



## **Command Reference, Cisco IOS XE Gibraltar 16.12.x (Catalyst 3850 Switches)**

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# Using the Command-Line Interface

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# Using the Command-Line Interface

This chapter describes the Cisco IOS command-line interface (CLI) and how to use it to configure your switch.

## Understanding Command Modes

The Cisco IOS user interface is divided into many different modes. The commands available to you depend on which mode you are currently in. Enter a question mark (?) at the system prompt to obtain a list of commands available for each command mode.

When you start a session on the switch, you begin in user mode, often called user EXEC mode. Only a limited subset of the commands are available in user EXEC mode. For example, most of the user EXEC commands are one-time commands, such as **show** commands, which show the current configuration status, and **clear** commands, which clear counters or interfaces. The user EXEC commands are not saved when the switch reboots.

To have access to all commands, you must enter privileged EXEC mode. Normally, you must enter a password to enter privileged EXEC mode. From this mode, you can enter any privileged EXEC command or enter global configuration mode.

Using the configuration modes (global, interface, and line), you can make changes to the running configuration. If you save the configuration, these commands are stored and used when the switch reboots. To access the various configuration modes, you must start at global configuration mode. From global configuration mode, you can enter interface configuration mode and line configuration mode.

This table describes the main command modes, how to access each one, the prompt you see in that mode, and how to exit the mode. The examples in the table use the hostname *Switch*.

**Table 1: Command Mode Summary**

Mode	Access Method	Prompt	Exit Method	About This Mode
User EXEC	Begin a session with your switch.	Switch>	Enter <b>logout</b> or <b>quit</b> .	Use this mode to <ul style="list-style-type: none"> <li>Change terminal settings.</li> <li>Perform basic tests.</li> <li>Display system information.</li> </ul>
Privileged EXEC	While in user EXEC mode, enter the <b>enable</b> command.	Device#	Enter <b>disable</b> to exit.	Use this mode to verify commands that you have entered. Use a password to protect access to this mode.
Global configuration	While in privileged EXEC mode, enter the <b>configure</b> command.	Device(config)#	To exit to privileged EXEC mode, enter <b>exit</b> or <b>end</b> , or press <b>Ctrl-Z</b> .	Use this mode to configure parameters that apply to the entire switch.

Mode	Access Method	Prompt	Exit Method	About This Mode
VLAN configuration	While in global configuration mode, enter the <b>vlan</b> <i>vlan-id</i> command.	Device (config-vlan) #	To exit to global configuration mode, enter the <b>exit</b> command.  To return to privileged EXEC mode, press <b>Ctrl-Z</b> or enter <b>end</b> .	Use this mode to configure VLAN parameters. When VTP mode is transparent, you can create extended-range VLANs (VLAN IDs greater than 1005) and save configurations in the switch startup configuration file.
Interface configuration	While in global configuration mode, enter the <b>interface</b> command (with a specific interface).	Device (config-if) #	To exit to global configuration mode, enter <b>exit</b> .  To return to privileged EXEC mode, press <b>Ctrl-Z</b> or enter <b>end</b> .	Use this mode to configure parameters for the Ethernet ports.
Line configuration	While in global configuration mode, specify a line with the <b>line vty</b> or <b>line console</b> command.	Device (config-line) #	To exit to global configuration mode, enter <b>exit</b> .  To return to privileged EXEC mode, press <b>Ctrl-Z</b> or enter <b>end</b> .	Use this mode to configure parameters for the terminal line.

For more detailed information on the command modes, see the command reference guide for this release.

## Understanding the Help System

You can enter a question mark (?) at the system prompt to display a list of commands available for each command mode. You can also obtain a list of associated keywords and arguments for any command.

**Table 2: Help Summary**

Command	Purpose
<b>help</b>	Obtains a brief description of the help system in any command mode.
<i>abbreviated-command-entry</i> ?  Device# <b>di?</b> dir disable disconnect	Obtains a list of commands that begin with a particular character string.

## Understanding Abbreviated Commands

Command	Purpose
<i>abbreviated-command-entry &lt;Tab&gt;</i>  Device# <b>sh conf&lt;tab&gt;</b> Device# <b>show configuration</b>	Completes a partial command name.
?  Switch> ?	Lists all commands available for a particular command mode.
<i>command ?</i>  Switch> <b>show ?</b>	Lists the associated keywords for a command.
<i>command keyword ?</i>  Device(config)# <b>cdp holdtime ?</b> <10-255> Length of time (in sec) that receiver must keep this packet	Lists the associated arguments for a keyword.

## Understanding Abbreviated Commands

You need to enter only enough characters for the switch to recognize the command as unique.

This example shows how to enter the **show configuration** privileged EXEC command in an abbreviated form:

```
Device# show conf
```

## Understanding no and default Forms of Commands

Almost every configuration command also has a **no** form. In general, use the **no** form to disable a feature or function or reverse the action of a command. For example, the **no shutdown** interface 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.

Configuration commands can also have a **default** form. The **default** form of a command returns the command setting to its default. Most commands are disabled by default, so the **default** form is the same as the **no** form. However, some commands are enabled by default and have variables set to certain default values. In these cases, the **default** command enables the command and sets variables to their default values.

## Understanding CLI Error Messages

This table lists some error messages that you might encounter while using the CLI to configure your switch.

**Table 3: Common CLI Error Messages**

Error Message	Meaning	How to Get Help
% Ambiguous command: "show con"	You did not enter enough characters for your switch to recognize the command.	Re-enter the command followed by a question mark (?) with a space between the command and the question mark.  The possible keywords that you can enter with the command appear.
% Incomplete command.	You did not enter all the keywords or values required by this command.	Re-enter the command followed by a question mark (?) with a space between the command and the question mark.  The possible keywords that you can enter with the command appear.
% Invalid input detected at '^' marker.	You entered the command incorrectly. The caret (^) marks the point of the error.	Enter a question mark (?) to display all the commands that are available in this command mode.  The possible keywords that you can enter with the command appear.

## Using Configuration Logging

You can log and view changes to the switch configuration. You can use the Configuration Change Logging and Notification feature to track changes on a per-session and per-user basis. The logger tracks each configuration command that is applied, the user who entered the command, the time that the command was entered, and the parser return code for the command. This feature includes a mechanism for asynchronous notification to registered applications whenever the configuration changes. You can choose to have the notifications sent to the syslog.



**Note** Only CLI or HTTP changes are logged.

## Using Command History

The software provides a history or record of commands that you have entered. The command history feature is particularly useful for recalling long or complex commands or entries, including access lists. You can customize this feature to suit your needs.

### Changing the Command History Buffer Size

By default, the switch records ten command lines in its history buffer. You can alter this number for a current terminal session or for all sessions on a particular line. These procedures are optional.

Beginning in privileged EXEC mode, enter this command to change the number of command lines that the switch records during the current terminal session:

## Recalling Commands

```
Device# terminal history [size number-of-lines]
```

The range is from 0 to 256.

Beginning in line configuration mode, enter this command to configure the number of command lines the switch records for all sessions on a particular line:

```
Device(config-line)# history [size number-of-lines]
```

The range is from 0 to 256.

## Recalling Commands

To recall commands from the history buffer, perform one of the actions listed in this table. These actions are optional.



**Note** The arrow keys function only on ANSI-compatible terminals such as VT100s.

*Table 4: Recalling Commands*

Action	Result
Press <b>Ctrl-P</b> or the up arrow key.	Recalls commands in the history buffer, beginning with the most recent command. Repeat the key sequence to recall successively older commands.
Press <b>Ctrl-N</b> or the down arrow key.	Returns to more recent commands in the history buffer after recalling commands with <b>Ctrl-P</b> or the up arrow key. Repeat the key sequence to recall successively more recent commands.
<b>show history</b>  Device(config)# help	While in privileged EXEC mode, lists the last several commands that you just entered. The number of commands that appear is controlled by the setting of the <b>terminal history</b> global configuration command and the <b>history</b> line configuration command.

## Disabling the Command History Feature

The command history feature is automatically enabled. You can disable it for the current terminal session or for the command line. These procedures are optional.

To disable the feature during the current terminal session, enter the **terminal no history** privileged EXEC command.

To disable command history for the line, enter the **no history** line configuration command.

## Using Editing Features

This section describes the editing features that can help you manipulate the command line.

## Enabling and Disabling Editing Features

Although enhanced editing mode is automatically enabled, you can disable it, re-enable it, or configure a specific line to have enhanced editing. These procedures are optional.

To globally disable enhanced editing mode, enter this command in line configuration mode:

```
Switch (config-line)# no editing
```

To re-enable the enhanced editing mode for the current terminal session, enter this command in privileged EXEC mode:

```
Device# terminal editing
```

To reconfigure a specific line to have enhanced editing mode, enter this command in line configuration mode:

```
Device(config-line)# editing
```

## Editing Commands through Keystrokes

This table shows the keystrokes that you need to edit command lines. These keystrokes are optional.



**Note** The arrow keys function only on ANSI-compatible terminals such as VT100s.

**Table 5: Editing Commands through Keystrokes**

Capability	Keystroke	Purpose
Move around the command line to make changes or corrections.	Press <b>Ctrl-B</b> , or press the left arrow key.	Moves the cursor back one character.
	Press <b>Ctrl-F</b> , or press the right arrow key.	Moves the cursor forward one character.
	Press <b>Ctrl-A</b> .	Moves the cursor to the beginning of the command line.
	Press <b>Ctrl-E</b> .	Moves the cursor to the end of the command line.
	Press <b>Esc B</b> .	Moves the cursor back one word.
	Press <b>Esc F</b> .	Moves the cursor forward one word.
	Press <b>Ctrl-T</b> .	Transposes the character to the left of the cursor with the character located at the cursor.

## Editing Commands through Keystrokes

Capability	Keystroke	Purpose
Recall commands from the buffer and paste them in the command line. The switch provides a buffer with the last ten items that you deleted.	Press <b>Ctrl-Y</b> .	Recalls the most recent entry in the buffer.
	Press <b>Esc Y</b> .	Recalls the next buffer entry. The buffer contains only the last 10 items that you have deleted or cut. If you press <b>Esc Y</b> more than ten times, you cycle to the first buffer entry.
Delete entries if you make a mistake or change your mind.	Press the <b>Delete</b> or <b>Backspace</b> key.	Erases the character to the left of the cursor.
	Press <b>Ctrl-D</b> .	Deletes the character at the cursor.
	Press <b>Ctrl-K</b> .	Deletes all characters from the cursor to the end of the command line.
	Press <b>Ctrl-U</b> or <b>Ctrl-X</b> .	Deletes all characters from the cursor to the beginning of the command line.
	Press <b>Ctrl-W</b> .	Deletes the word to the left of the cursor.
	Press <b>Esc D</b> .	Deletes from the cursor to the end of the word.
Capitalize or lowercase words or capitalize a set of letters.	Press <b>Esc C</b> .	Capitalizes at the cursor.
	Press <b>Esc L</b> .	Changes the word at the cursor to lowercase.
	Press <b>Esc U</b> .	Capitalizes letters from the cursor to the end of the word.
Designate a particular keystroke as an executable command, perhaps as a shortcut.	Press <b>Ctrl-V</b> or <b>Esc Q</b> .	

Capability	Keystroke	Purpose
Scroll down a line or screen on displays that are longer than the terminal screen can display.	Press the <b>Return</b> key.	Scrolls down one line.
<b>Note</b> The More prompt is used for any output that has more lines than can be displayed on the terminal screen, including <b>show</b> command output. You can use the <b>Return</b> and <b>Space</b> bar keystrokes whenever you see the More prompt.		
	Press the <b>Space</b> bar.	Scrolls down one screen.
Redisplay the current command line if the switch suddenly sends a message to your screen.	Press <b>Ctrl-L</b> or <b>Ctrl-R</b> .	Redisplays the current command line.

## Editing Command Lines that Wrap

You can use a wraparound feature for commands that extend beyond a single line on the screen. When the cursor reaches the right margin, the command line shifts ten spaces to the left. You cannot see the first ten characters of the line, but you can scroll back and check the syntax at the beginning of the command. The keystroke actions are optional.

To scroll back to the beginning of the command entry, press **Ctrl-B** or the left arrow key repeatedly. You can also press **Ctrl-A** to immediately move to the beginning of the line.



**Note** The arrow keys function only on ANSI-compatible terminals such as VT100s.

In this example, the **access-list** global configuration command entry extends beyond one line. When the cursor first reaches the end of the line, the line is shifted ten spaces to the left and redisplayed. The dollar sign (\$) shows that the line has been scrolled to the left. Each time the cursor reaches the end of the line, the line is again shifted ten spaces to the left.

```
Device(config)# access-list 101 permit tcp 131.108.2.5 255.255.255.0 131.108.1
Device(config)# $ 101 permit tcp 131.108.2.5 255.255.255.0 131.108.1.20 255.25
Device(config)# $t tcp 131.108.2.5 255.255.255.0 131.108.1.20 255.255.255.0 eq
Device(config)# $108.2.5 255.255.255.0 131.108.1.20 255.255.255.0 eq 45
```

After you complete the entry, press **Ctrl-A** to check the complete syntax before pressing the **Return** key to execute the command. The dollar sign (\$) appears at the end of the line to show that the line has been scrolled to the right:

## ■ Searching and Filtering Output of show and more Commands

```
Device(config)# access-list 101 permit tcp 131.108.2.5 255.255.255.0 131.108.1$
```

The software assumes that you have a terminal screen that is 80 columns wide. If you have a width other than that, use the **terminal width** privileged EXEC command to set the width of your terminal.

Use line wrapping with the command history feature to recall and modify previous complex command entries.

## Searching and Filtering Output of show and more Commands

You can search and filter the output for **show** and **more** commands. This is useful when you need to sort through large amounts of output or if you want to exclude output that you do not need to see. Using these commands is optional.

To use this functionality, enter a **show** or **more** command followed by the pipe character (|), one of the keywords **begin**, **include**, or **exclude**, and an expression that you want to search for or filter out:

*command | {begin | include | exclude} regular-expression*

Expressions are case sensitive. For example, if you enter | **exclude output**, the lines that contain *output* are not displayed, but the lines that contain *Output* appear.

This example shows how to include in the output display only lines where the expression *protocol* appears:

```
Device# show interfaces | include protocol
Vlan1 is up, line protocol is up
Vlan10 is up, line protocol is down
GigabitEthernet1/0/1 is up, line protocol is down
GigabitEthernet1/0/2 is up, line protocol is up
```

## Accessing the CLI

You can access the CLI through a console connection, through Telnet, or by using the browser.

You manage the switch stack and the switch member interfaces through the active switch. You cannot manage switch stack members on an individual switch basis. You can connect to the active switch through the console port or the Ethernet management port of one or more switch members. Be careful with using multiple CLI sessions to the active switch. Commands you enter in one session are not displayed in the other sessions. Therefore, it is possible to lose track of the session from which you entered commands.




---

**Note** We recommend using one CLI session when managing the switch stack.

---

If you want to configure a specific switch member port, you must include the switch member number in the CLI command interface notation.

To debug a specific switch member, you can access it from the active switch by using the **session stack-member-number** privileged EXEC command. The switch member number is appended to the system prompt. For example, *Switch-2#* is the prompt in privileged EXEC mode for switch member 2, and where the system prompt for the active switch is *Switch*. Only the **show** and **debug** commands are available in a CLI session to a specific switch member.

## Accessing the CLI through a Console Connection or through Telnet

Before you can access the CLI, you must connect a terminal or a PC to the switch console or connect a PC to the Ethernet management port and then power on the switch, as described in the hardware installation guide that shipped with your switch.

CLI access is available before switch setup. After your switch is configured, you can access the CLI through a remote Telnet session or SSH client.

You can use one of these methods to establish a connection with the switch:

- Connect the switch console port to a management station or dial-up modem, or connect the Ethernet management port to a PC. For information about connecting to the console or Ethernet management port, see the switch hardware installation guide.
- Use any Telnet TCP/IP or encrypted Secure Shell (SSH) package from a remote management station. The switch must have network connectivity with the Telnet or SSH client, and the switch must have an enable secret password configured.

The switch supports up to 16 simultaneous Telnet sessions. Changes made by one Telnet user are reflected in all other Telnet sessions.

The switch supports up to five simultaneous secure SSH sessions.

After you connect through the console port, through the Ethernet management port, through a Telnet session or through an SSH session, the user EXEC prompt appears on the management station.

**Accessing the CLI through a Console Connection or through Telnet**



PART I

## Cisco TrustSec

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## Cisco TrustSec Commands

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# cts authorization list

To specify a list of authentication, authorization, and accounting (AAA) servers to be used by the TrustSec seed device, use the **cts authorization list** command on the Cisco TrustSec seed device in global configuration mode. Use the **no** form of the command to stop using the list during authentication.

**cts authorization list server\_list**

**no cts authorization list server\_list**

<b>Syntax Description</b>	<i>server_list</i> Cisco TrustSec AAA server group.
---------------------------	---

<b>Command Default</b>	None
------------------------	------

<b>Command Modes</b>	Global configuration (config)
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## Supported User Roles

Administrator

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	This command is only for the seed device. Non-seed devices obtain the TrustSec AAA server list from their TrustSec authenticator peer as a component of their TrustSec environment data.
-------------------------	--

The following example displays an AAA configuration of a TrustSec seed device:

```
Device# cts credentials id Device1 password Cisco123
Device# configure terminal
Device(config)# aaa new-model
Device(config)# aaa authentication dot1x default group radius
Device(config)# aaa authorization network MLIST group radius
Device(config)# cts authorization list MLIST
Device(config)# aaa accounting dot1x default start-stop group radius
Device(config)# radius-server host 10.20.3.1 auth-port 1812 acct-port 1813 pac key
AbCe1234
Device(config)# radius-server vsa send authentication
Device(config)# dot1x system-auth-control
Device(config)# exit
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>show cts server-list</b>	Displays RADIUS server configurations.

# cts credentials

Use the **cts credentials** command in privileged EXEC mode to specify the TrustSec ID and password of the network device. Use the **clear cts credentials** command to delete the credentials.

**cts credentials id cts\_id password cts\_pwd**

<b>Syntax Description</b>	<b>credentials id cts_id</b> Specifies the Cisco TrustSec device ID for this device to use when authenticating with other Cisco TrustSec devices with EAP-FAST. The <i>cts_id</i> variable has a maximum length of 32 characters and is case sensitive. <b>password cts_pwd</b> Specifies the password for this device to use when authenticating with other Cisco TrustSec devices with EAP-FAST.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Supported User Roles</b>					
Administrator					
<b>Command History</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding-bottom: 5px;"><b>Release</b></th><th style="text-align: right; padding-bottom: 5px;"><b>Modification</b></th></tr> </thead> <tbody> <tr> <td style="padding-top: 5px;">Cisco IOS XE Denali 16.1.1</td><td style="text-align: right; padding-top: 5px;">This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.1.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Denali 16.1.1	This command was introduced.				

**Usage Guidelines** The **cts credentials** command specifies the Cisco TrustSec device ID and password for this device to use when authenticating with other Cisco TrustSec devices with EAP-FAST. The Cisco TrustSec credentials state retrieval is not performed by the nonvolatile generation process (NVGEN) because the Cisco TrustSec credential information is saved in the keystore, and not in the startup configuration. The device can be assigned a Cisco TrustSec identity by the Cisco Secure Access Control Server (ACS), or a new password auto-generated when prompted to do so by the ACS. These credentials are stored in the keystore, eliminating the need to save the running configuration. To display the Cisco TrustSec device ID, use the **show cts credentials** command. The stored password is never displayed.

To change the device ID or the password, reenter the command. To clear the keystore, use the **clear cts credentials** command.



**Note** When the Cisco TrustSec device ID is changed, all Protected Access Credentials (PACs) are flushed from the keystore because PACs are associated with the old device ID and are not valid for a new identity.

The following example shows how to configure the Cisco TrustSec device ID and password:

```
Device# cts credentials id cts1 password password1
CTS device ID and password have been inserted in the local keystore. Please make sure that
the same ID and password are configured in the server database.
```

**cts credentials**

The following example show how to change the Cisco TrustSec device ID and password to `cts_new` and `password123`, respectively:

```
Device# cts credentials id cts_new password password123
A different device ID is being configured.
This may disrupt connectivity on your CTS links.
Are you sure you want to change the Device ID? [confirm] y
```

TS device ID and password have been inserted in the local keystore. Please make sure that the same ID and password are configured in the server database.

The following sample output displays the Cisco TrustSec device ID and password state:

```
Device# show cts credentials
CTS password is defined in keystore, device-id = cts_new
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>clear cts credentials</b>	Clears the Cisco TrustSec device ID and password.
	<b>show cts credentials</b>	Displays the state of the current Cisco TrustSec device ID and password.
	<b>show cts keystore</b>	Displays contents of the hardware and software keystores.

