
EmWeb	ewaNetHTTPEnd: internal error - handle not in Handle table	EmWeb handle index not valid.
EmWeb	ewsNetHTTPReceive:recvBufCnt exceeds MAX_-QUEUED_RECV_BUFS!	The receive buffer limit has been reached. Bad request or DoS attack.
EmWeb	EmWeb accept: XXXX	Accept function for new SSH connection failed. XXXX indicates the error info.

Table 33. *CLI_UTIL Log Messages*

Component	Message	Cause
CLI_UTIL	Telnet Send Failed errno = 0x%x	Failed to send text string to the telnet client.
CLI_UTIL	osapiFsDir failed	Failed to obtain the directory information from a volume's directory.

Table 34. *WEB Log Messages*

Component	Message	Cause
WEB	Max clients exceeded	This message is shown when the maximum allowed java client connections to the switch is exceeded.

Table 34. *WEB Log Messages*

Component	Message	Cause
WEB	Error on send to sockfd XXXX, closing connection	Failed to send data to the java clients through the socket.
WEB	# (XXXX) Form Submission Failed. No Action Taken.	The form submission failed and no action is taken. XXXX indicates the file under consideration.
WEB	ewaFormServe_file_download() - WEB Unknown return code from tftp download result	Unknown error returned while downloading file using TFTP from web interface.
WEB	ewaFormServe_file_upload() - Unknown return code from tftp upload result	Unknown error returned while uploading file using TFTP from web interface.
WEB	Web UI Screen with unspecified access attempted to be brought up	Failed to get application-specific authorization handle provided to EmWeb/Server by the application in ewsAuthRegister(). The specified web page will be served in read-only mode.

Table 35. *CLI_WEB_MGR Log Messages*

Component	Message	Cause
CLI_WEB_MGR	File size is greater than 2K	The banner file size is greater than 2K bytes.
CLI_WEB_MGR	No. of rows greater than allowed maximum of XXXX	When the number of rows exceeds the maximum allowed rows.

Table 36. *SSHD Log Messages*

Component	Message	Cause
SSHD	SSHD: Unable to create the global (data) semaphore	Failed to create semaphore for global data protection.
SSHD	SSHD: Msg Queue is full, event = XXXX	Failed to send the message to the SSHD message queue as message queue is full. XXXX indicates the event to be sent.
SSHD	SSHD: Unknown UI event in message, event = XXXX	Failed to dispatch the UI event to the appropriate SSHD function as it's an invalid event. XXXX indicates the event to be dispatched.
SSHD	sshdApiCnfgrCommand: Failed calling sshdIssueCmd.	Failed to send the message to the SSHD message queue.

Table 37. *SSLT Log Messages*

Component	Message	Cause
SSLT	SSLT: Exceeded maximum, ssltConnectionTask	Exceeded maximum allowed SSLT connections.
SSLT	SSLT: Error creating Secure server socket6	Failed to create secure server socket for IPV6.

Table 37. *SSLT Log Messages*

Component	Message	Cause
SSLT	SSLT: Can't connect to unsecure server at XXXX, result = YYYY, errno = ZZZZ	Failed to open connection to unsecure server. XXXX is the unsecure server socket address. YYYY is the result returned from connect function and ZZZZ is the error code.
SSLT	SSLT: Msg Queue is full, event = XXXX	Failed to send the received message to the SSLT message queue as message queue is full. XXXX indicates the event to be sent.
SSLT	SSLT: Unknown UI event in message, event = XXXX	Failed to dispatch the received UI event to the appropriate SSLT function as it’s an invalid event. XXXX indicates the event to be dispatched.
SSLT	ssltApiCnfgrCommand: Failed calling ssltIssueCmd.	Failed to send the message to the SSLT message queue.
SSLT	SSLT: Error loading certificate from file XXXX	Failed while loading the SSLcertificate from specified file. XXXX indicates the file from where the certificate is being read.
SSLT	SSLT: Error loading private key from file	Failed while loading private key for SSL connection.
SSLT	SSLT: Error setting cipher list (no valid ciphers)	Failed while setting cipher list.
SSLT	SSLT: Could not delete the SSL semaphores	Failed to delete SSL semaphores during cleanup.of all resources associated with the OpenSSL Locking semaphores.

Table 38. *User_Manager Log Messages*

Component	Message	Cause
User_Manager	User Login Failed for XXXX	Failed to authenticate user login. XXXX indicates the username to be authenticated.
User_Manager	Access level for user XXXX could not be determined. Setting to Level 1.	Invalid access level specified for the user. The access level is set to Level 1. XXXX indicates the username.
User_Manager	Could not migrate config file XXXX from version YYYY to ZZZZ. Using defaults.	Failed to migrate the config file. XXXX is the config file name. YYYY is the old version number and ZZZZ is the new version number.

Switching

Table 39. *Protected Ports Log Messages*

Component	Message	Cause
Protected Ports	Protected Port: failed to save configuration	This appears when the protected port configuration cannot be saved.
Protected Ports	protectedPortCnfgrInitPhase1Process: Unable to create r/w lock for protected Port	This appears when protectedPortCfgRWLock Fails.
Protected Ports	protectedPortCnfgrInitPhase2Process: Unable to register for VLAN change callback	This appears when nimRegisterIntfChange with VLAN fails.
Protected Ports	Cannot add interface xxx to group yyy	This appears when an interface could not be added to a particular group.
Protected Ports	unable to set protected port group	This appears when a dtl call fails to add interface mask at the driver level.
Protected Ports	Cannot delete interface xxx from group yyy	This appears when a dtl call to delete an interface from a group fails.
Protected Ports	Cannot update group YYY after deleting interface XXX	This message appears when an update group for a interface deletion fails.
Protected Ports	Received an interface change callback while not ready to receive it	This appears when an interface change call back has come before the protected port component is ready.

Table 40. *IP Subnet VLANS Log Messages*

Component	Message	Cause
IP subnet VLANs	ERROR vlanIpSubnetSubnetValid:Invalid subnet	This occurs when an invalid pair of subnet and netmask has come from the CLI.
IP subnet VLANs	IP Subnet Vlans: failed to save configuration	This message appears when save configuration of subnet VLANs failed.
IP subnet VLANs	vlanIpSubnetCnfgrInitPhase1Process: Unable to create r/w lock for vlanIpSubnet	This appears when a read/write lock creations fails.
IP subnet VLANs	vlanIpSubnetCnfgrInitPhase2Process: Unable to register for VLAN change callback	This appears when this component unable to register for vlan change notifications.
IP subnet VLANs	vlanIpSubnetCnfgrFiniPhase1Process: could not delete avl semaphore	This appears when a semaphore deletion of this component fails.
IP subnet VLANs	vlanIpSubnetDtlVlanCreate: Failed	This appears when a dtl call fails to add an entry into the table.
IP subnet VLANs	vlanIpSubnetSubnetDeleteApply: Failed	This appears when a dtl fails to delete an entry from the table.
IP subnet VLANs	vlanIpSubnetVlanChangeCallback: Failed to add an Entry	This appears when a dtl fails to add an entry for a vlan add notify event.
IP subnet VLANs	vlanIpSubnetVlanChangeCallback: Failed to delete an Entry	This appears when a dtl fails to delete an entry for an vlan delete notify event.