# cts refresh

To refresh the TrustSec peer authorization policy of all or specific Cisco TrustSec peers, or to refresh the SGACL policies downloaded to the device by the authentication server, use the **cts refresh** command in privileged EXEC mode.

```
cts refresh {peer [peer_id] | sgt [{sgt_number | default | unknown}]}
```

## Syntax Description

**environment-data** Refreshes environment data.

**peer Peer-ID** (Optional) If a peer-id is specified, only policies related to the specified peer connection are refreshed.

**sgt sgt\_number** (Optional) Performs an immediate refresh of the SGACL policies from the authentication server.

If an SGT number is specified, only policies related to that SGT are refreshed.

**default** (Optional) Refreshes the default SGACL policy.

**unknown** (Optional) Refreshes the unknown SGACL policy.

## Command Default

None

## Command Modes

Privileged EXEC (#)

## Supported User Roles

Administrator

## Command History

### Release

### Modification

Cisco IOS XE Denali 16.1.1 This command was introduced.

## Usage Guidelines

To refresh the Peer Authorization Policy on all TrustSec peers, enter **cts policy refresh** without specifying a peer ID.

The peer authorization policy is initially downloaded from the Cisco ACS at the end of the EAP-FAST NDAC authentication success. The Cisco ACS is configured to refresh the peer authorization policy, but the **cts policy refresh** command can force immediate refresh of the policy before the Cisco ACS timer expires. This command is relevant only to TrustSec devices that can impose Security Group Tags (SGTs) and enforce Security Group Access Control Lists (SGACLs).

The following example shows how to refresh the TrustSec peer authorization policy of all peers:

```
Device# cts policy refresh
Policy refresh in progress
```

The following sample output displays the TrustSec peer authorization policy of all peers:

```
VSS-1# show cts policy peer
```

**cts refresh**

```
CTS Peer Policy
=====
device-id of the peer that this local device is connected to
Peer name: VSS-2T-1
Peer SGT: 1-02
Trusted Peer: TRUE
Peer Policy Lifetime = 120 secs
Peer Last update time = 12:19:09 UTC Wed Nov 18 2009
Policy expires in 0:00:01:51 (dd:hr:mm:sec)
Policy refreshes in 0:00:01:51 (dd:hr:mm:sec)
Cache data applied = NONE
```

**Related Commands**

Command	Description
<b>clear cts policy</b>	Clears all Cisco TrustSec policies, or by the peer ID or SGT.
<b>show cts policy peer</b>	Displays peer authorization policy for all or specific TrustSec peers.

# cts rekey

To regenerate the Pairwise Master Key used by the Security Association Protocol (SAP), use the **cts rekey** privileged EXEC command.

**cts rekey interface type slot/port**

<b>Syntax Description</b>	<b>interface type slot/port</b> Specifies the Cisco TrustSec interface on which to regenerate the SAP key.
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<b>Command Default</b>	None.
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<b>Command Modes</b>	Privileged EXEC (#)
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## Supported User Roles

Administrator

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	SAP Pair-wise Master Key key (PMK) refresh ordinarily occurs automatically, triggered by combinations of network events and non-configurable internal timers related to dot1X authentication. The ability to manually refresh encryption keys is often part of network administration security requirements. To manually force a PMK refresh, use the <b>cts rekey</b> command.
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TrustSec supports a manual configuration mode where dot1X authentication is not required to create link-to-link encryption between switches. In this case, the PMK is manually configured on devices on both ends of the link with the **sap pmk** Cisco TrustSec manual interface configuration command.

The following example shows how to regenerate the PMK on a specified interface:

```
Device# cts rekey interface gigabitEthernet 2/1
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>sap mode-list (cts manual)</b>	Configures Cisco TrustSec SAP for manual mode.

# cts role-based enforcement

To enable role-based access control globally and on specific Layer 3 interfaces using Cisco TrustSec, use the **cts role-based enforcement** command in global configuration mode and interface configuration mode respectively. To disable the enforcement of role-based access control at an interface level, use the **no** form of this command.

**cts role-based enforcement**  
**no cts role-based enforcement**

**Syntax Description** This command has no keywords or arguments.

**Command Default** Enforcement of role-based access control at an interface level is disabled globally.

**Command Modes** Global configuration (config)

Interface configuration (config-if)

Command History	Release	Modification
	Cisco IOS XE Denali 16.1.1	This command was introduced.

**Usage Guidelines** The **cts role-based enforcement** command in global configuration mode enables role-based access control globally. Once role-based access control is enabled globally, it is automatically enabled on every Layer 3 interface on the device. To disable role-based access control on specific Layer 3 interfaces, use the **no** form of the command in interface configuration mode. The **cts role-based enforcement** command in interface configuration mode enables enforcement of role-based access control on specific Layer 3 interfaces.

The attribute-based access control list organizes and manages the Cisco TrustSec access control on a network device. The security group access control list (SGACL) is a Layer 3-4 access control list to filter access based on the value of the security group tag (SGT). The filtering usually occurs at an egress port of the Cisco TrustSec domain. The terms role-based access control list (RBACL) and SGACL can be used interchangeably, and they refer to a topology-independent ACL used in an attribute-based access control (ABAC) policy model.

The following example shows how to enable role-based access control on a Gigabit Ethernet interface:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/1/3
Device(config-if)# cts role-based enforcement
Device(config-if)# end
```

# cts role-based l2-vrf

To select a virtual routing and forwarding (VRF) instance for Layer 2 VLANs, use the **cts role-based l2-vrf** command in global configuration mode. To remove the configuration, use the **no** form of this command.

```
cts role-based l2-vrf vrf-name vlan-list {all vlan-ID} [{,}] [{-}]
no cts role-based l2-vrf vrf-name vlan-list {all vlan-ID} [{,}] [{-}]
```

## Syntax Description

<i>vrf-name</i>	Name of the VRF instance.
<b>vlan-list</b>	Specifies the list of VLANs to be assigned to a VRF instance.
<b>all</b>	Specifies all VLANs.
<i>vlan-ID</i>	VLAN ID. Valid values are from 1 to 4094.
,	(Optional) Specifies another VLAN separated by a comma.
-	(Optional) Specifies a range of VLANs separated by a hyphen.

## Command Default

VRF instances are not selected.

## Command Modes

Global configuration (config)

## Command History

Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.

## Usage Guidelines

The *vlan-list* argument can be a single VLAN ID, a list of comma-separated VLAN IDs, or hyphen-separated VLAN ID ranges.

The **all** keyword is equivalent to the full range of VLANs supported by the network device. The **all** keyword is not preserved in the nonvolatile generation (NVGEN) process.

If the **cts role-based l2-vrf** command is issued more than once for the same VRF, each successive command entered adds the VLAN IDs to the specified VRF.

The VRF assignments configured by the **cts role-based l2-vrf** command are active as long as a VLAN remains a Layer 2 VLAN. The IP–SGT bindings learned while a VRF assignment is active are also added to the Forwarding Information Base (FIB) table associated with the VRF and the IP protocol version. If an Switched Virtual Interface (SVI) becomes active for a VLAN, the VRF-to-VLAN assignment becomes inactive and all bindings learned on the VLAN are moved to the FIB table associated with the VRF of the SVI.

Use the **interface vlan** command to configure an SVI interface, and the **vrf forwarding** command to associate a VRF instance to the interface.

The VRF-to-VLAN assignment is retained even when the assignment becomes inactive. It is reactivated when the SVI is removed or when the SVI IP address is changed. When reactivated, the IP–SGT bindings are moved back from the FIB table associated with the VRF of the SVI to the FIB table associated with the VRF assigned by the **cts role-based l2-vrf** command.

**cts role-based l2-vrf**

The following example shows how to select a list of VLANs to be assigned to a VRF instance:

```
Device(config)# cts role-based l2-vrf vrf1 vlan-list 20
```

The following example shows how to configure an SVI interface and associate a VRF instance:

```
Device(config)# interface vlan 101
Device(config-if)# vrf forwarding vrf1
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>interface vlan</b>	Configures a VLAN interface.
<b>vrf forwarding</b>	Associates a VRF instance or a virtual network with an interface or subinterface.
<b>show cts role-based permissions</b>	Displays the SGACL permission list.

# cts role-based monitor

To enable role-based (security-group) access list monitoring, use the **cts role-based monitor** command in global configuration mode. To remove role-based access list monitoring, use the **no** form of this command.

```
cts role-based monitor {all | permissions {default [{ipv4 | ipv6}] | from {sgt | unknown} to {sgt | unknown} [{ipv4 | ipv6}]}}
no cts role-based monitor {all | permissions {default [{ipv4 | ipv6}] | from {sgt | unknown} to {sgt | unknown} [{ipv4 | ipv6}]}}
```

<b>Syntax Description</b>	<p><b>all</b> Monitors permissions for all source tags to all destination tags.</p> <p><b>permissions</b> Monitors permissions from a source tags to a destination tags.</p> <p><b>default</b> Monitors the default permission list.</p> <p><b>ipv4</b> (Optional) Specifies the IPv4 protocol.</p> <p><b>ipv6</b> (Optional) Specifies the IPv6 protocol.</p> <p><b>from</b> Specifies the source group tag for filtered traffic.</p> <p><b>sgt</b> Security Group Tag (SGT). Valid values are from 2 to 65519.</p> <p><b>unknown</b> Specifies an unknown source or destination group tag (DST).</p>
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<b>Command Default</b>	Role-based access control monitoring is not enabled.
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<b>Command Modes</b>	Global configuration (config)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	Use the <b>cts role-based monitor all</b> command to enable the global monitor mode. If the <b>cts role-based monitor all</b> command is configured, the output of the <b>show cts role-based permissions</b> command displays monitor mode for all configured policies as true.
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The following examples shows how to configure SGACL monitor from a source tag to a destination tag:

```
Device(config)# cts role-based monitor permissions from 10 to 11
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>show cts role-based permissions</b>	Displays the SGACL permission list.

# cts role-based permissions

To enable permissions from a source group to a destination group, use the **cts role-based permissions** command in global configuration mode. To remove the permissions, use the **no** form of this command.

```
cts role-based permissions {default | from {sgt | unknown}to {sgt | unknown}}{rbacl-name | ipv4 | ipv6}
no cts role-based permissions {default | from {sgt | unknown}to {sgt | unknown}}{rbacl-name | ipv4 | ipv6}
```

<b>Syntax Description</b>	<p><b>default</b> Specifies the default permissions list. Every cell (an SGT pair) for which, security group access control list (SGACL) permission is not configured statically or dynamically falls under the default category.</p> <p><b>from</b> Specifies the source group tag of the filtered traffic.</p> <p><b>sgt</b> Security Group Tag (SGT). Valid values are from 2 to 65519.</p> <p><b>unknown</b> Specifies an unknown source or destination group tag.</p> <p><b>rbacl-name</b> Role-based access control list (RBACL) or SGACL name. Up to 16 SGACLs can be specified in the configuration.</p> <p><b>ipv4</b> Specifies the IPv4 protocol.</p> <p><b>ipv6</b> Specifies the IPv6 protocol.</p>				
<b>Command Default</b>	Permissions from a source group to a destination group is not enabled.				
<b>Command Modes</b>	Global configuration (config)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.1.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Denali 16.1.1	This command was introduced.				

**Usage Guidelines** Use the **cts role-based permissions** command to define, replace, or delete the list of SGACLs for a given source group tag (SGT), destination group tag (DGT) pair. This policy is in effect as long as there is no dynamic policy for the same DGT or SGT.

The **cts role-based permissions default** command defines, replaces, or deletes the list of SGACLs of the default policy as long as there is no dynamic policy for the same DGT.

The following example shows how to enable permissions for a destination group:

```
Device(config)# cts role-based permissions from 6 to 6 mon_2
```

Related Commands	Command	Description
	<b>show cts role-based permissions</b>	Displays the SGACL permission list.

cts role-based sgt-map

# cts role-based sgt-map

To manually map a source IP address to a Security Group Tag (SGT) on either a host or a VRF, use the **cts role-based sgt-map** command in global configuration mode. Use the **no** form of the command to remove the mapping.

```
cts role-based sgt-map {ipv4_netaddress | ipv6_netaddress | ipv4_netaddress/prefix | ipv6_netaddress/prefix}  

sgt sgt-number  

cts role-based sgt-map host {ipv4_hostaddress | ipv6_hostaddress} sgt sgt-number  

cts role-based sgt-map vlan-list [{vlan_ids | all}] sgt sgt-number  

cts role-based sgt-map vrf instance_name  

{ipv4_netaddress | ipv6_netaddress | ipv4_netaddress/prefix | ipv6_netaddress/prefix | host  

{ipv4_hostaddress | ipv6_hostaddress} } sgt sgt-number  

no cts role-based sgt-map
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><i>ipv4_netaddress</i>   <b>ipv6_netaddress</b></td><td>Specifies the network to be associated with an SGT. Enter IPv4 address in dot decimal notation; IPv6 in colon hexadecimal notation.</td></tr> <tr> <td><i>ipv4_netaddress/prefix</i>   <b>ipv6_netaddress/prefix</b></td><td>Maps the SGT to all hosts of the specified subnet address (IPv4 or IPv6). IPv4 is specified in dot decimal CIDR notation, IPv6 in colon hexadecimal notation</td></tr> <tr> <td><b>host</b> {<i>ipv4_hostaddress</i>   <i>ipv6_hostaddress</i>}</td><td>Binds the specified host IP address with the SGT. Enter the IPv4 address in dot decimal notation; IPv6 in colon hexadecimal notation.</td></tr> <tr> <td><b>vlan-list</b> {<i>vlan_ids</i>   <b>all</b>}</td><td>           Specifies VLAN IDs.           <ul style="list-style-type: none"> <li>(Optional) <i>vlan_ids</i>: Individual VLAN IDs are separated by commas, a range of IDs specified with a hyphen.</li> <li>(Optional) <b>all</b>: Specifies all VLAN IDs.</li> </ul> </td></tr> <tr> <td><b>vrf</b> <i>instance_name</i></td><td>Specifies a VRF instance, previously created on the device.</td></tr> <tr> <td><b>sgt</b> <i>sgt-number</i></td><td>Specifies the SGT number from 0 to 65,535.</td></tr> </table>	<i>ipv4_netaddress</i>   <b>ipv6_netaddress</b>	Specifies the network to be associated with an SGT. Enter IPv4 address in dot decimal notation; IPv6 in colon hexadecimal notation.	<i>ipv4_netaddress/prefix</i>   <b>ipv6_netaddress/prefix</b>	Maps the SGT to all hosts of the specified subnet address (IPv4 or IPv6). IPv4 is specified in dot decimal CIDR notation, IPv6 in colon hexadecimal notation	<b>host</b> { <i>ipv4_hostaddress</i>   <i>ipv6_hostaddress</i> }	Binds the specified host IP address with the SGT. Enter the IPv4 address in dot decimal notation; IPv6 in colon hexadecimal notation.	<b>vlan-list</b> { <i>vlan_ids</i>   <b>all</b> }	Specifies VLAN IDs. <ul style="list-style-type: none"> <li>(Optional) <i>vlan_ids</i>: Individual VLAN IDs are separated by commas, a range of IDs specified with a hyphen.</li> <li>(Optional) <b>all</b>: Specifies all VLAN IDs.</li> </ul>	<b>vrf</b> <i>instance_name</i>	Specifies a VRF instance, previously created on the device.	<b>sgt</b> <i>sgt-number</i>	Specifies the SGT number from 0 to 65,535.
<i>ipv4_netaddress</i>   <b>ipv6_netaddress</b>	Specifies the network to be associated with an SGT. Enter IPv4 address in dot decimal notation; IPv6 in colon hexadecimal notation.												
<i>ipv4_netaddress/prefix</i>   <b>ipv6_netaddress/prefix</b>	Maps the SGT to all hosts of the specified subnet address (IPv4 or IPv6). IPv4 is specified in dot decimal CIDR notation, IPv6 in colon hexadecimal notation												
<b>host</b> { <i>ipv4_hostaddress</i>   <i>ipv6_hostaddress</i> }	Binds the specified host IP address with the SGT. Enter the IPv4 address in dot decimal notation; IPv6 in colon hexadecimal notation.												
<b>vlan-list</b> { <i>vlan_ids</i>   <b>all</b> }	Specifies VLAN IDs. <ul style="list-style-type: none"> <li>(Optional) <i>vlan_ids</i>: Individual VLAN IDs are separated by commas, a range of IDs specified with a hyphen.</li> <li>(Optional) <b>all</b>: Specifies all VLAN IDs.</li> </ul>												
<b>vrf</b> <i>instance_name</i>	Specifies a VRF instance, previously created on the device.												
<b>sgt</b> <i>sgt-number</i>	Specifies the SGT number from 0 to 65,535.												

<b>Command Default</b>	None
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<b>Command Modes</b>	Global configuration (config)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	If you do not have a Cisco Identity Services Engine, Cisco Secure ACS, dynamic Address Resolution Protocol (ARP) inspection, Dynamic Host Control Protocol (DHCP) snooping, or Host Tracking available on your
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device to automatically map SGTs to source IP addresses, you can manually map an SGT to the following with the **cts role-based sgt-map** command:

- A single host IPv4 or IPv6 address
- All hosts of an IPv4 or IPv6 network or subnetwork
- VRFs
- Single or multiple VLANs

The **cts role-based sgt-map** command binds the specified SGT with packets that fall within the specified network address.

SXP exports an exhaustive expansion of all possible individual IP–SGT bindings within the specified network or subnetwork. IPv6 bindings and subnet bindings are exported only to SXP listener peers of SXP version 2 or later. The expansion does not include host bindings which are known individually or are configured or learnt from SXP for any nested subnet bindings.

The **cts role-based sgt-map host** command binds the specified SGT with incoming packets when the IP source address is matched by the specified host address. This IP-SGT binding has the lowest priority and is ignored in the presence of any other dynamically discovered bindings from other sources (such as, SXP or locally authenticated hosts). The binding is used locally on the device for SGT imposition and SGACL enforcement. It is exported to SXP peers if it is the only binding known for the specified host IP address.

The **vrf** keyword specifies a virtual routing and forwarding table previously defined with the **vrf** definition global configuration command. The IP-SGT binding specified with the **cts role-based sgt-map vrf** global configuration command is entered into the IP-SGT table associated with the specified VRF and the IP protocol version which is implied by the type of IP address entered.

The **cts role-based sgt-map vlan-list** command binds an SGT with a specified VLAN or a set of VLANs. The keyword **all** is equivalent to the full range of VLANs supported by the device and is not preserved in the nonvolatile generation (NVGEN) process. The specified SGT is bound to incoming packets received in any of the specified VLANs. The system uses discovery methods such as DHCP and/or ARP snooping (a.k.a. IP device tracking) to discover active hosts in any of the VLANs mapped by this command. Alternatively, the system could map the subnet associated with the SVI of each VLAN to the specified SGT. SXP exports the resulting bindings as appropriate for the type of binding.

## Examples

The following example shows how to manually map a source IP address to an SGT:

```
Device(config)# cts role-based sgt-map 10.10.1.1 sgt 77
```

In the following example, a device binds host IP address 10.1.2.1 to SGT 3 and 10.1.2.2 to SGT 4. These bindings are forwarded by SXP to an SGACL enforcement device.

```
Device(config)# cts role-based sgt-map host 10.1.2.1 sgt 3
Device(config)# cts role-based sgt-map host 10.1.2.2 sgt 4
```

## Related Commands

Command	Description
<b>show cts role-based sgt-map</b>	Displays role-based access control information.

## cts xp connection peer

To enter the Cisco TrustSec Security Group Tag (SGT) Exchange Protocol (CTS-SXP) peer IP address, to specify if a password is used for the peer connection, to specify the global hold-time period for a listener or speaker device, and to specify if the connection is bidirectional, use the **cts xp connection peer** command in global configuration mode. To remove these configurations for a peer connection, use the **no** form of this command.

```
cts xp connection peer ipv4-address {source | password} {default | none} mode {local | peer} [[[[{listener | speaker}]] [hold-time minimum-time maximum-time | vrf vrf-name}]] | both [vrf vrf-name}]]]
cts xp connection peer ipv4-address {source | password} {default | none} mode {local | peer} [[[[{listener | speaker}]] [hold-time minimum-time maximum-time | vrf vrf-name}]] | both [vrf vrf-name}]]]
```

Syntax Description	
<i>ipv4-address</i>	SXP peer IPv4 address.
<b>source</b>	Specifies the source IPv4 address.
<b>password</b>	Specifies that an SXP password is used for the peer connection.
<b>default</b>	Specifies that the default SXP password is used.
<b>none</b>	Specifies no password is used.
<b>mode</b>	Specifies either the local or peer SXP connection mode.
<b>local</b>	Specifies that the SXP connection mode refers to the local device.
<b>peer</b>	Specifies that the SXP connection mode refers to the peer device.
<b>listener</b>	(Optional) Specifies that the device is the listener in the connection.
<b>speaker</b>	(Optional) Specifies that the device is the speaker in the connection.
<b>hold-time</b> <i>minimum-time</i> <i>maximum-time</i>	(Optional) Specifies the hold-time period, in seconds, for the device. The range for minimum and maximum time is from 0 to 65535.  A <i>maximum-time</i> value is required only when you use the following keywords: <b>peer speaker</b> and <b>local listener</b> . In other instances, only a <i>minimum-time</i> value is required.  <b>Note</b> If both minimum and maximum times are required, the <i>maximum-time</i> value must be greater than or equal to the <i>minimum-time</i> value.
<b>vrf</b> <i>vrf-name</i>	(Optional) Specifies the virtual routing and forwarding (VRF) instance name to the peer.
<b>both</b>	(Optional) Specifies that the device is both the speaker and the listener in the bidirectional SXP connection.

<b>Command Default</b>	The CTS-SXP peer IP address is not configured and no CTS-SXP peer password is used for the peer connection. The default setting for a CTS-SXP connection password is <b>none</b> .
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<b>Command Modes</b>	Global configuration (config)
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Command History	Release	Modification
Cisco IOS XE Denali 16.1.1		This command was introduced.

<b>Usage Guidelines</b>	When a CTS-SXP connection to a peer is configured with the <b>cts_sxp_connection_peer</b> command, only the connection mode can be changed. The <b>vrf</b> keyword is optional. If a VRF name is not provided or a VRF name is provided with the <b>default</b> keyword, then the connection is set up in the default routing or forwarding domain.
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A **hold-time maximum-period** value is required only when you use the following keywords: **peer speaker** and **local listener**. In other instances, only a **hold-time minimum-period** value is required.



**Note** The *maximum-period* value must be greater than or equal to the *minimum-period* value.

Use the **both** keyword to configure a bidirectional SXP connection. With the support for bidirectional SXP configuration, a peer can act as both a speaker and a listener and propagate SXP bindings in both directions using a single connection.

## Examples

The following example shows how to enable CTS-SXP and configure the CTS-SXP peer connection on Device\_A, a speaker, for connection to Device\_B, a listener:

```
Device_A> enable
Device_A# configure terminal
Device_A#(config)# cts_sxp enable
Device_A#(config)# cts_sxp default password Cisco123
Device_A#(config)# cts_sxp default source-ip 10.10.1.1
Device_A#(config)# cts_sxp connection peer 10.20.2.2 password default mode local speaker
```

The following example shows how to configure the CTS-SXP peer connection on Device\_B, a listener, for connection to Device\_A, a speaker:

```
Device_B> enable
Device_B# configure terminal
Device_B(config)# cts_sxp enable
Device_B(config)# cts_sxp default password Cisco123
Device_B(config)# cts_sxp default source-ip 10.20.2.2
Device_B(config)# cts_sxp connection peer 10.10.1.1 password default mode local listener
```

You can also configure both peer and source IP addresses for an SXP connection. The source IP address specified in the **cts\_sxp\_connection** command overwrites the default value.

```
Device_A(config)# cts_sxp connection peer 51.51.51.1 source 51.51.51.2 password none mode local speaker
```

**cts xp connection peer**

```
Device_B(config)# cts xp connection peer 51.51.51.2 source 51.51.51.1 password none mode local listener
```

The following example shows how to enable bidirectional CTS-SXP and configure the SXP peer connection on Device\_A to connect to Device\_B:

```
Device_A> enable
Device_A# configure terminal
Device_A#(config)# cts xp enable
Device_A#(config)# cts xp default password Cisco123
Device_A#(config)# cts xp default source-ip 10.10.1.1
Device_A#(config)# cts xp connection peer 10.20.2.2 password default mode local both
```

#### Related Commands

Command	Description
<b>cts xp default password</b>	Configures the Cisco TrustSec SXP default password.
<b>cts xp default source-ip</b>	Configures the Cisco TrustSec SXP source IPv4 address.
<b>cts xp enable</b>	Enables Cisco TrustSec SXP on a device.
<b>cts xp log</b>	Enables logging for IP-to-SGT binding changes.
<b>cts xp reconciliation</b>	Changes the Cisco TrustSec SXP reconciliation period.
<b>cts xp retry</b>	Changes the Cisco TrustSec SXP retry period timer.
<b>cts xp speaker hold-time</b>	Configures the global hold-time period of a speaker device in a Cisco TrustSec SGT SXPr4 network.
<b>cts xp listener hold-time</b>	Configures the global hold-time period of a listener device in a Cisco TrustSec SGT SXPr4 network.
<b>show cts xp</b>	Displays the status of all Cisco TrustSec SXP configurations.

# cts\_sxp\_default\_password

To specify the Cisco TrustSec Security Group Tag (SGT) Exchange Protocol (CTS-SXP) default password, use the **cts\_sxp\_default\_password** command in global configuration mode. To remove the CTS-SXP default password, use the **no** form of this command.

```
cts_sxp default password {0 unencrypted-pwd | 6 encrypted-key | 7 encrypted-keycleartext-pwd}
no cts_sxp default password {0 unencrypted-pwd | 6 encrypted-key | 7 encrypted-keycleartext-pwd}
```

Syntax Description	<b>0 unencrypted-pwd</b>	Specifies that an unencrypted CTS-SXP default password follows. The maximum password length is 32 characters.
	<b>6 encrypted-key</b>	Specifies that a 6 encryption type password is used as the CTS-SXP default password. The maximum password length is 32 characters.
	<b>7 encrypted-key</b>	Specifies that a 7 encryption type password is used as the CTS-SXP default password. The maximum password length is 32 characters.
	<i>cleartext-pwd</i>	Specifies a cleartext CTS-SXP default password. The maximum password length is 32 characters.

**Command Default** Type **0** (cleartext)

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Denali 16.1.1	This command was introduced.

**Usage Guidelines** The **cts\_sxp\_default\_password** command sets the CTS-SXP default password to be optionally used for all CTS-SXP connections configured on the device. The CTS-SXP password can be cleartext, or encrypted with the **0**, **7**, **6** encryption type keywords. If the encryption type is 0, then an unencrypted cleartext password follows.

**Examples** The following example shows how to enable CTS-SXP and configure the CTS-SXP peer connection on Device\_A, a speaker, for connection to Device\_B, a listener:

```
Device_A# configure terminal
Device_A#(config)# cts_sxp enable
Device_A#(config)# cts_sxp default password Cisco123
Device_A#(config)# cts_sxp default source-ip 10.10.1.1
Device_A#(config)# cts_sxp connection peer 10.20.2.2 password default mode local speaker
```

The following example shows how to configure the CTS-SXP peer connection on Device\_B, a listener, for connection to Device\_A, a speaker:

```
Device_B# configure terminal
```

**cts xp default password**

```
Device_B(config) # cts xp enable
Device_B(config) # cts xp default password Cisco123
Device_B(config) # cts xp default source-ip 10.20.2.2
Device_B(config) # cts xp connection peer 10.10.1.1 password default mode local listener
```

Related Commands	Command	Description
	<b>cts xp connection peer</b>	Enters the CTS-SXP peer IP address and specifies if a password is used for the peer connection.
	<b>cts xp default source-ip</b>	Configures the CTS-SXP source IPv4 address.
	<b>cts xp enable</b>	Enables CTS-SXP on a device.
	<b>cts xp log</b>	Enables logging for IP-to-SGT binding changes.
	<b>cts xp reconciliation</b>	Changes the CTS-SXP reconciliation period.
	<b>cts xp retry</b>	Changes the CTS-SXP retry period timer.
	<b>show cts xp</b>	Displays the status of all SXP configurations.

# cts\_sxp\_default\_source-ip

To configure the Cisco TrustSec Security Group Tag (SGT) Exchange Protocol (CTS-SXP) source IPv4 address, use the **cts\_sxp\_default\_source-ip** command in global configuration mode. To remove the CTS-SXP default source IP address, use the **no** form of this command.

```
cts_sxp_default_source-ip ipv4-address
no cts_sxp_default_source-ip ipv4-address
```

<b>Syntax Description</b>	<i>ip-address</i> Default source CTS-SXP IPv4 address.
---------------------------	--

**Command Default** The CTS-SXP source IP address is not configured.

**Command Modes** Global configuration (config)

Command History	Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.	

**Usage Guidelines** The **cts\_sxp\_default\_source-ip** command sets the default source IP address that CTS-SXP uses for all new TCP connections where a source IP address is not specified. Preexisting TCP connections are not affected when this command is entered. CTS-SXP connections are governed by three timers:

- Retry timer
- Delete Hold Down timer
- Reconciliation timer

## Examples

The following example shows how to enable CTS-SXP and configure the CTS-SXP peer connection on Device\_A, a speaker, for connection to Device\_B, a listener:

```
Device_A# configure terminal
Device_A#(config)# cts_sxp_enable
Device_A#(config)# cts_sxp_default_password Cisco123
Device_A#(config)# cts_sxp_default_source-ip 10.10.1.1
Device_A#(config)# cts_sxp_connection_peer 10.20.2.2 password default mode local speaker
```

The following example shows how to configure the CTS-SXP peer connection on Device\_B, a listener, for connection to Device\_A, a speaker:

```
Device_B# configure terminal
Device_B(config)# cts_sxp_enable
Device_B(config)# cts_sxp_default_password Cisco123
Device_B(config)# cts_sxp_default_source-ip 10.20.2.2
Device_B(config)# cts_sxp_connection_peer 10.10.1.1 password default mode local listener
```

**cts xp default source-ip**

Related Commands	Command	Description
	<b>cts xp connectionpeer</b>	Enters the CTS-SXP peer IP address and specifies if a password is used for the peer connection.
	<b>cts xp default password</b>	Configures the CTS-SXP default password.
	<b>cts xp enable</b>	Enables CTS-SXP on a device.
	<b>cts xp log</b>	Enables logging for IP-to-SGT binding changes.
	<b>cts xp reconciliation</b>	Changes the CTS-SXP reconciliation period.
	<b>cts xp retry</b>	Changes the CTS-SXP retry period timer.
	<b>show cts xp</b>	Displays the status of all SXP configurations.

# cts sxp filter-enable

To enable filtering after creating filter lists and filter groups, use the **cts sxp filter-enable** command in global configuration mode. To disable filtering, use the **no** form of the command.

```
cts sxp filter-enable
no cts sxp filter-enable
```

## Syntax Description

This command has no keywords or arguments.

## Command Modes

Global configuration (config)

## Command History

	<b>Release</b>	<b>Modification</b>
Cisco IOS XE Denali 16.1.1		This command was introduced.

## Usage Guidelines

This command can be used at any time to enable or disable filtering. Configured filter lists and filter groups can be used to implement filtering only after filtering is enabled. The filter action will only filter bindings that are exchanged after filtering is enabled; there won't be any effect on the bindings that were exchanged before filtering was enabled.

## Examples

```
Device(config)# cts sxp filter-enable
```

## Related Commands

	<b>Command</b>	<b>Description</b>
	<b>cts sxp filter-list</b>	Creates a SXP filter list to filter IP-SGT bindings based on IP prefixes, SGT or a combination of both.
	<b>cts sxp filter-group</b>	Creates a filter group for grouping a set of peers and applying a filter list to them.
	<b>show cts sxp filter-group</b>	Displays information about the configured filter groups..
	<b>show cts sxp filter-list</b>	Displays information about the configured filter lists.
	<b>debug cts sxp filter events</b>	Logs events related to the creation, deletion and update of filter-lists and filter-groups

cts xp filter-group

# cts xp filter-group

To create a filter group for grouping a set of peers and applying a filter list to them, use the **cts xp filter-group** command in global configuration mode. To delete a filter group, use the **no** form of this command.

```
cts xp filter-group {listener | speaker} {filter-group-name | global filter-list-name}
no cts xp filter-group {listener | speaker} {filter-group-name | global filter-list-name}
```

## Syntax Description

<b>listener</b>	Creates a filter group for a set of listeners.
<b>speaker</b>	Creates a filter group for a set of speakers.
<b>global</b>	Groups all speakers or listeners on the device.
<i>filter-group-name</i>	Name of the filter group.
<i>filter-list-name</i>	Name of the filter list.

## Command Modes

Global configuration (config)

## Command History

Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.

## Usage Guidelines

Issuing this command, places the device in the filter group configuration mode. From this mode, you can specify the devices to be grouped and apply a filter list to the filter group.

The command format to add devices or peers to the group is as follows:

```
peer ipv4 peer-IP
```

In a single command, you can add one peer. To add more peers, repeat the command as many times as required.

The command format to apply a filter list to the group is as follows:

```
filter filter-list-name
```

You cannot specify a peer list for the global listener and global speaker filter-group options because in this case the filter is applied to all SXP connections.

When both the global filter group and peer-based filter groups are applied, the global filter takes priority. If only a global listener or global speaker filter group is configured, then the global filtering takes precedence only in that specific direction. For the other direction, the peer-based filter group is implemented.

## Examples

The following example shows how to create a listener group called **group\_1**, and assign peers and a filter list to this group:

```
Device# configure terminal
Device(config)# cts xp filter-group listener group_1
Device(config-filter-group)# filter filter_1
```

```
Device(config-filter-group)# peer ipv4 10.0.0.1
Device(config-filter-group)# peer ipv4 10.10.10.1
```

The following example shows how to create a global listener group called **group\_2**:

```
Device# configure terminal
Device(config)# cts sxp filter-group listener global group_2
```

**Related Commands**

Command	Description
<b>cts sxp filter-list</b>	Creates a SXP filter list to filter IP-SGT bindings based on IP prefixes, SGT or a combination of both.
<b>cts sxp filter-enable</b>	Enables filtering.
<b>show cts sxp filter-group</b>	Displays information about the configured filter groups.
<b>show cts sxp filter-list</b>	Displays information about the configured filter lists.
<b>debug cts sxp filter events</b>	Logs events related to the creation, deletion and update of filter-lists and filter-groups

**cts xp filter-list**

# cts xp filter-list

To create a SXP filter list to hold a set of filter rules for filtering IP-SGT bindings, use the **cts xp filter-list** command in global configuration mode. To delete a filter list, use the **no** form of the command.

```
cts xp filter-list filter-list-name
no cts xp filter-list filter-list-name
```

## Syntax Description

<i>filter-list-name</i>	Name of the filter-list.
-------------------------	--------------------------

## Command Modes

Global configuration (config)

## Command History

Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.

## Usage Guidelines

Issuing this command, places the device in the filter list configuration mode. From this mode, you can specify rules for the filter lists.

A filter rule can be based on SGT or IP Prefixes or a combination of both SGT and IP Prefixes.

The command format to add rules to the group is as follows:

```
sequence-number action(permit/deny) filter-type(ipv4/ipv6/sgt) value/values
```

For example, to permit SGT-IP bindings whose SGT value is 20, the rule is as follows:

```
30 permit sgt 20
```

Note that the sequence number is optional. If you do not specify a sequence number, it is generated by the system. Sequence numbers are automatically incremented by a value of 10 from the last used/configured sequence number. A new rule can be inserted by specifying a sequence number in between two existing rules.

The range of valid SGT values is between 2 and 65519. To provide multiple SGT values in a rule, separate the values using a space. A maximum of 8 SGT values are allowed in a rule.

In a SGT and IP prefix combination rule, if there is a match for the binding in both the parts of the rule, then the action specified in the second part of the rule takes precedence. For example, in the following rule, if the SGT value of the IP prefix 10.0.0.1 is 20, the corresponding binding will be denied even if the first part of the rule permits the binding.

```
Device(config-filter-list)# 10 permit sgt 30 20 deny 10.0.0.1/24
```

Similarly, in the rule below the binding with the sgt value 20 will be permitted even if the sgt of the IP prefix 10.0.0.1 is 20, and the first action does not permit the binding.

```
Device(config-filter-list)# 10 deny 10.0.0.1/24 permit sgt 30 20
```

## Examples

The following example shows how to create a filter list and add some rules to the list:

```
Device# configure terminal
Device(config)# cts sxp filter-list filter_1
Device (config-filter-list)# 10 deny ipv4 10.0.0.1/24 permit sgt 100
Device(config-filter-list)# 20 permit sgt 60 61 62 63
```

Related Commands	Command	Description
	<b>cts sxp filter-enable</b>	Enable SXP IP-prefix and SGT-based filtering.
	<b>cts sxp filter-group</b>	Creates a filter group for grouping a set of peers and applying a filter list to them.
	<b>show cts sxp filter-group</b>	Displays information about the configured filter groups.
	<b>show cts sxp filter-list</b>	Displays information about the configured filter lists.
	<b>debug cts sxp filter events</b>	Logs events related to the creation, deletion and update of filter-lists and filter-groups.

**cts xp log binding-changes**

# cts xp log binding-changes

To enable logging for IP-to-Cisco TrustSec Security Group Tag (SGT) Exchange Protocol (CTS-SXP) binding changes, use the **cts xp log binding-changes** command in global configuration mode. To disable logging, use the **no** form of this command.