Table 41. *Mac-based VLANs Log Messages*

Component	Message	Cause
MAC based VLANs	MAC VLANs: Failed to save configuration	This message appears when save configuration of Mac VLANs failed.
MAC based VLANs	vlanMacCnfgrInitPhase1Process: Unable to create r/w lock for vlanMac	This appears when a read/write lock creations fails.
MAC based VLANs	Unable to register for VLAN change callback	This appears when this component unable to register for vlan change notifications.
MAC based VLANs	vlanMacCnfgrFiniPhase1Process: could not delete avl semaphore	This appears when a semaphore deletion of this component fails.
MAC based VLANs	vlanMacAddApply: Failed to add an entry	This appears when a dtl call fails to add an entry into the table.
MAC based VLANs	vlanMacDeleteApply: Unable to delete an Entry	This appears when a dtl fails to delete an entry from the table.
MAC based VLANs	vlanMacVlanChangeCallback: Failed to add an entry	This appears when a dtl fails to add an entry for a vlan add notify event.
MAC based VLANs	vlanMacVlanChangeCallback: Failed to delete an entry	This appears when a dtl fails to delete an entry for an vlan delete notify event.

Table 42. *802.1X Log Messages*

Component	Message	Cause
802.1X	*function*: Failed calling dot1xIssueCmd	802.1X message queue is full.
802.1X	*function:* EAP message not received from server	RADIUS server did not send required EAP message.
802.1X	*function*: Out of System buffers	802.1X cannot process/transmit message due to lack of internal buffers.
802.1X	*function*: could not set state to *authorized/unauthorized*, intf xxx	DTL call failed setting authorization state of the port.
802.1X	dot1xApplyConfigData: Unable to *enable/disable* dot1x in driver	DTL call failed enabling/disabling 802.1X.
802.1X	dot1xSendRespToServer: dot1xRadiusAccessRequestSend failed	Failed sending message to RADIUS server.
802.1X	dot1xRadiusAcceptProcess: error calling radiusAccountingStart, ifIndex = xxx	Failed sending accounting start to RADIUS server.
802.1X	*function*: failed sending terminate cause, intf xxx	Failed sending accounting stop to RADIUS server.

Table 43. *IGMP Snooping Log Messages*

Component	Message	Cause
IGMP Snooping	*function*: osapiMessageSend failed	IGMP Snooping message queue is full.
IGMP Snooping	Failed to set global igmp snooping mode to xxx	Failed to set global IGMP Snooping mode due to message queue being full.

Table 43. *IGMP Snooping Log Messages (continued)*

Component	Message	Cause
IGMP Snooping	Failed to set igmp snooping mode xxx for interface yyy	Failed to set interface IGMP Snooping mode due to message queue being full.
IGMP Snooping	Failed to set igmp mrouter mode xxx for interface yyy	Failed to set interface multicast router mode due to IGMP Snooping message queue being full.
IGMP Snooping	Failed to set igmp snooping mode xxx for vlan yyy	Failed to set VLAN IGM Snooping mode due to message queue being full.
IGMP Snooping	Failed to set igmp mrouter mode%d for interface xxx on Vlan yyy	Failed to set VLAN multicast router mode due to IGMP Snooping message queue being full.
IGMP Snooping	snoopCnfgrInitPhase1Process: Error allocating small buffers	Could not allocate buffers for small IGMP packets.
IGMP Snooping	snoopCnfgrInitPhase1Process: Error allocating large buffers	Could not allocate buffers for large IGMP packets.

Table 44. *GARP/GVRP/GMRP Log Messages*

Component	Message	Cause
GARP/GVRP/ GMRP	garpSpanState, garpIfStateChange, GarpIssueCmd, garpDot1sChangeCallBack, garpApiCnfgrCommand, garpLeaveAllTimerCallback, garpTimerCallback: QUEUE SEND FAILURE:	The garpQueue is full, logs specifics of the message content like internal interface number, type of message, etc.
GARP/GVRP/ GMRP	GarpSendPDU: QUEUE SEND FAILURE	The garpPduQueue is full, logs specific of the GPDU, internal interface number, vlan id, buffer handle, etc.
GARP/GVRP/ GMRP	garpMapIntfIsConfigurable, gmrpMapIntfIsConfigurable: Error accessing GARP/GMRP config data for interface %d in garpMapIntfIsConfigurable.	A default configuration does not exist for this interface. Typically a case when a new interface is created and has no preconfiguration.
GARP/GVRP/ GMRP	garpTraceMsgQueueUsage: garpQueue usage has exceeded fifty/eighty/ninety percent	Traces the build up of message queue. Helpful in determining the load on GARP.
GARP/GVRP/ GMRP	gid_destroy_port: Error Removing port %d registration for vlan-mac %d - %02X:%02X:%02X:%02X:%02X:%02 X	Mismatch between the gmd (gmrp database) and MFDB.
GARP/GVRP/ GMRP	gmd_create_entry**:** GMRP failure adding MFDB entry: vlan %d and address %s	MFDB table is full.

Table 45. *802.3ad Log Messages*

Component	Message	Cause
802.3ad	dot3adReceiveMachine: received default event %x	Received a LAG PDU and the RX state machine is ignoring this LAGPDU.

Table 45. *802.3ad Log Messages*

Component	Message	Cause
802.3ad	dot3adNimEventCompletionCallback, dot3adNimEventCreateCompletionCallback: DOT3AD: notification failed for event(%d), intf(%d), reason(%d)	The event sent to NIM was not completed successfully.

Table 46. *FDB Log Message*

Component	Message	Cause
FDB	fdbSetAddressAgingTimeOut: Failure setting fid %d address aging timeout to %d	Unable to set the age time in the hardware.

Table 47. *Double VLAN Tag Log Message*

Component	Message	Cause
Double Vlan Tag	dvlantagIntfIsConfigurable: Error accessing dvlantag config data for interface %d	A default configuration does not exist for this interface. Typically a case when a new interface is created and has no preconfiguration.

Table 48. *IPv6 Provisioning Log Message*

Component	Message	Cause
IPV6 Provisioning	ipv6ProvIntfIsConfigurable: Error accessing IPv6 Provisioning config data for interface %d	A default configuration does not exist for this interface. Typically a case when a new interface is created and has no preconfiguration.