```
cts xp log binding-changes
no cts xp log binding-changes
```

## Command Default

Logging is disabled.

## Command Modes

Global configuration (config)

## Command History

Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.

## Usage Guidelines

The **cts xp log binding-changes** command enables logging for IP-to-SGT binding changes. SXP syslogs (sev 5 syslogs) are generated whenever IP address-to-SGT binding occurs (add, delete, change). These changes are learned and propagated on the SXP connection.

## Related Commands

Command	Description
<b>cts xp connectionpeer</b>	Enters the CTS-SXP peer IP address and specifies if a password is used for the peer connection
<b>cts xp default password</b>	Configures the CTS-SXP default password.
<b>cts xp default source-ip</b>	Configures the CTS-SXP source IPv4 address.
<b>cts xp enable</b>	Enables CTS-SXP on a device.
<b>cts xp reconciliation</b>	Changes the CTS-SXP reconciliation period.
<b>cts xp retry</b>	Changes the CTS-SXP retry period timer.
<b>show cts xp</b>	Displays status of all SXP configurations.

# cts\_sxp\_reconciliation\_period

To change the Cisco TrustSec Security Group Tag (SGT) Exchange Protocol (CTS-SXP) reconciliation period, use the **cts\_sxp\_reconciliation\_period** command in global configuration mode. To return the CTS-SXP reconciliation period to its default value, use the **no** form of this command.

**cts\_sxp\_reconciliation\_period seconds**  
**no cts\_sxp\_reconciliation\_period seconds**

<b>Syntax Description</b>	<i>seconds</i> CTS-SXP reconciliation timer in seconds. The range is from 0 to 64000. The default is 120.
---------------------------	---

<b>Command Default</b>	120 seconds (2 minutes)
------------------------	-------------------------

<b>Command Modes</b>	Global configuration (config)
----------------------	-------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	After a peer terminates a CTS-SXP connection, an internal delete hold-down timer starts. If the peer reconnects before the delete hold-down timer expires, then the CTS-SXP reconciliation timer starts. While the CTS-SXP reconciliation period timer is active, the CTS-SXP software retains the SGT mapping entries learned from the previous connection and removes invalid entries. Setting the SXP reconciliation period to 0 seconds disables the timer and causes all entries from the previous connection to be removed.
-------------------------	---

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>cts_sxp_connection_peer</b>	Enters the CTS-SXP peer IP address and specifies if a password is used for the peer connection.
	<b>cts_sxp_default_password</b>	Configures the CTS-SXP default password.
	<b>cts_sxp_default_source-ip</b>	Configures the CTS-SXP source IPv4 address.
	<b>cts_sxp_enable</b>	Enables CTS-SXP on a device.
	<b>cts_sxp_log</b>	Turns on logging for IP to SGT binding changes.
	<b>cts_sxp_retry</b>	Changes the CTS-SXP retry period timer.
	<b>show cts_sxp</b>	Displays status of all CTS-SXP configurations.

cts xp retry period

# cts xp retry period

To change the Cisco TrustSec Security Group Tag (SGT) Exchange Protocol (CTS-SXP) retry period timer, use the **cts xp retry period** command in global configuration mode. To return the CTS-SXP retry period timer to its default value, use the **no** form of this command.

**cts xpretry period** *seconds*  
**no cts xpretry period** *seconds*

<b>Syntax Description</b>	<b>seconds</b> CTS-SXP retry timer in seconds. The range is from 0 to 64000. The default is 120.
---------------------------	--

<b>Command Default</b>	120 seconds (2 minutes)
------------------------	-------------------------

<b>Command Modes</b>	Global configuration (config)
----------------------	-------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	The retry timer is triggered if there is at least one CTS-SXP connection that is not up. A new CTS-SXP connection is attempted when this timer expires. A zero value results in no retry being attempted.
-------------------------	---

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>cts xp connectionpeer</b>	Enters the CTS-SXP peer IP address and specifies if a password is used for the peer connection.
	<b>cts xp default password</b>	Configures the CTS-SXP default password.
	<b>cts xp default source-ip</b>	Configures the CTS-SXP source IPv4 address.
	<b>cts xp enable</b>	Enables CTS-SXP on a device.
	<b>cts xp log</b>	Enables logging for IP-to-SGT binding changes.
	<b>cts xp reconciliation</b>	Changes the CTS-SXP reconciliation period.
	<b>show cts xp</b>	Displays the status of all CTS-SXP configurations.

# propagate sgt (cts manual)

To enable Security Group Tag (SGT) propagation at Layer 2 on Cisco TrustSec Security (CTS) interfaces, use the **propagate sgt** command in interface configuration mode. To disable SGT propagation, use the **no** form of this command.

## propagate sgt

<b>Syntax Description</b>	This command has no arguments or keywords.				
<b>Command Default</b>	SGT processing propagation is enabled.				
<b>Command Modes</b>	CTS manual interface configuration mode (config-if-cts-manual)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.1.1	This command was introduced.
Release	Modification				
Cisco IOS XE Denali 16.1.1	This command was introduced.				

<b>Usage Guidelines</b>	SGT processing propagation allows a CTS-capable interface to accept and transmit a CTS Meta Data (CMD) based L2 SGT tag. The <b>no propagate sgt</b> command can be used to disable SGT propagation on an interface in situations where a peer device is not capable of receiving an SGT, and as a result, the SGT tag cannot be put in the L2 header.
-------------------------	--

<b>Examples</b>	The following example shows how to disable SGT propagation on a manually-configured TrustSec-capable interface:
-----------------	---

```
Device# configure terminal
Device(config)# interface gigabitethernet 0
Device(config-if)# cts manual
Device(config-if-cts-manual)# no propagate sgt
```

The following example shows that SGT propagation is disabled on Gigabit Ethernet interface 0:

```
Device#show cts interface brief
Global Dot1x feature is Disabled
Interface GigabitEthernet0:
    CTS is enabled, mode:      MANUAL
    IFC state:                OPEN
    Authentication Status:    NOT APPLICABLE
    Peer identity:            "unknown"
    Peer's advertised capabilities: ""
    Authorization Status:    NOT APPLICABLE
    SAP Status:               NOT APPLICABLE
    Propagate SGT:            Disabled
    Cache Info:
        Cache applied to link : NONE
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>cts manual</b>	Enables an interface for CTS.

propagate sgt (cts manual)

Command	Description
<b>show cts interface</b>	Displays Cisco TrustSec states and statistics per interface.

# show cts credentials

To display the Cisco TrustSec (CTS) device ID, use the **show cts credentials** command in EXEC or privileged EXEC mode.

## show cts credentials

<b>Syntax Description</b>	This command has no commands or keywords.
---------------------------	---

<b>Command Modes</b>	Privileged EXEC (#) User EXEC (>)
----------------------	-----------------------------------

Command History	Release	Modification
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Examples</b>	The following example displays output:
-----------------	--

```
Device# show cts credentials
CTS password is defined in keystore, device-id = r4
```

Related Commands	Command	Description
	<b>cts credentials</b>	Specifies the TrustSec ID and password.

**show cts interface**

# show cts interface

To display Cisco TrustSec (CTS) configuration statistics for an interface(s), use the **show cts interface** command in EXEC or privileged EXEC mode.

**show cts interface [{GigabitEthernet port | Vlan number | brief | summary}]**

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>port</b></td><td>(Optional) Gigabit Ethernet interface number. A verbose status output for this interface is returned.</td></tr> <tr> <td><b>number</b></td><td>(Optional) VLAN interface number from 1 to 4095.</td></tr> <tr> <td><b>brief</b></td><td>(Optional) Displays abbreviated status for all CTS interfaces.</td></tr> <tr> <td><b>summary</b></td><td>(Optional) Displays a tabular summary of all CTS interfaces with 4 or 5 key status fields for each interface.</td></tr> </table>	<b>port</b>	(Optional) Gigabit Ethernet interface number. A verbose status output for this interface is returned.	<b>number</b>	(Optional) VLAN interface number from 1 to 4095.	<b>brief</b>	(Optional) Displays abbreviated status for all CTS interfaces.	<b>summary</b>	(Optional) Displays a tabular summary of all CTS interfaces with 4 or 5 key status fields for each interface.
<b>port</b>	(Optional) Gigabit Ethernet interface number. A verbose status output for this interface is returned.								
<b>number</b>	(Optional) VLAN interface number from 1 to 4095.								
<b>brief</b>	(Optional) Displays abbreviated status for all CTS interfaces.								
<b>summary</b>	(Optional) Displays a tabular summary of all CTS interfaces with 4 or 5 key status fields for each interface.								

**Command Default** None

**Command Modes** EXEC (>  
Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

**Usage Guidelines** Use the **show cts interface** command without keywords to display verbose status for all CTS interfaces.

**Examples** The following example displays output without using a keyword (verbose status for all CTS interfaces):

```
Device# show cts interface

Global Dot1x feature is Disabled
  Interface GigabitEthernet0/1/0:
    CTS is enabled, mode:      MANUAL
    IFC state:                OPEN
    Interface Active for 00:00:18.232
    Authentication Status:    NOT APPLICABLE
      Peer identity:          "unknown"
      Peer's advertised capabilities: ""
    Authorization Status:     NOT APPLICABLE
    SAP Status:               NOT APPLICABLE
    Configured pairwise ciphers:
      gcm-encrypt
      null

    Replay protection:        enabled
    Replay protection mode:   STRICT

    Selected cipher:
```

```

Propagate SGT:           Enabled
Cache Info:
    Cache applied to link : NONE

Statistics:
    authc success:          0
    authc reject:           0
    authc failure:          0
    authc no response:      0
    authc logoff:           0
    sap success:            0
    sap fail:               0
    authz success:          0
    authz fail:              0
    port auth fail:         0

Ingress:
    control frame bypassed: 0
    sap frame bypassed:     0
    esp packets:             0
    unknown sa:              0
    invalid sa:              0
    inverse binding failed: 0
    auth failed:             0
    replay error:            0

Egress:
    control frame bypassed: 0
    esp packets:             0
    sgt filtered:            0
    sap frame bypassed:      0
    unknown sa dropped:       0
    unknown sa bypassed:      0

```

The following example displays output using the **brief** keyword:

```

Device# show cts interface brief

Global Dot1x feature is Disabled
Interface GigabitEthernet0/1/0:
    CTS is enabled, mode:    MANUAL
    IFC state:               OPEN
    Interface Active for 00:00:40.386
    Authentication Status:   NOT APPLICABLE
    Peer identity:           "unknown"
    Peer's advertised capabilities: ""
    Authorization Status:    NOT APPLICABLE
    SAP Status:               NOT APPLICABLE
    Propagate SGT:           Enabled
    Cache Info:
        Cache applied to link : NONE

```

Related Commands	Command	Description
	<b>cts manual</b>	Enables an interface for CTS.
	<b>cts sxp enable</b>	Configures SXP on a network device.
	<b>propagate sgt</b>	Enables Security Group Tag (SGT) propagation at Layer 2 on Cisco TrustSec Security (CTS) interfaces.

show cts role-based permissions

# show cts role-based permissions

To display the role-based (security group) access control permission list, use the **show cts role-based permissions** command in privileged EXEC mode.

```
show cts role-based permissions [{default [{details | ipv4 [details] | ipv6 [details]}] | from {{sgt | unknown }[{ipv4 | ipv6 | to {{sgt | unknown}}[{details | ipv4 [details] | ipv6 [details]}]}]} | ipv4 | ipv6 | platform | to {sgt | unknown}{[ipv4 | ipv6]}]}
```

## Syntax Description

**default** (Optional) Displays information about the default permission list.

**details** (Optional) Displays attached access control list (ACL) details.

**ipv4** (Optional) Displays information about the IPv4 protocol.

**ipv6** (Optional) Displays information about the IPv6 protocol.

**from** (Optional) Displays information about the source group.

**sgt** (Optional) Security Group Tag. Valid values are from 2 to 65519.

**to** (Optional) Displays information about the destination group.

**unknown** (Optional) Displays information about unknown source and destination groups.

**platform** (Optional) Displays information about the platform.

## Command Modes

Privileged EXE (#)

## Command History

Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.

## Usage Guidelines

This command displays the content of the SGACL permission matrix. You can specify the source security group tag (SGT) by using the **from** keyword and the destination SGT by using the **to** keyword. When both these keywords are specified RBACLS of a single cell are displayed. An entire column is displayed when only the **to** keyword is used. An entire row is displayed when the **from** keyword is used. The entire permission matrix is displayed when both the **from** and **to** keywords are omitted.

The command output is sorted by destination SGT as a primary key and the source SGT as a secondary key. SGACLs for each cell is displayed in the same order they are defined in the configuration or acquired from Cisco Identity Services Engine (ISE).

The **details** keyword is provided when a single cell is selected by specifying both **from** and **to** keywords. When the **details** keyword is specified the access control entries of SGACLs of a single cell are displayed.

The following is sample output from the **show role-based permissions** command:

```
Device# show cts role-based permissions
```

```
IPv4 Role-based permissions default (monitored):
default_sgacl-02
Permit IP-00
IPv4 Role-based permissions from group 305:sgt to group 306:dgt (monitored):
test_reg_tcp_permit-02
RBACL Monitor All for Dynamic Policies : TRUE
RBACL Monitor All for Configured Policies : FALSE
IPv4 Role-based permissions from group 6:SGT_6 to group 6:SGT_6 (configured):
mon_1
IPv4 Role-based permissions from group 10 to group 11 (configured):
mon_2
RBACL Monitor All for Dynamic Policies : FALSE
RBACL Monitor All for Configured Policies : FALSE
```

Related Commands	Command	Description
	<b>cts role-based permissions</b>	Enables permissions from a source group to a destination group.
	<b>cts role-based monitor</b>	Enables role-based access list monitoring.

**show cts server-list**

## show cts server-list

To display the list of RADIUS servers available to Cisco TrustSec (CTS) seed and nonseed devices, use the **show cts server-list** command in user EXEC or privileged EXEC mode.

### show cts server-list

**Syntax Description** This command has no commands or keywords.

**Command Modes** Privileged EXEC (#) User EXEC (>)

Command History	Release	Modification
Cisco IOS XE Denali 16.1.1		This command was introduced.

**Usage Guidelines** This command is useful for gathering CTS RADIUS server address and status information.

**Examples** The following example displays the CTS RADIUS server list:

```
Device> show cts server-list
CTS Server Radius Load Balance = DISABLED
Server Group Deadtime = 20 secs (default)
Global Server Liveness Automated Test Deadtime = 20 secs
Global Server Liveness Automated Test Idle Time = 60 mins
Global Server Liveness Automated Test = ENABLED (default)
Preferred list, 1 server(s):
 *Server: 10.0.1.6, port 1812, A-ID 1100E046659D4275B644BF946EFA49CD
   Status = ALIVE
   auto-test = TRUE, idle-time = 60 mins, deadtime = 20 secs
Installed list: ACSServerList1-0001, 1 server(s):
 *Server: 101.0.2.61, port 1812, A-ID 1100E046659D4275B644BF946EFA49CD
   Status = ALIVE
   auto-test = TRUE, idle-time = 60 mins, deadtime = 20 secs
```

Related Commands	Command	Description
	<b>address ipv4 (config-radius-server)</b>	Configures the RADIUS server accounting and authentication parameters for PAC provisioning.
	<b>pac key</b>	Specifies the PAC encryption key.

# show cts sxp

To display Cisco TrustSec Security Group Tag (SGT) Exchange Protocol (CTS-SXP) connection or source IP-to-SGT mapping information, use the **show cts sxp** command in user EXEC or privileged EXEC mode.

```
show cts sxp {connections [{brief | vrf instance-name}] | filter-group [{detailed | global | listener | speaker}] | filter-list filter-list-name | sgt-map [{brief | vrf instance-name}]} [{brief | vrf instance-name}]
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>connections</b></td><td>Displays Cisco TrustSec SXP connections information.</td></tr> <tr> <td><b>brief</b></td><td>(Optional) Displays an abbreviation of the SXP information.</td></tr> <tr> <td><b>vrf instance-name</b></td><td>(Optional) Displays the SXP information for the specified Virtual Routing and Forwarding (VRF) instance name.</td></tr> <tr> <td><b>filter-group {detailed   global   listener   speaker}</b></td><td>(Optional) Displays filter group information.</td></tr> <tr> <td><b>filter-list filter-list-name</b></td><td>(Optional) Displays filter list information.</td></tr> <tr> <td><b>sgt-map</b></td><td>(Optional) Displays the IP-to-SGT mappings received through SXP.</td></tr> </table>	<b>connections</b>	Displays Cisco TrustSec SXP connections information.	<b>brief</b>	(Optional) Displays an abbreviation of the SXP information.	<b>vrf instance-name</b>	(Optional) Displays the SXP information for the specified Virtual Routing and Forwarding (VRF) instance name.	<b>filter-group {detailed   global   listener   speaker}</b>	(Optional) Displays filter group information.	<b>filter-list filter-list-name</b>	(Optional) Displays filter list information.	<b>sgt-map</b>	(Optional) Displays the IP-to-SGT mappings received through SXP.
<b>connections</b>	Displays Cisco TrustSec SXP connections information.												
<b>brief</b>	(Optional) Displays an abbreviation of the SXP information.												
<b>vrf instance-name</b>	(Optional) Displays the SXP information for the specified Virtual Routing and Forwarding (VRF) instance name.												
<b>filter-group {detailed   global   listener   speaker}</b>	(Optional) Displays filter group information.												
<b>filter-list filter-list-name</b>	(Optional) Displays filter list information.												
<b>sgt-map</b>	(Optional) Displays the IP-to-SGT mappings received through SXP.												

**Command Default** None

## Command Modes

User EXEC (>  
Privileged EXEC (#)

## Command History

Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.

## Examples

The following example displays the SXP connections using the **brief** keyword:

```
Device# show cts sxp connection brief

SXP          : Enabled
Default Password : Set
Default Source IP: Not Set
Connection retry open period: 10 secs
Reconcile period: 120 secs
Retry open timer is not running
-----
Peer_IP      Source_IP      Conn Status      Duration
-----
10.10.10.1    10.10.10.2    On           0:00:02:14 (dd:hr:mm:sec)
10.10.2.1     10.10.2.2     On           0:00:02:14 (dd:hr:mm:sec)
Total num of SXP Connections = 2
```

**show cts sxp**

The following example displays the CTS-SXP connections:

```
Device# show cts sxp connections

SXP : Enabled
Default Password : Set
Default Source IP: Not Set
Connection retry open period: 10 secs
Reconcile period: 120 secs
Retry open timer is not running
-----
Peer IP : 10.10.10.1
Source IP : 10.10.10.2
Set up : Peer
Conn status : On
Connection mode : SXP Listener
Connection inst# : 1
TCP conn fd : 1
TCP conn password: not set (using default SXP password)
Duration since last state change: 0:00:01:25 (dd:hr:mm:sec)
-----
Peer IP : 10.10.2.1
Source IP : 10.10.2.2
Set up : Peer
Conn status : On
Connection mode : SXP Listener
TCP conn fd : 2
TCP conn password: not set (using default SXP password)
Duration since last state change: 0:00:01:25 (dd:hr:mm:sec)
Total num of SXP Connections = 2
```

The following example displays the CTS-SXP connections for a bi-directional connection when the device is both the speaker and listener:

```
Device# show cts sxp connections

SXP : Enabled
Highest Version Supported: 4
Default Password : Set
Default Source IP: Not Set
Connection retry open period: 120 secs
Reconcile period: 120 secs
Retry open timer is running
-----
Peer IP : 2.0.0.2
Source IP : 1.0.0.2
Conn status : On (Speaker) :: On (Listener)
Conn version : 4
Local mode : Both
Connection inst# : 1
TCP conn fd : 1(Speaker) 3(Listener)
TCP conn password: default SXP password
Duration since last state change: 1:03:38:03 (dd:hr:mm:sec) :: 0:00:00:46 (dd:hr:mm:sec)
```

The following example displays output from a CTS-SXP listener with a torn down connection to the SXP speaker. Source IP-to-SGT mappings are held for 120 seconds, the default value of the delete hold down timer.

```
Device# show cts sxp connections
```

```

SXP : Enabled
Default Password : Set
Default Source IP: Not Set
Connection retry open period: 10 secs
Reconcile period: 120 secs
Retry open timer is not running
-----
Peer IP      : 10.10.10.1
Source IP    : 10.10.10.2
Set up       : Peer
Conn status   : Delete_Hold_Down
Connection mode : SXP Listener
Connection inst# : 1
TCP conn fd   : -1
TCP conn password: not set (using default SXP password)
Delete hold down timer is running
Duration since last state change: 0:00:00:16 (dd:hr:mm:sec)
-----
Peer IP      : 10.10.2.1
Source IP    : 10.10.2.2
Set up       : Peer
Conn status   : On
Connection inst# : 1
TCP conn fd   : 2
TCP conn password: not set (using default SXP password)
Duration since last state change: 0:00:05:49 (dd:hr:mm:sec)
Total num of SXP Connections = 2

```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>cts sxp connection peer</b>	Enters the Cisco TrustSec SXP peer IP address and specifies if a password is used for the peer connection
<b>cts sxp default password</b>	Configures the Cisco TrustSec SXP default password.
<b>cts sxp default source-ip</b>	Configures the Cisco TrustSec SXP source IPv4 address.
<b>cts sxp enable</b>	Enables Cisco TrustSec SXP on a device.
<b>cts sxp log</b>	Enables logging for IP-to-SGT binding changes.
<b>cts sxp reconciliation</b>	Changes the Cisco TrustSec SXP reconciliation period.
<b>cts sxp retry</b>	Changes the Cisco TrustSec SXP retry period timer.

```
show cts sxp
```

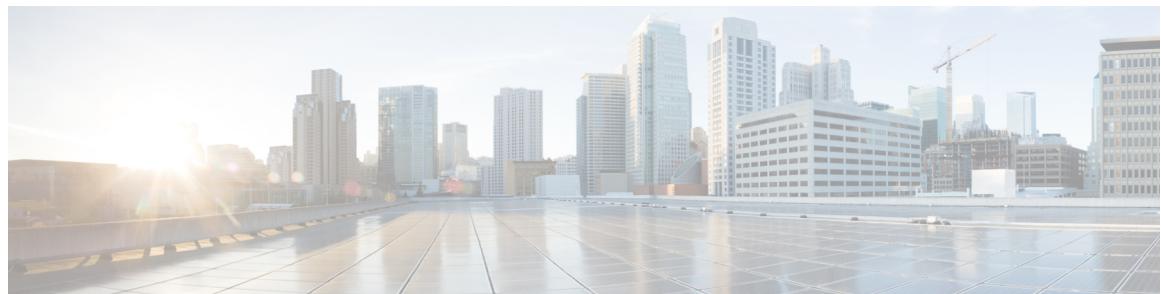


PART **II**

## **Interface and Hardware Components**

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# Interface and Hardware Commands

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# debug ilpower

To enable debugging of the power controller and Power over Ethernet (PoE) system, use the **debug ilpower** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

```
debug ilpower {cdp | event | ha | ipc | police | port | powerman | registries | scp | sense}
no debug ilpower {cdp | event | ha | ipc | police | port | powerman | registries | scp | sense}
```

## Syntax Description

<b>cdp</b>	Displays PoE Cisco Discovery Protocol (CDP) debug messages.
<b>event</b>	Displays PoE event debug messages.
<b>ha</b>	Displays PoE high-availability messages.
<b>ipc</b>	Displays PoE Inter-Process Communication (IPC) debug messages.
<b>police</b>	Displays PoE police debug messages.
<b>port</b>	Displays PoE port manager debug messages.
<b>powerman</b>	Displays PoE power management debug messages.
<b>registries</b>	Displays PoE registries debug messages.
<b>scp</b>	Displays PoE SCP debug messages.
<b>sense</b>	Displays PoE sense debug messages.

## Command Default

Debugging is disabled.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.
Cisco IOS XE 3.3SE	The <b>upoe</b> keyword was added.

## Usage Guidelines

This command is supported only on PoE-capable switches.

When you enable debugging on a switch stack, it is enabled only on the active switch. To enable debugging on a member switch, you can start a session from the active switch by using the **session switch-number** EXEC command. Then enter the **debug** command at the command-line prompt of the member switch.

# debug interface

To enable debugging of interface-related activities, use the **debug interface** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

```
debug interface {interface-id | counters {exceptions | protocol memory} | states}
no debug interface {interface-id | counters {exceptions | protocol memory} | states}
```

## Syntax Description

<i>interface-id</i>	ID of the physical interface. Displays debug messages for the specified physical port, identified by type switch number/module number/port, for example, gigabitethernet 1/0/2.
<b>counters</b>	Displays counters debugging information.
<b>exceptions</b>	Displays debug messages when a recoverable exceptional condition occurs during the computation of the interface packet and data rate statistics.
<b>protocol memory</b>	Displays debug messages for memory operations of protocol counters.
<b>states</b>	Displays intermediary debug messages when an interface's state transitions.

## Command Default

Debugging is disabled.

## Command Modes

Privileged EXEC

## Command History

	<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE		This command was introduced.

## Usage Guidelines

If you do not specify a keyword, all debug messages appear.

The **undebbug interface** command is the same as the **no debug interface** command.

When you enable debugging on a switch stack, it is enabled only on the active switch. To enable debugging on a member switch, you can start a session from the active switch by using the **session switch-number** EXEC command. Then enter the **debug** command at the command-line prompt of the member switch.

# debug lldp packets

To enable debugging of Link Layer Discovery Protocol (LLDP) packets, use the **debug lldp packets** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

**debug lldp packets**  
**no debug lldp packets**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Debugging is disabled.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The **undebbug lldp packets** command is the same as the **no debug lldp packets** command.

When you enable debugging on a switch stack, it is enabled only on the . To enable debugging on a stack member, you can start a session from the by using the **session switch-number** EXEC command.

# debug platform poe

To enable debugging of a Power over Ethernet (PoE) port, use the **debug platform poe** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

```
debug platform poe [{error | info}] [switch switch-number]
no debug platform poe [{error | info}] [switch switch-number]
```

<b>Syntax Description</b>	<b>error</b> (Optional) Displays PoE-related error debug messages. <b>info</b> (Optional) Displays PoE-related information debug messages. <b>switch switch-number</b> (Optional) Specifies the stack member. This keyword is supported only on stacking-capable switches.				
<b>Command Default</b>	Debugging is disabled.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	The <b>undebbug platform poe</b> command is the same as the <b>no debug platform poe</b> command.				

# debug platform software fed switch active punt packet-capture start

To enable debugging of packets during high CPU utilization, for an active switch, use the **debug platform software fed switch active punt packet-capture start** command in privileged EXEC mode. To disable debugging of packets during high CPU utilization, for an active switch, use the **debug platform software fed switch active punt packet-capture stop** command in privileged EXEC mode.

```
debug platform software fed switch active punt packet-capture start
debug platform software fed switch active punt packet-capture stop
```

<b>Syntax Description</b>	<b>switch active</b>	Displays information about the active switch.
	<b>punt</b>	Specifies the punt information.
	<b>packet-capture</b>	Specifies information about the captured packet.
	<b>start</b>	Enables debugging of the active switch.
	<b>stop</b>	Disables debugging of the active switch.

<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td> <td>This command was introduced.</td> </tr> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.				

<b>Usage Guidelines</b>	The <b>debug platform software fed switch active punt packet-capture start</b> command starts the debugging of packets during high CPU utilization. The packet capture is stopped when the 4k buffer size is exceeded.
-------------------------	--

<b>Examples</b>	The following is a sample output from the <b>debug platform software fed switch active punt packet-capture start</b> command:
-----------------	---

```
Device# debug platform software fed switch active packet-capture start
Punt packet capturing started.
```

The following is a sample output from the **debug platform software fed switch active punt packet-capture stop** command:

```
Device# debug platform software fed switch active packet-capture stop
Punt packet capturing stopped. Captured 101 packet(s)
```

# duplex

To specify the duplex mode of operation for a port, use the **duplex** command in interface configuration mode. To return to the default value, use the **no** form of this command.

```
duplex {auto | full | half}
no duplex {auto | full | half}
```

## Syntax Description

<b>auto</b>	Enables automatic duplex configuration. The port automatically detects whether it should run in full- or half-duplex mode, depending on the attached device mode.
<b>full</b>	Enables full-duplex mode.
<b>half</b>	Enables half-duplex mode (only for interfaces operating at 10 or 100 Mbps). You cannot configure half-duplex mode for interfaces operating at 1000 or 10,000 Mbps.

## Command Default

For Gigabit Ethernet ports, the default is **auto**.

For 100BASE-x (where -x is -BX, -FX, -FX-FE, or -LX) SFP modules, the default is **half**.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

For Gigabit Ethernet ports, setting the port to **auto** has the same effect as specifying **full** if the attached device does not autonegotiate the duplex parameter.

You cannot configure the duplex mode on 10-Gigabit Ethernet ports; it is always **full**.

Duplex options are not supported on the 1000BASE-x or 10GBASE-x (where -x is -BX, -CWDM, -LX, -SX, or -ZX) small form-factor pluggable (SFP) modules.



**Note** Half-duplex mode is supported on Gigabit Ethernet interfaces if the duplex mode is **auto** and the connected device is operating at half duplex. However, you cannot configure these interfaces to operate in half-duplex mode.

Certain ports can be configured to be either full duplex or half duplex. How this command is applied depends on the device to which the switch is attached.

If both ends of the line support autonegotiation, we highly recommend using the default autonegotiation settings. If one interface supports autonegotiation and the other end does not, configure duplex and speed on both interfaces, and use the **auto** setting on the supported side.

If the speed is set to **auto**, the switch negotiates with the device at the other end of the link for the speed setting and then forces the speed setting to the negotiated value. The duplex setting remains as configured on each end of the link, which could result in a duplex setting mismatch.

You can configure the duplex setting when the speed is set to **auto**.



**Caution** Changing the interface speed and duplex mode configuration might shut down and reenable the interface during the reconfiguration.

You can verify your setting by entering the **show interfaces** privileged EXEC command.

## Examples

This example shows how to configure an interface for full-duplex operation:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/0/1
Device(config-if)# duplex full
```

**errdisable detect cause**

# errdisable detect cause

To enable error-disable detection for a specific cause or for all causes, use the **errdisable detect cause** command in global configuration mode. To disable the error-disable detection feature, use the **no** form of this command.

```
errdisable detect cause {all | arp-inspection | bpduguard shutdown vlan | dhcp-rate-limit | dtp-flap | gbic-invalid | inline-power | l2ptguard | link-flap | loopback | pagp-flap | pppoe-ia-rate-limit | security-violation shutdown vlan | sfp-config-mismatch}
no errdisable detect cause {all | arp-inspection | bpduguard shutdown vlan | dhcp-rate-limit | dtp-flap | gbic-invalid | inline-power | l2ptguard | link-flap | loopback | pagp-flap | pppoe-ia-rate-limit | security-violation shutdown vlan | sfp-config-mismatch}
```

Syntax Description		
<b>all</b>	Enables error detection for all error-disabled causes.	
<b>arp-inspection</b>	Enables error detection for dynamic Address Resolution Protocol (ARP) inspection.	
<b>bpduguard shutdown vlan</b>	Enables per-VLAN error-disable for BPDU guard.	
<b>dhcp-rate-limit</b>	Enables error detection for DHCP snooping.	
<b>dtp-flap</b>	Enables error detection for the Dynamic Trunking Protocol (DTP) flapping.	
<b>gbic-invalid</b>	Enables error detection for an invalid Gigabit Interface Converter (GBIC) module.	<p><b>Note</b> This error refers to an invalid small form-factor pluggable (SFP) module.</p>
<b>inline-power</b>	Enables error detection for the Power over Ethernet (PoE) error-disabled cause.	<p><b>Note</b> This keyword is supported only on switches with PoE ports.</p>
<b>l2ptguard</b>	Enables error detection for a Layer 2 protocol-tunnel error-disabled cause.	
<b>link-flap</b>	Enables error detection for link-state flapping.	
<b>loopback</b>	Enables error detection for detected loopbacks.	
<b>pagp-flap</b>	Enables error detection for the Port Aggregation Protocol (PAgP) flap error-disabled cause.	
<b>pppoe-ia-rate-limit</b>	Enables error detection for the PPPoE Intermediate Agent rate-limit error-disabled cause.	
<b>security-violation shutdown vlan</b>	Enables voice aware 802.1x security.	
<b>sfp-config-mismatch</b>	Enables error detection on an SFP configuration mismatch.	

<b>Command Default</b>	Detection is enabled for all causes. All causes, except per-VLAN error disabling, are configured to shut down the entire port.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding-bottom: 5px;"><b>Release</b></th><th style="text-align: right; padding-bottom: 5px;"><b>Modification</b></th></tr> </thead> <tbody> <tr> <td style="padding-top: 5px;">Cisco IOS XE 3.2SE</td><td style="text-align: right; padding-top: 5px;">This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** A cause (such as a link-flap or dhcp-rate-limit) is the reason for the error-disabled state. When a cause is detected on an interface, the interface is placed in an error-disabled state, an operational state that is similar to a link-down state.

When a port is error-disabled, it is effectively shut down, and no traffic is sent or received on the port. For the bridge protocol data unit (BPDU) guard, voice-aware 802.1x security, and port-security features, you can configure the switch to shut down only the offending VLAN on the port when a violation occurs, instead of shutting down the entire port.

If you set a recovery mechanism for the cause by entering the **errdisable recovery** global configuration command, the interface is brought out of the error-disabled state and allowed to retry the operation when all causes have timed out. If you do not set a recovery mechanism, you must enter the **shutdown** and then the **no shutdown** commands to manually recover an interface from the error-disabled state.

To verify your settings, enter the **show errdisable detect** privileged EXEC command.

This example shows how to enable error-disabled detection for the link-flap error-disabled cause:

```
Device(config)# errdisable detect cause link-flap
```

This command shows how to globally configure BPDU guard for a per-VLAN error-disabled state:

```
Device(config)# errdisable detect cause bpduguard shutdown vlan
```

This command shows how to globally configure voice-aware 802.1x security for a per-VLAN error-disabled state:

```
Device(config)# errdisable detect cause security-violation shutdown vlan
```

You can verify your setting by entering the **show errdisable detect** privileged EXEC command.

**errdisable recovery cause**

## errdisable recovery cause

To enable the error-disabled mechanism to recover from a specific cause, use the **errdisable recovery cause** command in global configuration mode. To return to the default setting, use the **no** form of this command.

```
errdisable recovery cause {all | arp-inspection | bpduguard | channel-misconfig | dhcp-rate-limit |
dtp-flap | gbic-invalid | inline-power | l2ptguard | link-flap | loopback | mac-limit | pagp-flap |
port-mode-failure | pppoe-ia-rate-limit | psecure-violation | security-violation | sfp-config-mismatch |
storm-control | udld}
no errdisable recovery cause {all | arp-inspection | bpduguard | channel-misconfig | dhcp-rate-limit |
dtp-flap | gbic-invalid | inline-power | l2ptguard | link-flap | loopback | mac-limit | pagp-flap |
port-mode-failure | pppoe-ia-rate-limit | psecure-violation | security-violation | sfp-config-mismatch |
storm-control | udld}
```

Syntax Description		
	<b>all</b>	Enables the timer to recover from all error-disabled causes.
	<b>arp-inspection</b>	Enables the timer to recover from the Address Resolution Protocol (ARP) inspection error-disabled state.
	<b>bpduguard</b>	Enables the timer to recover from the bridge protocol data unit (BPDU) guard error-disabled state.
	<b>channel-misconfig</b>	Enables the timer to recover from the EtherChannel misconfiguration error-disabled state.
	<b>dhcp-rate-limit</b>	Enables the timer to recover from the DHCP snooping error-disabled state.
	<b>dtp-flap</b>	Enables the timer to recover from the Dynamic Trunking Protocol (DTP) flap error-disabled state.
	<b>gbic-invalid</b>	Enables the timer to recover from an invalid Gigabit Interface Converter (GBIC) module error-disabled state.
	<b>Note</b>	This error refers to an invalid small form-factor pluggable (SFP) error-disabled state.
	<b>inline-power</b>	Enables the timer to recover from the Power over Ethernet (PoE) error-disabled state.  This keyword is supported only on switches with PoE ports.
	<b>l2ptguard</b>	Enables the timer to recover from a Layer 2 protocol tunnel error-disabled state.
	<b>link-flap</b>	Enables the timer to recover from the link-flap error-disabled state.
	<b>loopback</b>	Enables the timer to recover from a loopback error-disabled state.
	<b>mac-limit</b>	Enables the timer to recover from the mac limit error-disabled state.

<b>pagg-flap</b>	Enables the timer to recover from the Port Aggregation Protocol (PAgP)-flap error-disabled state.
<b>port-mode-failure</b>	Enables the timer to recover from the port mode change failure error-disabled state.
<b>pppoe-ia-rate-limit</b>	Enables the timer to recover from the PPPoE IA rate limit error-disabled state.
<b>psecure-violation</b>	Enables the timer to recover from a port security violation disable state.
<b>security-violation</b>	Enables the timer to recover from an IEEE 802.1x-violation disabled state.
<b>sfp-config-mismatch</b>	Enables error detection on an SFP configuration mismatch.
<b>storm-control</b>	Enables the timer to recover from a storm control error.
<b>udld</b>	Enables the timer to recover from the UniDirectional Link Detection (UDLD) error-disabled state.

**Command Default** Recovery is disabled for all causes.

**Command Modes** Global configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A cause (such as all or BPDU guard) is defined as the reason that the error-disabled state occurred. When a cause is detected on an interface, the interface is placed in the error-disabled state, an operational state similar to link-down state.

When a port is error-disabled, it is effectively shut down, and no traffic is sent or received on the port. For the BPDU guard and port-security features, you can configure the switch to shut down only the offending VLAN on the port when a violation occurs, instead of shutting down the entire port.

If you do not enable the recovery for the cause, the interface stays in the error-disabled state until you enter the **shutdown** and the **no shutdown** interface configuration commands. If you enable the recovery for a cause, the interface is brought out of the error-disabled state and allowed to retry the operation again when all the causes have timed out.

Otherwise, you must enter the **shutdown** and then the **no shutdown** commands to manually recover an interface from the error-disabled state.

You can verify your settings by entering the **show errdisable recovery** privileged EXEC command.

**Examples** This example shows how to enable the recovery timer for the BPDU guard error-disabled cause:

```
Device(config)# errdisable recovery cause bpduguard
```

**errdisable recovery interval**

# errdisable recovery interval

To specify the time to recover from an error-disabled state, use the **errdisable recovery interval** command in global configuration mode. To return to the default setting, use the **no** form of this command.

**errdisable recovery interval** *timer-interval*  
**no errdisable recovery interval** *timer-interval*

---

## Syntax Description

*timer-interval* Time to recover from the error-disabled state. The range is 30 to 86400 seconds. The same interval is applied to all causes. The default interval is 300 seconds.

---

## Command Default

The default recovery interval is 300 seconds.

## Command Modes

Global configuration

---

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

---

## Usage Guidelines

The error-disabled recovery timer is initialized at a random differential from the configured interval value. The difference between the actual timeout value and the configured value can be up to 15 percent of the configured interval.

You can verify your settings by entering the **show errdisable recovery** privileged EXEC command.

---

## Examples

This example shows how to set the timer to 500 seconds:

```
Device(config)# errdisable recovery interval 500
```

# interface

To configure an interface, use the **interface** command.

```
interface {Auto-Template interface-number | GigabitEthernet switch-number/slot-number/port-number
| Group VI Group VI interface number | Internal Interface Internal Interface number | Loopback
interface-number Null interface-number Port-channel interface-number TenGigabitEthernet
switch-number/slot-number/port-number Tunnel interface-number Vlan interface-number }
```

<b>Auto-Template</b> <i>interface-number</i>	Enables you to configure a auto-template interface. The range is from 1 to 999.
<b>GigabitEthernet</b> <i>switch-number/slot-number/port-number</i>	Enables you to configure a Gigabit Ethernet IEEE 802.3z interface. The range is from 0 to 9
<b>Group VI</b> <i>Group VI interface number</i>	Enables you to configure a Group VI interface. The range is from 0 to 9.
<b>Internal Interface</b> <i>Internal Interface</i>	Enables you to configure an internal interface.
<b>Loopback</b> <i>interface-number</i>	Enables you to configure a loopback interface. The range is from 0 to 2147483647.
<b>Null</b> <i>interface-number</i>	Enables you to configure a null interface. The default value is 0.
<b>Port-channel</b> <i>interface-number</i>	Enables you to configure a port-channel interface. The range is from 1 to 128.
<b>TenGigabitEthernet</b> <i>switch-number/slot-number/port-number</i>	Enables you to configure a 10-Gigabit Ethernet interface. <ul style="list-style-type: none"> <li>• <i>switch-number</i> — Switch ID. The range is from 1 to 8.</li> <li>• <i>slot-number</i> — Slot number. The range is from 0 to 1.</li> <li>• <i>port-number</i> — Port number. The range is from 1 to 24 and 37 to 48</li> </ul>
<b>Tunnel</b> <i>interface-number</i>	Enables you to configure a tunnel interface. The range is from 0 to 2147483647.
<b>Vlan</b> <i>interface-number</i>	Enables you to configure a switch VLAN. The range is from 1 to 4094.