Table 49. *MFDB Log Message*

Component	Message	Cause
MFDB	mfdbTreeEntryUpdate: entry does not exist	Trying to update a non existing entry.

Table 50. *802.1Q Log Messages*

Component	Message	Cause
802.1Q	dot1qIssueCmd: Unable to send message %d to dot1qMsgQueue for vlan %d - %d msgs in queue	dot1qMsgQueue is full.
802.1Q	dot1qVlanCreateProcess: Attempt to create a vlan with an invalid vlan id %d ; VLAN %d not in range,	This accommodates for reserved vlan ids. i.e. 4094 - x.
802.1Q	dot1qMapIntfIsConfigurable: Error accessing DOT1Q config data for interface %d in dot1qMapIntfIsConfigurable.	A default configuration does not exist for this interface. Typically a case when a new interface is created and has no preconfiguration.
802.1Q	dot1qVlanDeleteProcess: Deleting the default VLAN	Typically encountered during clear Vlan and clear config.

Table 50. *802.1Q Log Messages (continued)*

Component	Message	Cause
802.1Q	dot1qVlanMemberSetModify, dot1qVlanTaggedMemberSetModify: Dynamic entry %d can only be modified after it is converted to static	If this vlan is learned via GVRP then we cannot modify its member set via management.
802.1Q	dtl failure when adding ports to vlan id %d - portMask = %s	Failed to add the ports to VLAN entry in hardware.
802.1Q	dtl failure when deleting ports from vlan id %d - portMask = %s	Failed to delete the ports for a VLAN entry from the hardware.
802.1Q	dtl failure when adding ports to tagged list for vlan id %d - portMask = %s	Failed to add the port to the tagged list in hardware.
802.1Q	dtl failure when deleting ports from tagged list for vlan id %d - portMask = %s"	Failed to delete the port to the tagged list from the hardware.
802.1Q	dot1qTask: unsuccessful return code on receive from dot1qMsgQueue: %08x"	Failed to receive the dot1q message from dot1q message queue.
802.1Q	Unable to apply VLAN creation request for VLAN ID %d, Database reached MAX VLAN count!	Failed to create VLAN ID, VLAN Database reached maximum values.
802.1Q	Attempt to create a vlan (%d) that already exists	Creation of the existing Dynamic VLAN ID from the CLI.
802.1Q	DTL call to create VLAN %d failed with rc %d"	Failed to create VLAN ID in hardware.
802.1Q	Problem unrolling data for VLAN %d	Failed to delete VLAN from the VLAN database after failure of VLAN hardware creation.
802.1Q	VLan %d does not exist	Failed to delete VLAN entry.
802.1Q	VLan %d requestor type %d does not exist	Failed to delete dynamic VLAN ID if the given requestor is not valid.
802.1Q	Can not delete the VLAN, Some unknown component has taken the ownership!	Failed to delete, as some unknown component has taken the ownership.
802.1Q	Not valid permission to delete the VLAN %d requestor %d	Failed to delete the VLAN ID as the given requestor and VLAN entry status are not same.
802.1Q	VLAN Delete Call failed in driver for vlan %d	Failed to delete VLAN ID from the hardware.
802.1Q	Problem deleting data for VLAN %d	Failed to delete VLAN ID from the VLAN database.
802.1Q	Dynamic entry %d can only be modified after it is converted to static	Failed to modify the VLAN group filter
802.1Q	Cannot find vlan %d to convert it to static	Failed to convert Dynamic VLAN to static VLAN. VLAN ID not exists.
802.1Q	Only Dynamically created VLANs can be converted	Error while trying to convert the static created VLAN ID to static.
802.1Q	Cannot modify tagging of interface %s to non existence vlan %d"	Error for a given interface sets the tagging property for all the VLANs in the vlan mask.
802.1Q	Error in updating data for VLAN %d in VLAN database	Failed to add VLAN entry into VLAN database.
802.1Q	DTL call to create VLAN %d failed with rc %d	Failed to add VLAN entry in hardware.

Table 50. *802.1Q Log Messages (continued)*

Component	Message	Cause
802.1Q	Not valid permission to delete the VLAN %d	Failed to delete static VLAN ID. Invalid requestor.
802.1Q	Attempt to set access vlan with an invalid vlan id %d	Invalid VLAN ID.
802.1Q	Attempt to set access vlan with (%d) that does not exist	VLAN ID not exists.
802.1Q	VLAN create currently underway for VLAN ID %d	Creating a VLAN which is already under process of creation.
802.1Q	VLAN ID %d is already exists as static VLAN	Trying to create already existing static VLAN ID.
802.1Q	Cannot put a message on dot1q msg Queue, Returns:%d	Failed to send Dot1q message on Dot1q message Queue.
802.1Q	Invalid dot1q Interface: %s	Failed to add VLAN to a member of port.
802.1Q	Cannot set membership for user interface %s on management vlan %d	Failed to add VLAN to a member of port.
802.1Q	Incorrect tagmode for vlan tagging. tagmode: %d Interface: %s	Incorrect tagmode for VLAN tagging.
802.1Q	Cannot set tagging for interface %d on non existent VLAN %d"	The VLAN ID does not exist.
802.1Q	Cannot set tagging for interface %d which is not a member of VLAN %d	Failure in Setting the tagging configuration for a interface on a range of VLAN.
802.1Q	VLAN create currently underway for VLAN ID %d"	Trying to create the VLAN ID which is already under process of creation.
802.1Q	VLAN ID %d already exists	Trying to create the VLAN ID which is already exists.
802.1Q	Failed to delete, Default VLAN %d cannot be deleted	Trying to delete Default VLAN ID.
802.1Q	Failed to delete, VLAN ID %d is not a static VLAN	Trying to delete Dynamic VLAN ID from CLI.
802.1Q	Requester %d attempted to release internal VLAN %d: owned by %d	-

Table 51. *802.1S Log Messages*

Component	Message	Cause
802.1S	dot1sIssueCmd: Dot1s Msg Queue is full!!!!Event: %u, on interface: %u, for instance: %u	The message Queue is full.
802.1S	dot1sStateMachineRxBpdu(): Rcvd BPDU Discarded	The current conditions, like port is not enabled or we are currently not finished processing another BPDU on the same interface, does not allow us to process this BPDU.
802.1S	dot1sBpduTransmit(): could not get a buffer	Out of system buffers.

Table 52. *Port Mac Locking Log Message*

Component	Message	Cause
Port Mac Locking	pmlMapIntfIsConfigurable: Error accessing PML config data for interface %d in pmlMapIntfIsConfigurable.	A default configuration does not exist for this interface. Typically a case when a new interface is created and has no preconfiguration.