**Command Default** None

**Command Modes** Global configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

Usage Guidelines	You can not use the "no" form of this command.
------------------	--

The following example shows how to configure a tunnel interface:

```
Device# interface Tunnel 15
```

# interface range

To configure an interface range, use the **interface range** command.

```
interface range {Auto-Template interface-number | GigabitEthernet
switch-number/slot-number/port-number | Loopback interface-number | Null interface-number |
Port-channel interface-number | TenGigabitEthernet switch-number/slot-number/port-number | Tunnel
interface-number | Vlan interface-number }
```

<b>Auto-Template</b> <i>interface-number</i>	Enables you to configure an auto-template interface. The range is from 1 to 999.
<b>GigabitEthernet</b> <i>switch-number/slot-number/port-number</i>	Enables you to configure a Gigabit Ethernet IEEE 802.3z interface. <ul style="list-style-type: none"> <li>• <i>switch-number</i>— Switch ID. The range is from 1 to 8.</li> <li>• <i>slot-number</i>— Slot number. The range is from 0 to 1.</li> <li>• <i>port-number</i>— Port number. The range is from 1 to 48.</li> </ul>
<b>Loopback</b> <i>interface-number</i>	Enables you to configure a loopback interface. The range is from 0 to 2147483647.
<b>Null</b> <i>interface-number</i>	Enables you to configure a null interface. The default value is 0.
<b>Port-channel</b> <i>interface-number</i>	Enables you to configure a port-channel interface. The range is from 1 to 128.
<b>TenGigabitEthernet</b> <i>switch-number/slot-number/port-number</i>	Enables you to configure a 10-Gigabit Ethernet interface. <ul style="list-style-type: none"> <li>• <i>switch-number</i>— Switch ID. The range is from 1 to 8.</li> <li>• <i>slot-number</i>— Slot number. The range is from 0 to 1.</li> <li>• <i>port-number</i>— Port number. The range is from 1 to 24 and 37 to 48.</li> </ul>
<b>Tunnel</b> <i>interface-number</i>	Enables you to configure a tunnel interface. The range is from 0 to 2147483647.
<b>Vlan</b> <i>interface-number</i>	Enables you to configure a switch VLAN. The range is from 1 to 4094.

**Command Default** None

**interface range****Command Modes** Global configuration**Command History** **Release** **Modification**Cisco IOS XE      This command was introduced.  
3.2SE

This example shows how you can configure interface range:

```
Device(config)# interface range vlan 1-100
```

# ip mtu

To set the IP maximum transmission unit (MTU) size of routed packets on all routed ports of the switch or switch stack, use the **ip mtu** command in interface configuration mode. To restore the default IP MTU size, use the **no** form of this command.

```
ip mtu bytes
no ip mtu bytes
```

## Syntax Description

*bytes* MTU size, in bytes. The range is from 68 up to the system MTU value (in bytes).

## Command Default

The default IP MTU size for frames received and sent on all switch interfaces is 1500 bytes.

## Command Modes

Interface configuration

## Command History

	Release	Modification
Cisco IOS XE 3.2SE		This command was introduced.

## Usage Guidelines

The upper limit of the IP value is based on the switch or switch stack configuration and refers to the currently applied system MTU value. For more information about setting the MTU sizes, see the **system mtu** global configuration command.

To return to the default IP MTU setting, you can apply the **default ip mtu** command or the **no ip mtu** command on the interface.

You can verify your setting by entering the **show ip interface *interface-id*** or **show interfaces *interface-id*** privileged EXEC command.

The following example sets the maximum IP packet size for VLAN 200 to 1000 bytes:

```
Device(config)# interface vlan 200
Device(config-if)# ip mtu 1000
```

The following example sets the maximum IP packet size for VLAN 200 to the default setting of 1500 bytes:

```
Device(config)# interface vlan 200
Device(config-if)# default ip mtu
```

This is an example of partial output from the **show ip interface *interface-id*** command. It displays the current IP MTU setting for the interface.

```
Device# show ip interface gigabitethernet4/0/1
GigabitEthernet4/0/1 is up, line protocol is up
  Internet address is 18.0.0.1/24
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set

<output truncated>
```

# ipv6 mtu

To set the IPv6 maximum transmission unit (MTU) size of routed packets on all routed ports of the switch or switch stack, use the **ipv6 mtu** command in interface configuration mode. To restore the default IPv6 MTU size, use the **no** form of this command.

```
ipv6 mtu bytes
no ipv6 mtu bytes
```

## Syntax Description

*bytes* MTU size, in bytes. The range is from 1280 up to the system MTU value (in bytes).

## Command Default

The default IPv6 MTU size for frames received and sent on all switch interfaces is 1500 bytes.

## Command Modes

Interface configuration

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

The upper limit of the IPv6 MTU value is based on the switch or switch stack configuration and refers to the currently applied system MTU value. For more information about setting the MTU sizes, see the **system mtu** global configuration command.

To return to the default IPv6 MTU setting, you can apply the **default ipv6 mtu** command or the **no ipv6 mtu** command on the interface.

You can verify your setting by entering the **show ipv6 interface *interface-id*** or **show interface *interface-id*** privileged EXEC command.

The following example sets the maximum IPv6 packet size for an interface to 2000 bytes:

```
Device(config)# interface gigabitethernet4/0/1
Device(config-if)# ipv6 mtu 2000
```

The following example sets the maximum IPv6 packet size for an interface to the default setting of 1500 bytes:

```
Device(config)# interface gigabitethernet4/0/1
Device(config-if)# default ipv6 mtu
```

This is an example of partial output from the **show ipv6 interface *interface-id*** command. It displays the current IPv6 MTU setting for the interface.

```
Device# show ipv6 interface gigabitethernet4/0/1
GigabitEthernet4/0/1 is up, line protocol is up
  Internet address is 18.0.0.1/24
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set

<output truncated>
```

# lldp (interface configuration)

To enable Link Layer Discovery Protocol (LLDP) on an interface, use the **lldp** command in interface configuration mode. To disable LLDP on an interface, use the **no** form of this command.

```
lldp {med-tlv-select tlv | receive | tlv-select power-management | transmit}
no lldp {med-tlv-select tlv | receive | tlv-select power-management | transmit}
```

<b>Syntax Description</b>	<b>med-tlv-select</b> Selects an LLDP Media Endpoint Discovery (MED) time-length-value (TLV) element to send. <b>tlv</b> String that identifies the TLV element. Valid values are the following: <ul style="list-style-type: none"> <li>• <b>inventory-management</b>— LLDP MED Inventory Management TLV.</li> <li>• <b>location</b>— LLDP MED Location TLV.</li> <li>• <b>network-policy</b>— LLDP MED Network Policy TLV.</li> <li>• <b>power-management</b>— LLDP MED Power Management TLV.</li> </ul>				
<b>receive</b>	Enables the interface to receive LLDP transmissions.				
<b>tlv-select</b>	Selects the LLDP TLVs to send.				
<b>power-management</b>	Sends the LLDP Power Management TLV.				
<b>transmit</b>	Enables LLDP transmission on the interface.				
<b>Command Default</b>	LLDP is disabled.				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding-bottom: 5px;"><b>Release</b></th><th style="text-align: right; padding-bottom: 5px;"><b>Modification</b></th></tr> </thead> <tbody> <tr> <td style="padding-top: 5px;">Cisco IOS XE 3.2SE</td><td style="text-align: right; padding-top: 5px;">This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** This command is supported on 802.1 media types.

If the interface is configured as a tunnel port, LLDP is automatically disabled.

The following example shows how to disable LLDP transmission on an interface:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# no lldp transmit
```

The following example shows how to enable LLDP transmission on an interface:

```
Device(config)# interface gigabitethernet1/0/1
```

**lldp (interface configuration)**

```
Device(config-if)# lldp transmit
```

# logging event power-inline-status

To enable the logging of Power over Ethernet (PoE) events, use the **logging event power-inline-status** command in interface configuration mode. To disable the logging of PoE status events, use the **no** form of this command.

```
logging event power-inline-status
no logging event power-inline-status
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** Logging of PoE events is enabled.

**Command Modes** Interface configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The **no** form of this command does not disable PoE error events.

**Examples** This example shows how to enable logging of PoE events on a port:

```
Device(config-if)# interface gigabitethernet1/0/1
Device(config-if)# logging event power-inline-status
Device(config-if)#
```

# mdix auto

To enable the automatic medium-dependent interface crossover (auto-MDIX) feature on the interface, use the **mdix auto** command in interface configuration mode. To disable auto-MDIX, use the **no** form of this command.

```
mdix auto
no mdix auto
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** Auto-MDIX is enabled.

**Command Modes** Interface configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** When auto-MDIX is enabled, the interface automatically detects the required cable connection type (straight-through or crossover) and configures the connection appropriately.

When you enable auto-MDIX on an interface, you must also set the interface speed and duplex to **auto** so that the feature operates correctly.

When auto-MDIX (and autonegotiation of speed and duplex) is enabled on one or both of the connected interfaces, link up occurs, even if the cable type (straight-through or crossover) is incorrect.

This example shows how to enable auto-MDIX on a port:

```
Device# configure terminal
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# speed auto
Device(config-if)# duplex auto
Device(config-if)# mdix auto
Device(config-if)# end
```

# mode (power-stack configuration)

To configure power stack mode for the power stack, use the **mode** command in power-stack configuration mode. To return to the default settings, use the **no** form of the command.

```
mode {power-shared | redundant} [strict]
no mode
```

<b>Syntax Description</b>	<b>power-shared</b> Sets the power stack to operate in power-shared mode. This is the default. <b>redundant</b> Sets the power stack to operate in redundant mode. The largest power supply is removed from the power pool to be used as backup power in case one of the other power supplies fails. <b>strict</b> (Optional) Configures the power stack mode to run a strict power budget. The stack power needs cannot exceed the available power.				
<b>Command Default</b>	The default modes are <b>power-shared</b> and nonstrict.				
<b>Command Modes</b>	Power-stack configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	<p>This command is available only on switch stacks running the IP Base or IP Services feature set.</p> <p>To access power-stack configuration mode, enter the <b>stack-power stack <i>power stack name</i></b> global configuration command.</p> <p>Entering the <b>no mode</b> command sets the switch to the defaults of <b>power-shared</b> and non-strict mode.</p>
-------------------------	---



**Note** For stack power, available power is the total power available for PoE from all power supplies in the power stack, available power is the power allocated to all powered devices connected to PoE ports in the stack, and consumed power is the actual power consumed by the powered devices.

In **power-shared** mode, all of the input power can be used for loads, and the total available power appears as one large power supply. The power budget includes all power from all supplies. No power is set aside for power supply failures. If a power supply fails, load shedding (shutting down of powered devices or switches) might occur.

In **redundant** mode, the largest power supply is removed from the power pool to use as backup power in case one of the other power supplies fails. The available power budget is the total power minus the largest power supply. This reduces the available power in the pool for switches and powered devices, but in case of a failure or an extreme power load, there is less chance of having to shut down switches or powered devices.

In **strict** mode, when a power supply fails and the available power drops below the budgeted power, the system balances the budget through load shedding of powered devices, even if the actual power is less than the available power. In nonstrict mode, the power stack can run in an over-allocated state and is stable as long as

**mode (power-stack configuration)**

the actual power does not exceed the available power. In this mode, a powered device drawing more than normal power could cause the power stack to start shedding loads. This is normally not a problem because most devices do not run at full power. The chances of multiple powered devices in the stack requiring maximum power at the same time is small.

In both strict and nonstrict modes, power is denied when there is no power available in the power budget.

This is an example of setting the power stack mode for the stack named power1 to power-shared with strict power budgeting. All power in the stack is shared, but when the total available power is allotted, no more devices are allowed power.

```
Device(config)# stack-power stack power1
Device(config-stackpower)# mode power-shared strict
Device(config-stackpower)# exit
```

This is an example of setting the power stack mode for the stack named power2 to redundant. The largest power supply in the stack is removed from the power pool to provide redundancy in case one of the other supplies fails.

```
Device(config)# stack-power stack power2
Device(config-stackpower)# mode redundant
Device(config-stackpower)# exit
```

# network-policy

To apply a network-policy profile to an interface, use the **network-policy** command in interface configuration mode. To remove the policy, use the **no** form of this command.

```
network-policy profile-number
no network-policy
```

<b>Syntax Description</b>	<i>profile-number</i> The network-policy profile number to apply to the interface.
---------------------------	--

<b>Command Default</b>	No network-policy profiles are applied.
------------------------	---

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	Use the <b>network-policy <i>profile number</i></b> interface configuration command to apply a profile to an interface.
-------------------------	---

You cannot apply the **switchport voice vlan** command on an interface if you first configure a network-policy profile on it. However, if **switchport voice vlan *vlan-id*** is already configured on the interface, you can apply a network-policy profile on the interface. The interface then has the voice or voice-signaling VLAN network-policy profile applied.

This example shows how to apply network-policy profile 60 to an interface:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# network-policy 60
```

# network-policy profile (global configuration)

To create a network-policy profile and to enter network-policy configuration mode, use the **network-policy profile** command in global configuration mode. To delete the policy and to return to global configuration mode, use the **no** form of this command.

**network-policy profile** *profile-number*  
**no network-policy profile** *profile-number*

<b>Syntax Description</b>	<i>profile-number</i> Network-policy profile number. The range is 1 to 4294967295.	
<b>Command Default</b>	No network-policy profiles are defined.	
<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
<b>Usage Guidelines</b>	<p>Use the <b>network-policy profile</b> global configuration command to create a profile and to enter network-policy profile configuration mode.</p> <p>To return to privileged EXEC mode from the network-policy profile configuration mode, enter the <b>exit</b> command.</p> <p>When you are in network-policy profile configuration mode, you can create the profile for voice and voice signaling by specifying the values for VLAN, class of service (CoS), differentiated services code point (DSCP), and tagging mode.</p> <p>These profile attributes are contained in the Link Layer Discovery Protocol for Media Endpoint Devices (LLDP-MED) network-policy time-length-value (TLV).</p>	

This example shows how to create network-policy profile 60:

```
Device(config)# network-policy profile 60
Device(config-network-policy) #
```

# power efficient-ethernet auto

To enable Energy Efficient Ethernet (EEE) for an interface, use the **power efficient-ethernet auto** command in interface configuration mode. To disable EEE on an interface, use the **no** form of this command.

```
power efficient-ethernet auto  
no power efficient-ethernet auto
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** EEE is disabled.

**Command Modes** Interface configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** You can enable EEE on devices that support low power idle (LPI) mode. Such devices can save power by entering LPI mode during periods of low utilization. In LPI mode, systems on both ends of the link can save power by shutting down certain services. EEE provides the protocol needed to transition into and out of LPI mode in a way that is transparent to upper layer protocols and applications.

The **power efficient-ethernet auto** command is available only if the interface is EEE capable. To check if an interface is EEE capable, use the **show eee capabilities** EXEC command.

When EEE is enabled, the device advertises and autonegotiates EEE to its link partner. To view the current EEE status for an interface, use the **show eee status** EXEC command.

This command does not require a license.

This example shows how to enable EEE for an interface:

```
Device(config-if)# power efficient-ethernet auto  
Device(config-if)#
```

This example shows how to disable EEE for an interface:

```
Device(config-if)# no power efficient-ethernet auto  
Device(config-if)#
```

**power-priority**

# power-priority

To configure Cisco StackPower power-priority values for a switch in a power stack and for its high-priority and low-priority PoE ports, use the **power-priority** command in switch stack-power configuration mode. To return to the default setting, use the **no** form of the command.

```
power-priority {high value | low value | switch value}
no power-priority {high | low | switch}
```

<b>Syntax Description</b>	<p><b>high value</b> Sets the power priority for the ports configured as high-priority ports. The range is 1 to 27, with 1 as the highest priority. The <b>high</b> value must be lower than the value set for the low-priority ports and higher than the value set for the switch.</p> <p><b>low value</b> Sets the power priority for the ports configured as low-priority ports. The range is 1 to 27. The <b>low</b> value must be higher than the value set for the high-priority ports and the value set for the switch.</p> <p><b>switch value</b> Sets the power priority for the switch. The range is 1 to 27. The <b>switch</b> value must be lower than the values set for the low and high-priority ports.</p>
---------------------------	--

<b>Command Default</b>	If no values are configured, the power stack randomly determines a default priority. The default ranges are 1 to 9 for switches, 10 to 18 for high-priority ports, 19 to 27 for low-priority ports. On non-PoE switches, the high and low values (for port priority) have no effect.
------------------------	--

<b>Command Modes</b>	Switch stack-power configuration
----------------------	----------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	To access switch stack-power configuration mode, enter the <b>stack-power switch switch-number</b> global configuration command.  Cisco StackPower power-priority values determine the order for shutting down switches and ports when power is lost and load shedding must occur. Priority values are from 1 to 27; the highest numbers are shut down first.  We recommend that you configure different priority values for each switch and for its high priority ports and low priority ports to limit the number of devices shut down at one time during a loss of power. If you try to configure the same priority value on different switches in a power stack, the configuration is allowed, but you receive a warning message.
-------------------------	---



**Note** This command is available only on switch stacks running the IP Base or IP Services feature set.

<b>Examples</b>	This is an example of setting the power priority for switch 1 in power stack a to 7, for the high-priority ports to 11, and for the low-priority ports to 20.
-----------------	---

```
Device(config)# stack-power switch 1
Device(config-switch-stackpower)# stack-id power_stack_a
Device(config-switch-stackpower)# power-priority high 11
Device(config-switch-stackpower)# power-priority low 20
Device(config-switch-stackpower)# power-priority switch 7
Device(config-switch-stackpower)# exit
```

# power inline

To configure the power management mode on Power over Ethernet (PoE) ports, use the **power inline** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

```
power inline {auto [max max-wattage] | never | port priority {high | low} | static [max max-wattage]}
no power inline {auto | never | port priority {high | low} | static [max max-wattage]}
```

Syntax Description		
	<b>auto</b>	Enables powered-device detection. If enough power is available, automatically allocates power to the PoE port after device detection. Allocation is first-come, first-serve.
	<b>max max-wattage</b>	(Optional) Limits the power allowed on the port. The range is 4000 to 30000 mW. If no value is specified, the maximum is allowed.
	<b>never</b>	Disables device detection, and disables power to the port.
	<b>port</b>	Configures the power priority of the port. The default priority is low.
	<b>priority {high   low}</b>	Sets the power priority of the port. In case of a power supply failure, ports configured as low priority are turned off first and ports configured as high priority are turned off last. The default priority is low.
	<b>static</b>	Enables powered-device detection. Pre-allocates (reserves) power for a port before the switch discovers the powered device. This action guarantees that the device connected to the interface receives enough power.
<b>Command Default</b>	The default is <b>auto</b> (enabled). The maximum wattage is 30,000 mW. The default port priority is low.	
<b>Command Default</b>	Interface configuration	

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.
	Cisco IOS XE 3.3SE	The <b>four-pair forced</b> keywords were added.

**Usage Guidelines** This command is supported only on PoE-capable ports. If you enter this command on a port that does not support PoE, this error message appears:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# power inline auto
^
% Invalid input detected at '^' marker.
```

In a switch stack, this command is supported on all ports in the stack that support PoE.

Use the **max max-wattage** option to disallow higher-power powered devices. With this configuration, when the powered device sends Cisco Discovery Protocol (CDP) messages requesting more power than the maximum wattage, the switch removes power from the port. If the powered-device IEEE class maximum is greater than the maximum wattage, the switch does not power the device. The power is reclaimed into the global power budget.



**Note** The switch never powers any class 0 or class 3 device if the **power inline max max-wattage** command is configured for less than 30 W.

If the switch denies power to a powered device (the powered device requests more power through CDP messages or if the IEEE class maximum is greater than the maximum wattage), the PoE port is in a power-deny state. The switch generates a system message, and the Oper column in the **show power inline** privileged EXEC command output shows *power-denied*.

Use the **power inline static max max-wattage** command to give a port high priority. The switch allocates PoE to a port configured in static mode before allocating power to a port configured in auto mode. The switch reserves power for the static port when it is configured rather than upon device discovery. The switch reserves the power on a static port even when there is no connected device and whether or not the port is in a shutdown or in a no shutdown state. The switch allocates the configured maximum wattage to the port, and the amount is never adjusted through the IEEE class or by CDP messages from the powered device. Because power is pre-allocated, any powered device that uses less than or equal to the maximum wattage is guaranteed power when it is connected to a static port. However, if the powered device IEEE class is greater than the maximum wattage, the switch does not supply power to it. If the switch learns through CDP messages that the powered device needs more than the maximum wattage, the powered device is shut down.

If the switch cannot pre-allocate power when a port is in static mode (for example, because the entire power budget is already allocated to other auto or static ports), this message appears: Command rejected: power inline static: pwr not available. The port configuration remains unchanged.

When you configure a port by using the **power inline auto** or the **power inline static** interface configuration command, the port autonegotiates by using the configured speed and duplex settings. This is necessary to determine the power requirements of the connected device (whether or not it is a powered device). After the power requirements have been determined, the switch hardcodes the interface by using the configured speed and duplex settings without resetting the interface.

**power inline**

When you configure a port by using the **power inline never** command, the port reverts to the configured speed and duplex settings.