Table 53. *Protocol-based VLANs Log Messages*

Component	Message	Cause
Protocol Based VLANs	pbVlanCnfgrInitPhase2Process: Unable to register NIM callback	Appears when nimRegisterIntfChange fails to register pbVlan for link state changes.
Protocol Based VLANs	pbVlanCnfgrInitPhase2Process: Unable to register pbVlan callback with VLANs	Appears when VLANRegisterForChange fails to register pbVlan for VLAN changes.
Protocol Based VLANs	pbVlanCnfgrInitPhase2Process: Unable to register pbVlan callback with nvStore	Appears when nvStoreRegister fails to register save and restore functions for configuration save.

QoS

Table 54. *ACL Log Messages*

Component	Message	Cause
ACL	Total number of ACL rules (x) exceeds max (y) on intf i.	The combination of all ACLs applied to an interface has resulted in requiring more rules than the platform supports.
ACL	ACL *name*, rule *x*: This rule is not being logged	The ACL configuration has resulted in a requirement for more logging rules than the platform supports. The specified rule is functioning normally except for the logging action.
ACL	aclLogTask: error logging ACL rule trap for correlator *number*	The system was unable to send an SNMP trap for this ACL rule which contains a logging attribute.
ACL	IP ACL *number*: Forced truncation of one or more rules during config migration	While processing the saved configuration, the system encountered an ACL with more rules than is supported by the current version. This may happen when code is updated to a version supporting fewer rules per ACL than the previous version.

Table 55. *CoS Log Message*

Component	Message	Cause
COS	cosCnfgrInitPhase3Process: Unable to apply saved config -- using factory defaults	The COS component was unable to apply the saved configuration and has initialized to the factory default settings.

Table 56. *DiffServ Log Messages*

Component	Message	Cause
DiffServ	diffserv.c 165: diffServRestore Failed to reset DiffServ. Recommend resetting device	While attempting to clear the running configuration an error was encountered in removing the current settings. This may lead to an inconsistent state in the system and resetting is advised.
DiffServ	Policy invalid for service intf: policy *name*, interface *x*, direction *y*	The DiffServ policy definition is not compatible with the capabilities of the interface specified. Check the platform release notes for information on configuration limitations.

Routing/IPv6 Routing

Table 57. *DHCP Relay Log Messages*

Component	Message	Cause
DHCP relay	REQUEST hops field more than config value	The DHCP relay agent has processed a DHCP request whose HOPS field is larger than the maximum value allowed. The relay agent will not forward a message with a hop count greater than 4.
DHCP relay	Request's seconds field less than the config value	The DHCP relay agent has processed a DHCP request whose SECS field is larger than the configured minimum wait time allowed.
DHCP relay	processDhcpPacket: invalid DHCP packet type: %u\n	The DHCP relay agent has processed an invalid DHCP packet. Such packets are discarded by the relay agent.

Table 58. *OSPFv2 Log Messages*

Component	Message	Cause
OSPFv2	Best route client deregistration failed for OSPF Redist	OSPFv2 registers with the IPv4 routing table manager ("RTO") to be notified of best route changes. There are cases where OSPFv2 deregisters more than once, causing the second deregistration to fail. The failure is harmless.
OSPFv2	XX_Call() failure in _checkTimers for thread 0x869bcc0	An OSPFv2 timer has fired but the message queue that holds the event has filled up. This is normally a fatal error.
OSPFv2	Warning: OSPF LSDB is 90% full (22648 LSAs).	OSPFv2 limits the number of Link State Advertisements (LSAs) that can be stored in the link state database (LSDB). When the database becomes 90 or 95 percent full, OSPFv2 logs this warning. The warning includes the current size of the database.
OSPFv2	The number of LSAs, 25165, in the OSPF LSDB has exceeded the LSDB memory allocation.	When the OSPFv2 LSDB becomes full, OSPFv2 logs this message. OSPFv2 re-originates its router LSAs with the metric of all non-stub links set to the maximum value to encourage other routers to not compute routes through the overloaded router.
OSPFv2	Dropping the DD packet because of MTU mismatch	OSPFv2 ignored a Database Description packet whose MTU is greater than the IP MTU on the interface where the DD was received.
OSPFv2	LSA Checksum error in LsUpdate, dropping LSID 1.2.3.4 checksum 0x1234.	OSPFv2 ignored a received link state advertisement (LSA) whose checksum was incorrect.

Table 59. *OSPFv3 Log Messages*

Component	Message	Cause
OSPFv3	Best route client deregistration failed for OSPFv3 Redist	OSPFv3 registers with the IPv6 routing table manager (“RTO6”) to be notified of best route changes. There are cases where OSPFv3 deregisters more than once, causing the second deregistration to fail. The failure is harmless.
OSPFv3	Warning: OSPF LSDB is 90% full (15292 LSAs).	OSPFv3 limits the number of Link State Advertisements (LSAs) that can be stored in the link state database (LSDB). When the database becomes 90 or 95 percent full, OSPFv3 logs this warning. The warning includes the current size of the database.
OSPFv3	The number of LSAs, 16992, in the OSPF LSDB has exceeded the LSDB memory allocation.	When the OSPFv3 LSDB becomes full, OSPFv3 logs this message. OSPFv3 re-originates its router LSAs with the R-bit clear indicating that OSPFv3 is overloaded.
OSPFv3	LSA Checksum error detected for LSID 1.2.3.4 checksum 0x34f5. OSPFv3 Database may be corrupted.	OSPFv3 periodically verifies the checksum of each LSA in memory. OSPFv3 logs this.

Table 60. *Routing Table Manager Log Messages*

Component	Message	Cause
RTO	RTO is no longer full. Routing table contains xxx best routes, xxx total routes, xxx reserved local routes.	When the number of best routes drops below full capacity, RTO logs this notice. The number of bad adds may give an indication of the number of route adds that failed while RTO was full, but a full routing table is only one reason why this count is incremented.
RTO	RTO is full. Routing table contains xxx best routes, xxx total routes, xxx reserved local routes. The routing table manager stores a limited number of best routes. The count of total routes includes alternate routes, which are not installed in hardware.	The routing table manager, also called “RTO,” stores a limited number of best routes, based on hardware capacity. When the routing table becomes full, RTO logs this alert. The count of total routes includes alternate routes, which are not installed in hardware.

Table 61. *VRRP Log Messages*

Component	Message	Cause
VRRP	VRRP packet of size xxx dropped. Min VRRP packet size is xxx; Max VRRP packet size is xxx.	This message appears when there is flood of VRRP messages in the network.
VRRP	VR xxx on interface xxx started as xxx.	This message appears when the Virtual router is started in the role of a Master or a Backup.
VRRP	This router is the IP address owner for virtual router xxx on interface xxx. Setting the virtual router priority to xxx.	This message appears when the address ownership status for a specific VR is updated. If this router is the address owner for the VR, set the VR's priority to MAX priority (as per RFC 3768). If the router is no longer the address owner, revert the priority.

Table 62. *ARP Log Message*

Component	Message	Cause
ARP	IP address conflict on interface xxx for IP address yyy. Conflicting host MAC address is zzz.	When an address conflict is detected for any IP address on the switch upon reception of ARP packet from another host or router.

Table 63. *RIP Log Message*

Component	Message	Cause
RIP	RIP: discard response from xxx via unexpected interface	When RIP response is received with a source address not matching the incoming interface’s subnet.

Multicast

Table 64. *IGMP/MLD Log Messages*

Component	Message	Cause
IGMP/MLD	MGMD Protocol Heap Memory Init Failed; Family – xxx.	MGMD Heap memory initialization Failed for the specified address family. This message appears when trying to enable MGMD Protocol.
IGMP/MLD	MGMD Protocol Heap Memory De-Init Failed; Family – xxx.	MGMD Heap memory de-initialization Failed for the specified address family. This message appears when trying to disable MGMD (IGMP/MLD) Protocol. As a result of this, the subsequent attempts to enable/disable MGMD will also fail.
IGMP/MLD	MGMD Protocol Initialization Failed; Family – xxx.	MGMD protocol initialization sequence Failed. This could be due to the non-availability of some resources. This message appears when trying to enable MGMD Protocol.
IGMP/MLD	MGMD All Routers Address - xxx Set to the DTL Mcast List Failed; Mode – xxx, intf – xxx.	This message appears when trying to enable/disable MGMD Protocol.
IGMP/MLD	MGMD All Routers Address - xxx Add to the DTL Mcast List Failed.	MGMD All Routers Address addition to the local multicast list Failed. As a result of this, MGMD Multicast packets with this address will not be received at the application.
IGMP/MLD	MGMD All Routers Address – xxx Delete from the DTL Mcast List Failed.	MGMD All Routers Address deletion from the local multicast list Failed. As a result of this, MGMD Multicast packets are still received at the application though MGMD is disabled.
IGMP/MLD	MLDv2 GroupAddr-[FF02::16] Enable with Interpeak Stack Failed; rtrIfNum - xxx, intf – xxx.	Registration of this Group address with the Interpeak stack failed. As a result of this, MLDv2 packets will not be received at the application.
IGMP/MLD	MGMD Group Entry Creation Failed; grpAddr - xxx, rtrIfNum – xxx.	The specified Group Address registration on the specified router interface failed.
IGMP/MLD	MGMD Socket Creation/Initialization Failed for addrFamily – xxx.	MGMD Socket Creation/options Set Failed. As a result of this, the MGMD Control packets cannot be sent out on an interface.

Table 65. *IGMP-Proxy Log Messages*

Component	Message	Cause
IGMP-Proxy/ MLD-Proxy	MGMD-Proxy Protocol Initialization Failed; Family – xxx.	MGMD-Proxy protocol initialization sequence Failed. This could be due to the non-availability of some resources. This message appears when trying to enable MGMD-Proxy Protocol.

Table 65. *IGMP-Proxy Log Messages*

Component	Message	Cause
IGMP-Proxy/ MLD-Proxy	MGMD-Proxy Protocol Heap Memory De-Init Failed; Family – xxx.	MGMD-Proxy Heap memory de-initialization is Failed for the specified address family. This message appears when trying to disable MGMD-Proxy Protocol. As a result of this, the subsequent attempts to enable/disable MGMD-Proxy will also fail.
IGMP-Proxy/ MLD-Proxy	MGMD Proxy Route Entry Creation Failed; grpAddr - xxx, srcAddr – xxx, rtrIfNum – xxx.	Registration of the Multicast Forwarding entry for the specified Source and Group Address Failed when MGMD-Proxy is used.

Table 66. *PIM-SM Log Messages*

Component	Message	Cause
PIMSM	Non-Zero SPT/Data Threshold Rate – xxx is currently Not Supported on this platform.	This message appears when the user tries to configure the PIMSM SPT threshold value.
PIMSM	PIMSM Protocol Heap Memory Init Failed; Family – xxx.	PIMSM Heap memory initialization Failed for the specified address family. This message appears when trying to enable PIMSM Protocol.
PIMSM	PIMSM Protocol Heap Memory De-Init Failed; Family –xxx.	PIMSM Heap memory de-initialization Failed for the specified address family. This message appears when trying to disable PIMSM Protocol. As a result of this, the subsequent attempts to enable/disable PIMSM will also fail.
PIMSM	PIMSM Protocol Initialization Failed; Family –xxx.	PIMSM protocol initialization sequence Failed. This could be due to the non-availability of some resources. This message appears when trying to enable PIMSM Protocol.
PIMSM	PIMSM Protocol De-Initialization Failed; Family – xxx.	PIMSM protocol de-initialization sequence Failed. This message appears when trying to disable PIMSM Protocol.
PIMSM	PIMSM SSM Range Table is Full.	PIMSM SSM Range Table is Full. This message appears when the protocol cannot accommodate new SSM registrations.
PIMSM	PIM All Routers Address – xxx Delete from the DTL Mcast List Failed for intf – xxx.	PIM All Routers Address deletion from the local multicast list Failed. As a result of this, PIM Multicast packets are still received at the application though PIM is disabled.
PIMSM	PIM All Routers Address - xxx Add to the DTL Mcast List Failed for intf – xxx.	PIM All Routers Address addition to the local multicast list Failed. As a result of this, PIM Multicast packets with this address will not be received at the application.

Table 66. *PIM-SM Log Messages (continued)*

Component	Message	Cause
PIMSM	Mcast Forwarding Mode Disable Failed for intf – xxx.	Multicast Forwarding Mode Disable Failed. As a result of this, Multicast packets are still received at the application though no protocol is enabled.
PIMSM	Mcast Forwarding Mode Enable Failed for intf – xxx.	Multicast Forwarding Mode Enable Failed. As a result of this, Multicast packets will not be received at the application though a protocol is enabled.
PIMSM	PIMSMv6 Socket Memb'ship Enable Failed for rtrIfNum - xxx.	PIMSMv6 Socket Creation/options Set with Kernel IP Stack Failed. As a result of this, the PIM Control packets cannot be received on the interface.
PIMSM	PIMSMv6 Socket Memb'ship Disable Failed for rtrIfNum – xxx.	PIMSMv6 Socket Creation/options Disable with Kernel IP Stack Failed. As a result of this, the PIM Control packets are still received on the interface at the application though no protocol is enabled.
PIMSM	PIMSM (S,G,RPt) Table Max Limit – xxx Reached; Cannot accommodate any further routes.	PIMSM Multicast Route table (S,G,RPt) has reached maximum capacity and cannot accommodate new registrations anymore.
PIMSM	PIMSM (S,G) Table Max Limit - xxx Reached; Cannot accommodate any further routes.	PIMSM Multicast Route table (S,G) has reached maximum capacity and cannot accommodate new registrations anymore.
PIMSM	PIMSM (*,G) Table Max Limit - xxx Reached; Cannot accommodate any further routes.	PIMSM Multicast Route table (*,G) has reached maximum capacity and cannot accommodate new registrations anymore.