If a port has a Cisco powered device connected to it, you should not use the **power inline never** command to configure the port. A false link-up can occur, placing the port in an error-disabled state.

Use the **power inline port priority {high | low}** command to configure the power priority of a PoE port. Powered devices connected to ports with low port priority are shut down first in case of a power shortage.

You can verify your settings by entering the **show power inline** EXEC command.

**Examples**

This example shows how to enable detection of a powered device and to automatically power a PoE port on a switch:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# power inline auto
```

This example shows how to configure a PoE port on a switch to allow a class 1 or a class 2 powered device:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# power inline auto max 7000
```

This example shows how to disable powered-device detection and to not power a PoE port on a switch:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# power inline never
```

This example shows how to set the priority of a port to high, so that it would be one of the last ports to be shut down in case of power supply failure:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# power inline port priority high
```

# power inline police

To enable policing of real-time power consumption on a powered device, use the **power inline police** command in interface configuration mode. To disable this feature, use the **no** form of this command.

```
power inline police [action {errdisable | log}]
no power inline police
```

<b>Syntax Description</b>	<b>action</b> (Optional) Configures the device to turn off power to the port if the real-time power consumption exceeds the maximum power allocation on the port. This is the default action. <b>errdisable</b>				
	<b>action log</b> (Optional) Configures the device to generate a syslog message while still providing power to a connected device if the real-time power consumption exceeds the maximum power allocation on the port.				
<b>Command Default</b>	Policing of the real-time power consumption of the powered device is disabled.				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	<p>This command is supported only on the LAN Base image.</p> <p>This command is supported only on Power over Ethernet (PoE)-capable ports. If you enter this command on a device or port that does not support PoE, an error message appears.</p> <p>In a switch stack, this command is supported on all switches or ports in the stack that support PoE and real-time power-consumption monitoring.</p> <p>When policing of the real-time power consumption is enabled, the device takes action when a powered device consumes more power than the allocated maximum amount.</p> <p>When PoE is enabled, the device senses the real-time power consumption of the powered device. This feature is called <i>power monitoring</i> or <i>power sensing</i>. The device also polices the power usage with the <i>power policing</i> feature.</p> <p>When power policing is enabled, the device uses one of the these values as the cutoff power on the PoE port in this order:</p> <ol style="list-style-type: none"> <li>1. The user-defined power level that limits the power allowed on the port when you enter the <b>power inline auto max max-wattage</b> or the <b>power inline static max max-wattage</b> interface configuration command</li> <li>2. The device automatically sets the power usage of the device by using CDP power negotiation or by the IEEE classification and LLDP power negotiation.</li> </ol> <p>If you do not manually configure the cutoff-power value, the device automatically determines it by using CDP power negotiation or the device IEEE classification and LLDP power negotiation. If CDP or LLDP are not enabled, the default value of 30 W is applied. However without CDP or LLDP, the device does not allow devices to consume more than 15.4 W of power because values from 15400 to 30000 mW are only allocated based on CDP or LLDP requests. If a powered device consumes more than 15.4 W without CDP or LLDP</p>
-------------------------	---

**power inline police**

negotiation, the device might be in violation of the maximum current  $I_{max}$  limitation and might experience an  $I_{cut}$  fault for drawing more current than the maximum. The port remains in the fault state for a time before attempting to power on again. If the port continuously draws more than 15.4 W, the cycle repeats.

When a powered device connected to a PoE+ port restarts and sends a CDP or LLDP packet with a power TLV, the device locks to the power-negotiation protocol of that first packet and does not respond to power requests from the other protocol. For example, if the device is locked to CDP, it does not provide power to devices that send LLDP requests. If CDP is disabled after the device has locked on it, the device does not respond to LLDP power requests and can no longer power on any accessories. In this case, you should restart the powered device.

If power policing is enabled, the device polices power usage by comparing the real-time power consumption to the maximum power allocated on the PoE port. If the device uses more than the maximum power allocation (or *cutoff power*) on the port, the device either turns power off to the port, or the device generates a syslog message and updates the LEDs (the port LEDs are blinking amber) while still providing power to the device.

- To configure the device to turn off power to the port and put the port in the error-disabled state, use the **power inline police** interface configuration command.
- To configure the device to generate a syslog message while still providing power to the device, use the **power inline police action log** command.

If you do not enter the **action log** keywords, the default action is to shut down the port, turn off power to it, and put the port in the PoE error-disabled state. To configure the PoE port to automatically recover from the error-disabled state, use the **errdisable detect cause inline-power** global configuration command to enable error-disabled detection for the PoE cause and the **errdisable recovery cause inline-power interval interval** global configuration command to enable the recovery timer for the PoE error-disabled cause.



**Caution** If policing is disabled, no action occurs when the powered device consumes more than the maximum power allocation on the port, which could adversely affect the device.

You can verify your settings by entering the **show power inline police** privileged EXEC command.

**Examples**

This example shows how to enable policing of the power consumption and configuring the device to generate a syslog message on the PoE port on a device:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# power inline police action log
```

# power supply

To configure and manage the internal power supplies on a switch, use the **power supply** command in privileged EXEC mode.

```
power supply stack-member-number slot {A | B} {off | on}
```

<b>Syntax Description</b>	<p><i>stack-member-number</i></p> <p>Stack member number for which to configure the internal power supplies. The range is 1 to 9, depending on the number of switches in the stack.</p> <p>This parameter is available only on stacking-capable switches.</p>						
<b>slot</b>	Selects the switch power supply to set.						
<b>A</b>	Selects the power supply in slot A.						
<b>B</b>	Selects the power supply in slot B.						
	<p><b>Note</b> Power supply slot B is the closest slot to the outer edge of the switch.</p>						
<b>off</b>	Sets the switch power supply to off.						
<b>on</b>	Sets the switch power supply to on.						
<b>Command Default</b>	The switch power supply is on.						
<b>Command Modes</b>	Privileged EXEC						
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> <tr> <td>Cisco IOS XE 3.3SE</td><td>The <b>slot</b> keyword replaced the <b>frufep</b> keyword.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.	Cisco IOS XE 3.3SE	The <b>slot</b> keyword replaced the <b>frufep</b> keyword.
Release	Modification						
Cisco IOS XE 3.2SE	This command was introduced.						
Cisco IOS XE 3.3SE	The <b>slot</b> keyword replaced the <b>frufep</b> keyword.						
<b>Usage Guidelines</b>	<p>The <b>power supply</b> command applies to a switch or to a switch stack where all switches are the same platform. In a switch stack with the same platform switches, you must specify the stack member before entering the <b>slot {A   B} off</b> or <b>on</b> keywords.</p> <p>To return to the default setting, use the <b>power supply stack-member-number on</b> command.</p> <p>You can verify your settings by entering the <b>show env power</b> privileged EXEC command.</p>						
<b>Examples</b>	<p>This example shows how to set the power supply in slot A to off:</p> <pre>Device&gt; power supply 2 slot A off Disabling Power supply A may result in a power loss to PoE devices and/or switches ... Continue? (yes/[no]): yes Device</pre>						

**power supply**

```
Jun 10 04:52:54.389: %PLATFORM_ENV-6-FRU_PS_OIR: FRU Power Supply 1 powered off
Jun 10 04:52:56.717: %PLATFORM_ENV-1-FAN_NOT_PRESENT: Fan is not present
```

This example shows how to set the power supply in slot A to on:

```
Device> power supply 1 slot B on
Jun 10 04:54:39.600: %PLATFORM_ENV-6-FRU_PS_OIR: FRU Power Supply 1 powered on
```

This example shows the output of the show env power command:

```
Device> show env power
SW PID Serial# Status Sys Pwr PoE Pwr Watts
-- -----
1A PWR-1RUC2-640WAC DCB1705B05B OK Good Good 250/390
1B Not Present
```

# show eee

To display Energy Efficient Ethernet (EEE) information for an interface, use the **show eee** command in EXEC mode.

**show eee {capabilities| status}interface*interface-id***

<b>Syntax Description</b>	<b>capabilities</b> <b>status</b> <b>interface <i>interface-id</i></b>	Displays EEE capabilities for the specified interface. Displays EEE status information for the specified interface. Specifies the interface for which to display EEE capabilities or status information.
<b>Command Default</b>	None	
<b>Command Modes</b>	User EXEC Privileged EXEC	
<b>Command History</b>	<b>Release</b> Cisco IOS XE 3.2SE	<b>Modification</b> This command was introduced.

**Usage Guidelines** You can enable EEE on devices that support low power idle (LPI) mode. Such devices can save power by entering LPI mode during periods of low power utilization. In LPI mode, systems on both ends of the link can save power by shutting down certain services. EEE provides the protocol needed to transition into and out of LPI mode in a way that is transparent to upper layer protocols and applications.

To check if an interface is EEE capable, use the **show eee capabilities** command. You can enable EEE on an interface that is EEE capable by using the **power efficient-ethernet auto** interface configuration command.

To view the EEE status, LPI status, and wake error count information for an interface, use the **show eee status** command.

This is an example of output from the **show eee capabilities** command on an interface where EEE is enabled:

```
Device# show eee capabilities interface gigabitethernet1/0/1
Gi1/0/1
    EEE(efficient-ethernet) : yes (100-Tx and 1000T auto)
    Link Partner           : yes (100-Tx and 1000T auto)
```

This is an example of output from the **show eee capabilities** command on an interface where EEE is not enabled:

```
Device# show eee capabilities interface gigabitethernet2/0/1
Gi2/0/1
    EEE(efficient-ethernet) : not enabled
```

**show eee**

```
Link Partner : not enabled
```

This is an example of output from the **show eee status** command on an interface where EEE is enabled and operational. The table that follows describes the fields in the display.

```
Device# show eee status interface gigabitethernet1/0/4
Gi1/0/4 is up
    EEE(efficient-ethernet): Operational
    Rx LPI Status       : Received
    Tx LPI Status       : Received
```

This is an example of output from the **show eee status** command on an interface where EEE is operational and the ports are in low power save mode:

```
Device# show eee status interface gigabitethernet1/0/3
Gi1/0/3 is up
    EEE(efficient-ethernet): Operational
    Rx LPI Status       : Low Power
    Tx LPI Status       : Low Power
    Wake Error Count   : 0
```

This is an example of output from the **show eee status** command on an interface where EEE is not enabled because a remote link partner is incompatible with EEE:

```
Device# show eee status interface gigabitethernet1/0/3
Gi1/0/3 is down
    EEE(efficient-ethernet): Disagreed
    Rx LPI Status       : None
    Tx LPI Status       : None
    Wake Error Count   : 0
```

**Table 6: show eee status Field Descriptions**

Field	Description
EEE (efficient-ethernet)	<p>The EEE status for the interface. This field can have any of the following values:</p> <ul style="list-style-type: none"> <li>• N/A—The port is not capable of EEE.</li> <li>• Disabled—The port EEE is disabled.</li> <li>• Disagreed—The port EEE is not set because a remote link partner might be incompatible with EEE; either it is not EEE capable, or its EEE setting is incompatible.</li> <li>• Operational—The port EEE is enabled and operating.</li> </ul> <p>If the interface speed is configured as 10 Mbps, EEE is disabled internally. When the interface speed moves back to auto, 100 Mbps or 1000 Mbps, EEE becomes active again.</p>

Field	Description
Rx/Tx LPI Status	<p>The Low Power Idle (LPI) status for the link partner. These fields can have any of the following values:</p> <ul style="list-style-type: none"> <li>• N/A—The port is not capable of EEE.</li> <li>• Interrupted—The link partner is in the process of moving to low power mode.</li> <li>• Low Power—The link partner is in low power mode.</li> <li>• None—EEE is disabled or not capable at the link partner side.</li> <li>• Received—The link partner is in low power mode and there is traffic activity.</li> </ul> <p>If an interface is configured as half-duplex, the LPI status is None, which means the interface cannot be in low power mode until it is configured as full-duplex.</p>
Wake Error Count	<p>The number of PHY wake-up faults that have occurred. A wake-up fault can occur when EEE is enabled and the connection to the link partner is broken.</p> <p>This information is useful for PHY debugging.</p>

**show env**

# show env

To display fan, temperature, and power information, use the **show env** command in EXEC mode.

```
show env {all | fan | power [{all | switch [stack-member-number]}] | stack [stack-member-number] | temperature [status]}
```

Syntax Description	<b>all</b> Displays the fan and temperature environmental status and the status of the internal power supplies. <b>fan</b> Displays the switch fan status. <b>power</b> Displays the internal power status of the active switch. <b>all</b> (Optional) Displays the status of all the internal power supplies in a standalone switch when the command is entered on the switch, or in all the stack members when the command is entered on the active switch. <b>switch</b> (Optional) Displays the status of the internal power supplies for each switch in the stack or for the specified switch. This keyword is available only on stacking-capable switches. <b>stack-member-number</b> (Optional) Number of the stack member for which to display the status of the internal power supplies or the environmental status. The range is 1 to 9.	
Command Default	None	
Command Modes	User EXEC Privileged EXEC	
Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.
Usage Guidelines	Use the <b>show env</b> EXEC command to display the information for the switch being accessed—a standalone switch or the active switch. Use this command with the <b>stack</b> and <b>switch</b> keywords to display all information for the stack or for the specified stack member.	

If you enter the **show env temperature status** command, the command output shows the switch temperature state and the threshold level.

You can also use the **show env temperature** command to display the switch temperature status. The command output shows the green and yellow states as *OK* and the red state as *FAULTY*. If you enter the **show env all** command, the command output is the same as the **show env temperature status** command output.

## Examples

```
Device>show env all
Switch 1 FAN 1 is OK
Switch 1 FAN 2 is OK
Switch 1 FAN 3 is OK
FAN PS-1 is NOT PRESENT
FAN PS-2 is OK
Switch 1: SYSTEM TEMPERATURE is OK
SW PID           Serial#      Status       Sys Pwr   PoE Pwr   Watts
-- -----          -----        -----       -----     -----    -----
1A Not Present
1B PWR-C1-715WAC    LIT150119Z1  OK          Good     Good     715
```

```
Device>show env fan
Switch 1 FAN 1 is OK
Switch 1 FAN 2 is OK
Switch 1 FAN 3 is OK
FAN PS-1 is NOT PRESENT
FAN PS-2 is OK
```

This is an example of output from the **show env power** command:

```
Device>show env power
SW PID           Serial#      Status       Sys Pwr   PoE Pwr   Watts
-- -----          -----        -----       -----     -----    -----
1A Not Present
1B PWR-C1-715WAC    LIT150119Z1  OK          Good     Good     715
```

This is an example of output from the **show env power all** command on the active switch:

```
Device# show env power all
SW PID           Serial#      Status       Sys Pwr   PoE Pwr   Watts
-- -----          -----        -----       -----     -----    -----
1A Not Present
1B PWR-C1-715WAC    LIT150119Z1  OK          Good     Good     715
```

```
Device> show env stack
SWITCH: 1
Switch 1 FAN 1 is OK
Switch 1 FAN 2 is OK
Switch 1 FAN 3 is OK
FAN PS-1 is NOT PRESENT
FAN PS-2 is OK
Switch 1: SYSTEM TEMPERATURE is OK
Temperature Value: 28 Degree Celsius
Temperature State: GREEN
Yellow Threshold : 41 Degree Celsius
Red Threshold    : 56 Degree Celsius
```

show env

```
Device> show env temperature status
Temperature Value: 33 Degree Celsius
Temperature State: GREEN
Yellow Threshold : 65 Degree Celsius
Red Threshold    : 75 Degree Celsius
```

**Table 7: States in the show env temperature status Command Output**

<b>State</b>	<b>Description</b>
Green	The switch temperature is in the <i>normal</i> operating range.
Yellow	The temperature is in the <i>warning</i> range. You should check the external temperature around the switch.
Red	The temperature is in the <i>critical</i> range. The switch might not run properly if the temperature is in this range.

# show errdisable detect

To display error-disabled detection status, use the **show errdisable detect** command in EXEC mode.

## show errdisable detect

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Default</b>	None
------------------------	------

<b>Command Modes</b>	User EXEC
----------------------	-----------

Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A gbic-invalid error reason refers to an invalid small form-factor pluggable (SFP) module.

The error-disable reasons in the command output are listed in alphabetical order. The mode column shows how error-disable is configured for each feature.

You can configure error-disabled detection in these modes:

- port mode—The entire physical port is error-disabled if a violation occurs.
- vlan mode—The VLAN is error-disabled if a violation occurs.
- port/vlan mode—The entire physical port is error-disabled on some ports and is per-VLAN error-disabled on other ports.

```
Device> show errdisable detect
ErrDisable Reason      Detection    Mode
-----  -----  -----
arp-inspection          Enabled     port
bpduguard                Enabled     vlan
channel-misconfig        Enabled     port
community-limit          Enabled     port
dhcp-rate-limit          Enabled     port
dtp-flap                  Enabled     port
gbic-invalid              Enabled     port
inline-power               Enabled     port
invalid-policy            Enabled     port
l2ptguard                 Enabled     port
link-flap                  Enabled     port
loopback                   Enabled     port
lsgroup                     Enabled     port
pagp-flap                  Enabled     port
psecure-violation          Enabled     port/vlan
security-violatio          Enabled     port
sfp-config-mismat         Enabled     port
storm-control               Enabled     port
udld                         Enabled     port
```

**show errdisable recovery**

# show errdisable recovery

To display the error-disabled recovery timer information, use the **show errdisable recovery** command in EXEC mode.

## show errdisable recovery

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** User EXEC

Privileged EXEC

---

**Command History**

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

---

**Usage Guidelines** A gbic-invalid error-disable reason refers to an invalid small form-factor pluggable (SFP) module interface.



**Note** Though visible in the output, the unicast-flood field is not valid.

---

This is an example of output from the **show errdisable recovery** command:

```
Device> show errdisable recovery
ErrDisable Reason      Timer Status
-----
udld                  Disabled
bpduguard             Disabled
security-violatio     Disabled
channel-misconfig     Disabled
pagp-flap              Disabled
dtp-flap               Disabled
link-flap              Enabled
l2ptguard              Disabled
psecure-violation     Disabled
gbic-invalid           Disabled
dhcp-rate-limit        Disabled
unicast-flood          Disabled
storm-control          Disabled
arp-inspection         Disabled
loopback               Disabled
Timer interval:300 seconds
Interfaces that will be enabled at the next timeout:
Interface  Errdisable reason      Time left(sec)
-----
Gi1/0/2                link-flap            279
```

# show interfaces

To display the administrative and operational status of all interfaces or for a specified interface, use the **show interfaces** command in privileged EXEC mode.