Table 67. *PIM-DM Log Messages*

Component	Message	Cause
PIMDM	PIMDM Protocol Heap Memory Init Failed; Family – xxx.	PIMDM Heap memory initialization Failed for the specified address family. This message appears when trying to enable PIMDM Protocol.
PIMDM	PIMDM Protocol Heap Memory De-Init Failed; Family –xxx.	PIMDM Heap memory de-initialization Failed for the specified address family. This message appears when trying to disable PIMDM Protocol. As a result of this, the subsequent attempts to enable/disable PIMDM will also fail.
PIMDM	PIMDM Protocol Initialization Failed; Family –xxx.	PIMDM protocol initialization sequence Failed. This could be due to the non-availability of some resources. This message appears when trying to enable PIMDM Protocol.
PIMDM	PIMDM Protocol De-Initialization Failed; Family – xxx.	PIMDM protocol de-initialization sequence Failed. This message appears when trying to disable PIMDM Protocol.

Table 67. *PIM-DM Log Messages (continued)*

Component	Message	Cause
PIMDM	PIM All Routers Address – xxx Delete from the DTL Mcast List Failed for intf – xxx.	PIM All Routers Address deletion from the local multicast list Failed. As a result of this, PIM Multicast packets are still received at the application though PIM is disabled.
PIMDM	PIM All Routers Address - xxx Add to the DTL Mcast List Failed for intf – xxx.	PIM All Routers Address addition to the local multicast list Failed. As a result of this, PIM Multicast packets with this address will not be received at the application.
PIMDM	Mcast Forwarding Mode Disable Failed for intf – xxx.	Multicast Forwarding Mode Disable Failed. As a result of this, Multicast packets are still received at the application though no protocol is enabled.
PIMDM	Mcast Forwarding Mode Enable Failed for intf – xxx.	Multicast Forwarding Mode Enable Failed. As a result of this, Multicast packets will not be received at the application though a protocol is enabled.
PIMDM	PIMDMv6 Socket Memb'ship Enable Failed for rtrIfNum - xxx.	PIMDMv6 Socket Creation/options Set with Kernel IP Stack Failed. As a result of this, the PIM Control packets cannot be received on the interface.
PIMDM	PIMDMv6 Socket Memb'ship Disable Failed for rtrIfNum – xxx.	PIMDMv6 Socket Creation/options Disable with Kernel IP Stack Failed. As a result of this, the PIM Control packets are still received on the interface at the application though no protocol is enabled.
PIMDM	PIMDM FSM Action Invoke Failed; rtrIfNum - xxx Out of Bounds for Event – xxx.	The PIMDM FSM Action invocation Failed due to invalid Routing interface number. In such cases, the FSM Action routine can never be invoked which may result in abnormal behavior. The failed FSM-name can be identified from the specified Event name.
PIMDM	PIMDM Socket Initialization Failed for addrFamily - xxx.	PIMDM Socket Creation/options Set Failed. As a result of this, the PIM Control packets cannot be sent out on an interface.
PIMDM	PIMDMv6 Socket Memb'ship Enable Failed for rtrIfNum - xxx.	Socket options Set to enable the reception of PIMv6 packets Failed. As a result of this, the PIMv6 packets will not be received by the application.
PIMDM	PIMDMv6 Socket Memb'ship Disable Failed for rtrIfNum – xxx.	PIMDMv6 Socket Creation/options Disable with Kernel IP Stack Failed. As a result of this, the PIMv6 Control packets are still received on the interface at the application though no protocol is enabled.
PIMDM	PIMDM MRT Table Max Limit - xxx Reached; Cannot accommodate any further routes.	PIMDM Multicast Route table (S,G) has reached maximum capacity and cannot accommodate new registrations anymore.

Table 68. *DVMRP Log Messages*

Component	Message	Cause
DVMRP	DVMRP Heap memory initialization is Failed for the specified address family.	This message appears when trying to enable DVMRP Protocol
DVMRP	DVMRP Heap memory de-initialization is Failed for the specified address family.	This message appears when trying to disable DVMRP Protocol. As a result of this, the subsequent attempts to enable/disable DVMRP will also fail.
DVMRP	DVMRP protocol initialization sequence Failed.	This could be due to the non-availability of some resources. This message appears when trying to enable DVMRP Protocol.
DVMRP	DVMRP All Routers Address - xxx Delete from the DTL Mcast List Failed for intf – xxx.	DMVRP All Routers Address deletion from the local multicast list Failed. As a result of this, DVMRP Multicast packets are still received at the application though DVMRP is disabled.
DVMRP	Mcast Forwarding Mode Disable Failed for intf – xxx.	The Multicast Forwarding mode Disable Failed for this routing interface.
DVMRP	DVMRP All Routers Address - xxx Add to the DTL Mcast List Failed for intf – xxx.	DMVRP All Routers Address addition to the local multicast list Failed. As a result of this, DVMRP Multicast packets with this address will not be received at the application.
DVMRP	Mcast Forwarding Mode Enable Failed for intf – xxx.	The Multicast Forwarding mode Enable Failed for this routing interface. As a result of this, the ability to forward Multicast packets does not function on this interface.
DVMRP	DVMRP Probe Control message Send Failed on rtrIfNum – xxx.	DVMRP Probe control message send failed. This could mostly be because of a Failure return status of the socket call sendto(). As a result of this, the DVMRP neighbor could be lost in the neighboring DVMRP routers.
DVMRP	DVMRP Prune Control message Send Failed; rtrIfNum – xxx.	Neighbor - %s, SrcAddr - %s, GrpAddr - %s DVMRP Prune control message send failed. This could mostly be because of a Failure return status of the socket call sendto(). As a result of this, the unwanted multicast traffic is still received and forwarded.
DVMRP	DVMRP Probe Control message Send Failed on rtrIfNum –xxx.	DVMRP Probe control message send failed. This could mostly be because of a Failure return status of the socket call sendto(). As a result of this, the DVMRP neighbor could be lost in the neighboring DVMRP routers.

Stacking

Table 69. *EDB Log Message*

Component	Message	Cause
EDB	EDB Callback: Unit Join: *num*.	Unit *num* has joined the stack.

Technologies

Table 70. *SDK Error Messages*

Component	Message	Cause
Lenovo	Invalid USP unit = x, slot = x, port = x	A port was not able to be translated correctly during the receive.
Lenovo	In hapiBroadSystemMacAddress call to 'bcm_l2_addr_add' - FAILED : x	Failed to add an L2 address to the MAC table. This should only happen when a hash collision occurs or the table is full.
Lenovo	Failed installing mirror action - rest of the policy applied successfully	A previously configured probe port is not being used in the policy. The release notes state that only a single probe port can be configured.
Lenovo	Policy x does not contain rule x	The rule was not added to the policy due to a discrepancy in the rule count for this specific policy. Additionally, the message can be displayed when an old rule is being modified, but the old rule is not in the policy.
Lenovo	ERROR: policy x, tmpPolicy x, size x, data x x x x x x x x	An issue installing the policy due to a possible duplicate hash.
Lenovo	ACL x not found in internal table	Attempting to delete a non-existent ACL.
Lenovo	ACL internal table overflow	Attempting to add an ACL to a full table.
Lenovo	In hapiBroadQosCosQueueConfig, Failed to configure minimum bandwidth. Available bandwidth x	Attempting to configure the bandwidth beyond it's capabilities.
Lenovo	USL: failed to put sync response on queue	A response to a sync request was not enqueued. This could indicate that a previous sync request was received after it was timed out.
Lenovo	USL: failed to sync ipmc table on unit = x	Either the transport failed or the message was dropped.
Lenovo	usl_task_ipmc_msg_send(): failed to send with x	Either the transport failed or the message was dropped.
Lenovo	USL: No available entries in the STG table	The Spanning Tree Group table is full in USL.
Lenovo	USL: failed to sync stg table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Lenovo	USL: A Trunk doesn't exist in USL	Attempting to modify a Trunk that doesn't exist.

Table 70. *SDK Error Messages (continued)*

Component	Message	Cause
Lenovo	USL: A Trunk being created by bcmx already existed in USL	Possible synchronization issue between the application, hardware, and sync layer.
Lenovo	USL: A Trunk being destroyed doesn't exist in USL	Possible synchronization issue between the application, hardware, and sync layer.
Lenovo	USL: A Trunk being set doesn't exist in USL	Possible synchronization issue between the application, hardware, and sync layer.
Lenovo	USL: failed to sync trunk table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Lenovo	USL: Mcast entry not found on a join	Possible synchronization issue between the application, hardware, and sync layer.
Lenovo	USL: Mcast entry not found on a leave	Possible synchronization issue between the application, hardware, and sync layer.
Lenovo	USL: failed to sync dVLAN data on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Lenovo	USL: failed to sync policy table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Lenovo	USL: failed to sync VLAN table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Lenovo	Invalid LAG id x	Possible synchronization issue between the BCM driver and HAPI.
Lenovo	Invalid uport calculated from the BCM uport bcmx_l2_addr->lport = x	Uport not valid from BCM driver.
Lenovo	Invalid USP calculated from the BCM uport\nbcmx_l2_addr->lport = x	USP not able to be calculated from the learn event for BCM driver.
Lenovo	Unable to insert route R/P	Route R with prefix P could not be inserted in the hardware route table. A retry will be issued.
Lenovo	Unable to Insert host H	Host H could not be inserted in hardware host table. A retry will be issued.
Lenovo	USL: failed to sync L3 Intf table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Lenovo	USL: failed to sync L3 Host table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.

Table 70. *SDK Error Messages (continued)*

Component	Message	Cause
Lenovo	USL: failed to sync L3 Route table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Lenovo	USL: failed to sync initiator table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Lenovo	USL: failed to sync terminator table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.
Lenovo	USL: failed to sync ip-multicast table on unit = x	Could not synchronize unit x due to a transport failure or API issue on remote unit. A synchronization retry will be issued.

O/S Support

Table 71. *Linux BSP Log Message*

Component	Message	Cause
Linux BSP	rc = 10	Second message logged at bootup, right after *Starting code…. Always* logged.

Table 72. *OSAPI Linux Log Messages*

Component	Message	Cause
OSAPI Linux	osapiNetLinkNeighDump: could not open socket! - or – ipstkNdpFlush: could not open socket! – or – osapiNetlinkDumpOpen: unable to bind socket! errno = XX	Could not open a NetLink® socket. Make sure “ARP Daemon support” (CONFIG_ARPD) is enabled in the Linux kernel, if the reference kernel binary is not being used.
OSAPI Linux	ipstkNdpFlush: sending delete failed	Failed when telling the kernel to delete a neighbor table entry (the message is incorrect).
OSAPI Linux	unable to open /proc/net/ipv6/conf/default/hop_limit	IPv6 MIB objects read, but /proc file system is not mounted, or running kernel does not have IPV6 support.
OSAPI Linux	osapimRouteEntryAdd, errno XX adding 0xYY to ZZ – or – osapimRouteEntryDelete, errno XX deleting 0xYY from ZZ	Error adding or deleting an IPv4 route (listed in hex as YY), on the interface with Linux name ZZ Error code can be looked up in errno.h.
OSAPI Linux	l3intfAddRoute: Failed to Add Route – or – l3intfDeleteRoute: Failed to Delete Route	Error adding or deleting a default gateway in the kernel’s routing table (the function is really osapiRawMRouteAdd()/Delete()).

Table 72. *OSAPI Linux Log Messages (continued)*

Component	Message	Cause
OSAPI Linux	osapiNetIfConfig: ioctl on XX failed: addr: 0xYY, err: ZZ – or – osapiNetIPSet: ioctl on XX failed: addr: 0x%YY	Failed trying to set the IP address (in hex as YY) of the interface with Linux name XX, and the interface does not exist. Sometimes this is a harmless race condition (e.g. we try to set address 0 when DHCPing on the network port (dtl0) at bootup, before it's created using TAP).
OSAPI Linux	ping: sendto error	Trouble sending an ICMP echo request packet for the UI ping command. Maybe there was no route to that network.
OSAPI Linux	Failed to Create Interface	Out of memory at system initialization time.
OSAPI Linux	TAP Unable to open XX	The /dev/tap file is missing, or, if not using the reference kernel binary, the kernel is missing "Universal TUN/TAP device driver support" (CONFIG_TUN).
OSAPI Linux	Tap monitor task is spinning on select failures – then – Tap monitor select failed: XX	Trouble reading the /dev/tap device, check the error message XX for details.
OSAPI Linux	Log_Init: log file error - creating new log file	This pertains to the "event log" persistent file in flash. Either it did not exist, or had a bad checksum.
OSAPI Linux	Log_Init: Flash (event) log full; erasing	Event log file has been cleared; happens at boot time.
OSAPI Linux	Log_Init: Corrupt event log; erasing	Event log file had a non-blank entry after a blank entry; therefore, something was messed up.
OSAPI Linux	Failed to Set Interface IP Address – or – IP Netmask – or – Broadcast Address – or – Flags – or – Hardware Address – or – Failed to Retrieve Interface Flags	Trouble adding VRRP IP or MAC address(es) to a Linux network interface.

Appendix A. Getting Help and Technical Assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

Use this information to obtain additional information about Lenovo and Lenovo products, and determine what to do if you experience a problem with your Lenovo system or optional device.

Before you call, make sure that you have taken these steps to try to solve the problem yourself.

If you believe that you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare before you call.

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated software, firmware, and operating-system device drivers for your Lenovo product. The Lenovo Warranty terms and conditions state that you, the owner of the Lenovo product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.

Go to the Lenovo Support portal at https://datacentersupport.lenovo.com/us/en/ to check the product service information.

- Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
  - Hardware and Software Maintenance agreement contract numbers, if applicable
  - Machine type number
  - Model number
  - Serial number
  - Current firmware levels
  - Other pertinent information such as error messages and logs
- Start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The Lenovo product documentation also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

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Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

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Attn: Open Source Team / Source Code Requests

8001 Development Dr.

Morrisville, NC 27560

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Particulate Contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document.

Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the device to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If Lenovo determines that the levels of particulates or gases in your environment have caused damage to the device, Lenovo may condition provision of repair or replacement of devices or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility..

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days

[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

[2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

[3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

Telecommunication Regulatory Statement

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact a Lenovo representative or reseller for any questions.

Electronic Emission Notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used to meet FCC emission limits. Lenovo is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that might cause undesired operation.

Industry Canada Class A Emission Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de Conformité à la Réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A Statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

European Union - Compliance to the Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC (until April 19, 2016) and EU Council Directive 2014/30/EU (from April 20, 2016) on the approximation of the laws of the Member States relating to electromagnetic compatibility. Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers.

This product has been tested and found to comply with the limits for Class A equipment according to European Standards harmonized in the Directives in compliance. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

CE Lenovo, Einsteinova 21, 851 01 Bratislava, Slovakia

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Germany Class A Statement

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EG Richtlinie 2004/108/EC (früher 89/336/EWG), für Geräte der Klasse A.

Dieses Gerät ist berechtigt, in übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die Lenovo (Deutschland) GmbH, Gropiusplatz 10, D-70563 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

Nach der EN 55022: "Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen."

Nach dem EMVG: Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der Lenovo empfohlene Kabel angeschlossen werden. Lenovo übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der Lenovo verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der Lenovo gesteckt/eingebaut werden.

Deutschland:

Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmittein
Dieses Produkt entspricht dem “Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln” EMVG (früher “Gesetz über die elektromagnetische Verträglichkeit von Geräten"). Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EG Richtlinie 2004/108/EC (früher 89/336/EWG), für Geräte der Klasse A.

Dieses Gerät ist berechtigt, in übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die Lenovo (Deutschland) GmbH, Gropiusplatz 10, D-70563 Stuttgart.

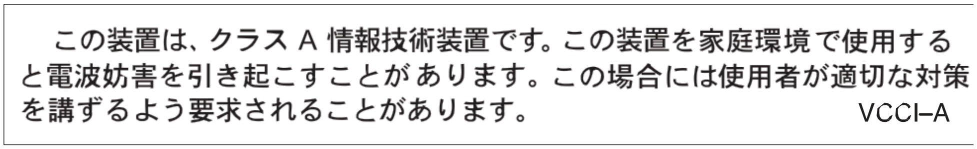
Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:
Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

Nach der EN 55022: “Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen."

Nach dem EMVG: “Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind.” (Auszug aus dem EMVG, Paragraph 3, Abs. 4). Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt 14/93) kostenpflichtig.

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den Handbüchern angegeben, zu installieren und zu betreiben.

Japan VCCI Class A Statement

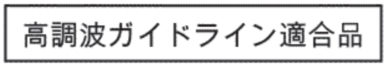


この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

VCCI–A

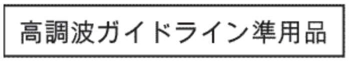
This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

Japan Electronics and Information Technology Industries Association (JEITA) Statement



高調波ガイドライン適合品

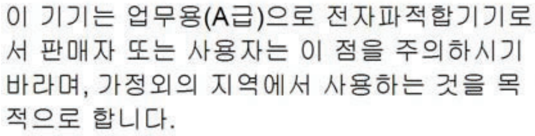
Japan Electronics and Information Technology Industries Association (JEITA) Confirmed Harmonics Guidelines (products less than or equal to 20 A per phase)



高調波ガイドライン準用品

Japan Electronics and Information Technology Industries Association (JEITA) Confirmed Harmonics Guidelines with Modifications (products greater than 20 A per phase).

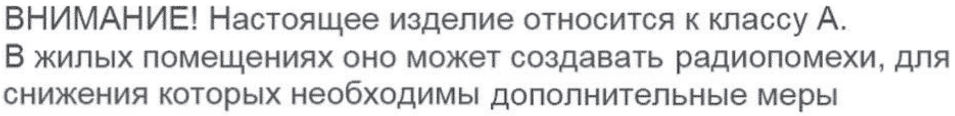
Korea Communications Commission (KCC) Statement



이 기기는 업무용(A급)으로 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

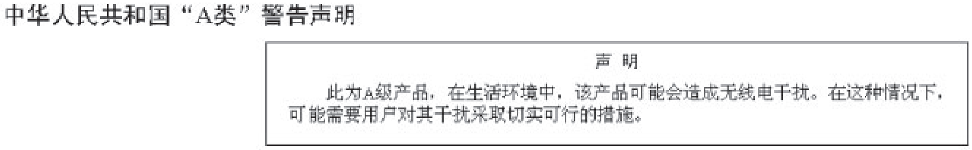
This is electromagnetic wave compatibility equipment for business (Type A). Sellers and users need to pay attention to it. This is for any areas other than home.

Russia Electromagnetic Interference (EMI) Class A statement



ВНИМАНИЕ! Настоящее изделие относится к классу А.
В жилых помещениях оно может создавать радиопомехи, для
снижения которых необходимы дополнительные меры

People’s Republic of China Class A electronic emission statement

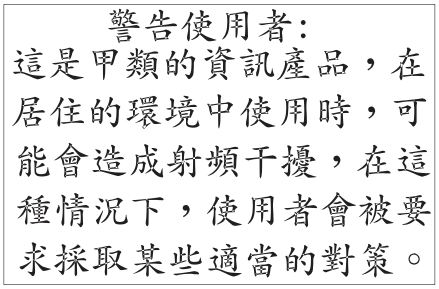


中华人民共和国“A类”警告声明

声 明

此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

Taiwan Class A compliance statement



警告使用者:
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Index