```
show interfaces [{interface-id|vlan vlan-id}] [{accounting|capabilities [module number]|debounce|description|etherchannel|flowcontrol|pruning|stats|status [{err-disabled|inactive}]]|trunk}]
```

Syntax Description		
	<i>interface-id</i>	(Optional) ID of the interface. Valid interfaces include physical ports (including type, stack member for stacking-capable switches, module, and port number) and port channels. The port channel range is 1 to 48.
	<b>vlan</b> <i>vlan-id</i>	(Optional) VLAN identification. The range is 1 to 4094.
	<b>accounting</b>	(Optional) Displays accounting information on the interface, including active protocols and input and output packets and octets.  <b>Note</b> The display shows only packets processed in software; hardware-switched packets do not appear.
	<b>capabilities</b>	(Optional) Displays the capabilities of all interfaces or the specified interface, including the features and options that you can configure on the interface. Though visible in the command line help, this option is not available for VLAN IDs.
	<b>module</b> <i>number</i>	(Optional) Displays capabilities of all interfaces on the switch or specified stack member.  The range is 1 to 9.  This option is not available if you entered a specific interface ID.
	<b>debounce</b>	(Optional) Displays port debounce timer information for an interface.
	<b>description</b>	(Optional) Displays the administrative status and description set for an interface.
	<b>etherchannel</b>	(Optional) Displays interface EtherChannel information.
	<b>flowcontrol</b>	(Optional) Displays interface flow control information.
	<b>mtu</b>	(Optional) Displays the MTU for each interface or for the specified interface.
	<b>pruning</b>	(Optional) Displays trunk VTP pruning information for the interface.
	<b>stats</b>	(Optional) Displays the input and output packets by switching the path for the interface.

**show interfaces**

<b>status</b>	(Optional) Displays the status of the interface. A status of unsupported in the Type field means that a non-Cisco small form-factor pluggable (SFP) module is inserted in the module slot.
<b>err-disabled</b>	(Optional) Displays interfaces in an error-disabled state.
<b>inactive</b>	(Optional) Displays interfaces in an inactive state.
<b>trunk</b>	(Optional) Displays interface trunk information. If you do not specify an interface, only information for active trunking ports appears.



**Note** Though visible in the command-line help strings, the **crb**, **fair-queue**, **irb**, **mac-accounting**, **precedence**, **random-detect**, and **rate-limit** keywords are not supported.

**Command Default** None

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE		This command was introduced.

**Usage Guidelines** The **show interfaces capabilities** command with different keywords has these results:

- Use the **show interface capabilities module number** command to display the capabilities of all interfaces on that switch in the stack. If there is no switch with that module number in the stack, there is no output.
- Use the **show interfaces interface-id capabilities** to display the capabilities of the specified interface.
- Use the **show interfaces capabilities** (with no module number or interface ID) to display the capabilities of all interfaces in the stack.

This is an example of output from the **show interfaces** command for an interface on stack member 3:

```
Device# show interfaces gigabitethernet3/0/2
GigabitEthernet3/0/2 is down, line protocol is down (notconnect)
  Hardware is Gigabit Ethernet, address is 2037.064d.4381 (bia 2037.064d.4381)
    MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
      reliability 255/255, txload 1/255, rxload 1/255
    Encapsulation ARPA, loopback not set
    Keepalive set (10 sec)
    Auto-duplex, Auto-speed, media type is 10/100/1000BaseTX
    input flow-control is off, output flow-control is unsupported
    ARP type: ARPA, ARP Timeout 04:00:00
    Last input never, output never, output hang never
    Last clearing of "show interface" counters never
    Input queue: 0/2000/0/0 (size/max/drops/flushes); Total output drops: 0
    Queueing strategy: fifo
    Output queue: 0/40 (size/max)
    5 minute input rate 0 bits/sec, 0 packets/sec
    5 minute output rate 0 bits/sec, 0 packets/sec
```

```

0 packets input, 0 bytes, 0 no buffer
Received 0 broadcasts (0 multicasts)
0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
0 watchdog, 0 multicast, 0 pause input
0 input packets with dribble condition detected
0 packets output, 0 bytes, 0 underruns
0 output errors, 0 collisions, 1 interface resets
0 unknown protocol drops
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier, 0 pause output
0 output buffer failures, 0 output buffers swapped out

```

```

Device# show interfaces gigabitethernet1/0/2 capabilities
GigabitEthernet1/0/2
  Model: UA-3850-24-CR
  Type: 10/100/1000BaseTX
  Speed: 10,100,1000,auto
  Duplex: full,half,auto
  Trunk encap. type: 802.1Q
  Trunk mode: on,off,desirable,nonegotiate
  Channel: yes
  Fast Start: yes
  QoS scheduling: rx-(not configurable on per port basis),
                   tx-(4q3t) (3t: Two configurable values and one fixed.)
  CoS rewrite: yes
  ToS rewrite: yes
  UDLD: yes
  Inline power: no
  SPAN: source/destination
  PortSecure: yes
  Dot1x: yes

```

This is an example of output from the **show interfaces interface description** command when the interface has been described as *Connects to Marketing* by using the **description** interface configuration command:

```

Device# show interfaces gigabitethernet1/0/2 description
Interface          Status      Protocol Description
Gi1/0/2            up         down    Connects to Marketing

```

This is an example of output from the **show interfaces interface-id pruning** command when pruning is enabled in the VTP domain:

```

Device# show interfaces gigabitethernet1/0/2 pruning
Port      Vlans pruned for lack of request by neighbor
Gi1/0/2   3,4

Port      Vlans traffic requested of neighbor
Gi1/0/2   1-3

```

This is an example of output from the **show interfaces stats** command for a specified VLAN interface:

```

Device# show interfaces vlan 1 stats
Switching path      Pkts In      Chars In      Pkts Out      Chars Out
      Processor     1165354    136205310      570800    91731594
      Route cache      0           0           0           0
      Total        1165354    136205310      570800    91731594

```

This is an example of output from the **show interfaces interface-id status** command:

**show interfaces**

```
Device# show interfaces gigabitethernet1/0/20 status
Port      Name          Status     Vlan      Duplex   Speed      Type
Gi1/0/20           notconnect    1         auto     auto 10/100/1000Ba
seTX
```

This is an example of output from the **show interfaces status err-disabled** command. It displays the status of interfaces in the error-disabled state:

```
Device# show interfaces status err-disabled
Port      Name          Status     Reason
Gi1/0/2           err-disabled  gbic-invalid
Gi2/0/3           err-disabled  dtp-flap
```

This is an example of output from the **show interfaces interface-id pruning** command:

```
Device# show interfaces gigabitethernet1/0/2 pruning
Port Vlans pruned for lack of request by neighbor
```

```
Device# show interfaces gigabitethernet1/0/1 trunk
Port      Mode          Encapsulation  Status      Native vlan
Gi1/0/1    on            802.1q        other       10

Port      Vlans allowed on trunk
Gi1/0/1    none

Port      Vlans allowed and active in management domain
Gi1/0/1    none

Port      Vlans in spanning tree forwarding state and not pruned
Gi1/0/1    none
```

# show interfaces counters

To display various counters for the switch or for a specific interface, use the **show interfaces counters** command in privileged EXEC mode.

```
show interfaces [interface-id] counters [{errors | etherchannel | module stack-member-number | protocol status | trunk}]
```

## Syntax Description

<i>interface-id</i>	(Optional) ID of the physical interface, including type, stack member (stacking-capable switches only) module, and port number.
<b>errors</b>	(Optional) Displays error counters.
<b>etherchannel</b>	(Optional) Displays EtherChannel counters, including octets, broadcast packets, multicast packets, and unicast packets received and sent.
<b>module</b> <i>stack-member-number</i>	(Optional) Displays counters for the specified stack member. The range is 1 to 9.
<b>Note</b>	In this command, the <b>module</b> keyword refers to the stack member number. The module number that is part of the interface ID is always zero.
<b>protocol status</b>	(Optional) Displays the status of protocols enabled on interfaces.
<b>trunk</b>	(Optional) Displays trunk counters.



**Note** Though visible in the command-line help string, the **vlan** *vlan-id* keyword is not supported.

## Command Default

None

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

If you do not enter any keywords, all counters for all interfaces are included.

This is an example of partial output from the **show interfaces counters** command. It displays all counters for the switch.

```
Device# show interfaces counters
Port          InOctets   InUcastPkts   InMcastPkts   InBcastPkts
Gi1/0/1        0           0             0             0
Gi1/0/2        0           0             0             0
Gi1/0/3    95285341      43115         1178430      1950
Gi1/0/4        0           0             0             0
```

**show interfaces counters**

```
<output truncated>
```

This is an example of partial output from the **show interfaces counters module** command for stack member 2. It displays all counters for the specified switch in the stack.

```
Device# show interfaces counters module 2
Port          InOctets   InUcastPkts   InMcastPkts   InBcastPkts
Gi1/0/1        520         2             0             0
Gi1/0/2        520         2             0             0
Gi1/0/3        520         2             0             0
Gi1/0/4        520         2             0             0
```

```
<output truncated>
```

This is an example of partial output from the **show interfaces counters protocol status** command for all interfaces:

```
Device# show interfaces counters protocol status
Protocols allocated:
Vlan1: Other, IP
Vlan20: Other, IP, ARP
Vlan30: Other, IP, ARP
Vlan40: Other, IP, ARP
Vlan50: Other, IP, ARP
Vlan60: Other, IP, ARP
Vlan70: Other, IP, ARP
Vlan80: Other, IP, ARP
Vlan90: Other, IP, ARP
Vlan900: Other, IP, ARP
Vlan3000: Other, IP
Vlan3500: Other, IP
GigabitEthernet1/0/1: Other, IP, ARP, CDP
GigabitEthernet1/0/2: Other, IP
GigabitEthernet1/0/3: Other, IP
GigabitEthernet1/0/4: Other, IP
GigabitEthernet1/0/5: Other, IP
GigabitEthernet1/0/6: Other, IP
GigabitEthernet1/0/7: Other, IP
GigabitEthernet1/0/8: Other, IP
GigabitEthernet1/0/9: Other, IP
GigabitEthernet1/0/10: Other, IP, CDP
```

```
<output truncated>
```

This is an example of output from the **show interfaces counters trunk** command. It displays trunk counters for all interfaces.

```
Device# show interfaces counters trunk
Port      TrunkFramesTx  TrunkFramesRx  WrongEncap
Gi1/0/1       0            0            0
Gi1/0/2       0            0            0
Gi1/0/3     80678         0            0
Gi1/0/4    82320         0            0
Gi1/0/5       0            0            0

<output truncated>
```

# show interfaces switchport

To display the administrative and operational status of a switching (nonrouting) port, including port blocking and port protection settings, use the **show interfaces switchport** command in privileged EXEC mode.

**show interfaces [interface-id] switchport [{module number}]**

<b>Syntax Description</b>	<p><b>interface-id</b> (Optional) ID of the interface. Valid interfaces include physical ports (including type, stack member for stacking-capable switches, module, and port number) and port channels. The port channel range is 1 to 48.</p> <p><b>module number</b> (Optional) Displays switchport configuration of all interfaces on the switch or specified stack member. The range is 1 to 9. This option is not available if you entered a specific interface ID.</p>				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** Use the **show interface switchport module number** command to display the switch port characteristics of all interfaces on that switch in the stack. If there is no switch with that module number in the stack, there is no output.

This is an example of output from the **show interfaces switchport** command for a port. The table that follows describes the fields in the display.



**Note** Private VLANs are not supported in this release, so those fields are not applicable.

```
Device# show interfaces gigabitethernet1/0/1 switchport
Name: Gi1/0/1
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: down
Administrative Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 10 (VLAN0010)
Administrative Native VLAN tagging: enabled
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
```

```
show interfaces switchport
```

```
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings: none
Operational private-vlan: none
Trunking VLANs Enabled: 11-20
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL

Protected: false
Unknown unicast blocked: disabled
Unknown multicast blocked: disabled
Appliance trust: none
```

Field	Description
Name	Displays the port name.
Switchport	Displays the administrative and operational status of the port. In this display, the port is in switchport mode.
Administrative Mode	Displays the administrative and operational modes.
Operational Mode	
Administrative Trunking Encapsulation	Displays the administrative and operational encapsulation method and whether trunking negotiation is enabled.
Operational Trunking Encapsulation	
Negotiation of Trunking	
Access Mode VLAN	Displays the VLAN ID to which the port is configured.
Trunking Native Mode VLAN	Lists the VLAN ID of the trunk that is in native mode.
Trunking VLANs Enabled	Lists the allowed VLANs on the trunk. Lists the active VLANs on the trunk.
Trunking VLANs Active	
Pruning VLANs Enabled	Lists the VLANs that are pruning-eligible.
Protected	Displays whether or not protected port is enabled (True) or disabled (False) on the interface.
Unknown unicast blocked	Displays whether or not unknown multicast and unknown unicast traffic is blocked on the interface.
Unknown multicast blocked	
Voice VLAN	Displays the VLAN ID on which voice VLAN is enabled.
Appliance trust	Displays the class of service (CoS) setting of the data packets of the IP phone.

# show interfaces transceiver

To display the physical properties of a small form-factor pluggable (SFP) module interface, use the **show interfaces transceiver** command in EXEC mode.

```
show interfaces [interface-id] transceiver [{detail | module number | properties | supported-list | threshold-table}]
```

## Syntax Description

<i>interface-id</i>	(Optional) ID of the physical interface, including type, stack member (stacking-capable switches only) module, and port number.
<b>detail</b>	(Optional) Displays calibration properties, including high and low numbers and any alarm information for any Digital Optical Monitoring (DoM)-capable transceiver if one is installed in the switch.
<b>module number</b>	(Optional) Limits display to interfaces on module on the switch. The range is 1 to 9. This option is not available if you entered a specific interface ID.
<b>properties</b>	(Optional) Displays speed, duplex, and inline power settings on an interface.
<b>supported-list</b>	(Optional) Lists all supported transceivers.
<b>threshold-table</b>	(Optional) Displays alarm and warning threshold table.

## Command Modes

User EXEC

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Examples

This is an example of output from the **show interfaces *interface-id* transceiver properties** command:

```
Device# show interfaces transceiver

If device is externally calibrated, only calibrated values are printed.
++ : high alarm, + : high warning, - : low warning, -- : low alarm.
NA or N/A: not applicable, Tx: transmit, Rx: receive.
mA: milliamperes, dBm: decibels (milliwatts).
```

Port	Temperature (Celsius)	Voltage (Volts)	Current (mA)	Optical	Optical
				Tx Power (dBm)	Rx Power (dBm)
Gi5/1/2	42.9	3.28	22.1	-5.4	-8.1
Te5/1/3	32.0	3.28	19.8	2.4	-4.2

```
Device# show interfaces gigabitethernet1/1/1 transceiver properties
```

**show interfaces transceiver**

```
Name : Gi1/1/1
Administrative Speed: auto
Operational Speed: auto
Administrative Duplex: auto
Administrative Power Inline: enable
Operational Duplex: auto
Administrative Auto-MDIX: off
Operational Auto-MDIX: off
```

This is an example of output from the **show interfaces interface-id transceiver detail** command:

```
Device# show interfaces gigabitethernet1/1/1 transceiver detail
ITU Channel not available (Wavelength not available),
Transceiver is internally calibrated.
mA:milliamperes, dBm:decibels (milliwatts), N/A:not applicable.
++:high alarm, +:high warning, -:low warning, -- :low alarm.
A2D readouts (if they differ), are reported in parentheses.
The threshold values are uncalibrated.
```

Port	Temperature (Celsius)	High Alarm Threshold (Celsius)	High Warn Threshold (Celsius)	Low Warn Threshold (Celsius)	Low Alarm Threshold (Celsius)
Gi1/1/1	29.9	74.0	70.0	0.0	-4.0
Port	Voltage (Volts)	High Alarm Threshold (Volts)	High Warn Threshold (Volts)	Low Warn Threshold (Volts)	Low Alarm Threshold (Volts)
Gi1/1/1	3.28	3.60	3.50	3.10	3.00
Port	Optical Transmit Power (dBm)	High Alarm Threshold (dBm)	High Warn Threshold (dBm)	Low Warn Threshold (dBm)	Low Alarm Threshold (dBm)
Gi1/1/1	1.8	7.9	3.9	0.0	-4.0
Port	Optical Receive Power (dBm)	High Alarm Threshold (dBm)	High Warn Threshold (dBm)	Low Warn Threshold (dBm)	Low Alarm Threshold (dBm)
Gi1/1/1	-23.5	-5.0	-9.0	-28.2	-32.2

```
Device# show interfaces transceiver supported-list
Transceiver Type Cisco p/n min version
supporting DOM
```

DWDM GBIC	ALL
DWDM SFP	ALL
RX only WDM GBIC	ALL
DWDM XENPAK	ALL
DWDM X2	ALL
DWDM XFP	ALL
CWDM GBIC	NONE
CWDM X2	ALL
CWDM XFP	ALL
XENPAK ZR	ALL
X2 ZR	ALL
XFP ZR	ALL
Rx_only_WDM_XENPAK	ALL
XENPAK_ER	10-1888-04
X2_ER	ALL

XFP_ER	ALL
XENPAK_LR	10-1838-04
X2_LR	ALL
XFP_LR	ALL
XENPAK_LW	ALL
X2_LW	ALL
XFP_LW	NONE
XENPAK_SR	NONE
X2_SR	ALL
XFP_SR	ALL
XENPAK_LX4	NONE
X2_LX4	NONE
XFP_LX4	NONE
XENPAK_CX4	NONE
X2_CX4	NONE
XFP_CX4	NONE
SX_GBIC	NONE
LX_GBIC	NONE
ZX_GBIC	NONE
CWDMD_SFPP	ALL
Rx_only_WDM_SFPP	NONE
SX_SFPP	ALL
LX_SFPP	ALL
ZX_SFPP	ALL
EX_SFPP	ALL
SX_SFP	NONE
LX_SFP	NONE
ZX_SFP	NONE
GigE_BX_U_SFP	NONE
GigE_BX_D_SFP	ALL
X2_LRM	ALL
SR_SFPP	ALL
LR_SFPP	ALL
LRM_SFPP	ALL
ER_SFPP	ALL
ZR_SFPP	ALL
DWDM_SFPP	ALL
GigE_BX_40U_SFP	ALL
GigE_BX_40D_SFP	ALL
GigE_BX_40DA_SFP	ALL
GigE_BX_80U_SFP	ALL
GigE_BX_80D_SFP	ALL
GIG_BXU_SFPP	ALL
GIG_BXD_SFPP	ALL
GIG_BX40U_SFPP	ALL
GIG_BX40D_SFPP	ALL
GigE_Dual_Rate_LX_SFP	ALL
CWDMD_SFPP	ALL
CPAK_SR10	ALL
CPAK_LR4	ALL
QSFP_LR	ALL
QSFP_SR	ALL

This is an example of output from the **show interfaces transceiver threshold-table** command:

Device# show interfaces transceiver threshold-table					
	Optical Tx	Optical Rx	Temp	Laser Bias current	Voltage
	-----	-----	-----	-----	-----
DWDM GBIC					
Min1	-4.00	-32.00	-4	N/A	4.65
Min2	0.00	-28.00	0	N/A	4.75
Max2	4.00	-9.00	70	N/A	5.25

**show interfaces transceiver**

Max1	7.00	-5.00	74	N/A	5.40
DWDM SFP					
Min1	-4.00	-32.00	-4	N/A	3.00
Min2	0.00	-28.00	0	N/A	3.10
Max2	4.00	-9.00	70	N/A	3.50
Max1	8.00	-5.00	74	N/A	3.60
RX only WDM GBIC					
Min1	N/A	-32.00	-4	N/A	4.65
Min2	N/A	-28.30	0	N/A	4.75
Max2	N/A	-9.00	70	N/A	5.25
Max1	N/A	-5.00	74	N/A	5.40
DWDM XENPAK					
Min1	-5.00	-28.00	-4	N/A	N/A
Min2	-1.00	-24.00	0	N/A	N/A
Max2	3.00	-7.00	70	N/A	N/A
Max1	7.00	-3.00	74	N/A	N/A
DWDM X2					
Min1	-5.00	-28.00	-4	N/A	N/A
Min2	-1.00	-24.00	0	N/A	N/A
Max2	3.00	-7.00	70	N/A	N/A
Max1	7.00	-3.00	74	N/A	N/A
DWDM XFP					
Min1	-5.00	-28.00	-4	N/A	N/A
Min2	-1.00	-24.00	0	N/A	N/A
Max2	3.00	-7.00	70	N/A	N/A
Max1	7.00	-3.00	74	N/A	N/A
CWDM X2					
Min1	N/A	N/A	0	N/A	N/A
Min2	N/A	N/A	0	N/A	N/A
Max2	N/A	N/A	0	N/A	N/A
Max1	N/A	N/A	0	N/A	N/A

<output truncated>

**Related Commands**

Command	Description
<b>transceiver type all</b>	Enters the transceiver type configuration mode.
<b>monitoring</b>	Enables digital optical monitoring.

# show memory platform

To display memory statistics of a platform, use the **show memory platform** command in privileged EXEC mode.

**show memory platform [{compressed-swap | information | page-merging}]**

<b>Syntax Description</b>	<b>compressed-swap</b> (Optional) Displays platform memory compressed-swap information.
	<b>information</b> (Optional) Displays general information about the platform.
	<b>page-merging</b> (Optional) Displays platform memory page-merging information.

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	Prior to Cisco IOS XE Denali 16.3.1, the Free Memory displayed in the command output was obtained from the underlying Linux kernel. This value was not accurate because some memory chunks that was available for use was not considered as free memory.
-------------------------	--

In Cisco IOS XE Denali 16.3.1, the free memory is accurately computed and displayed in the Free Memory field of the command output.

<b>Examples</b>	The following is sample output from the <b>show memory platform</b> command:
-----------------	--

```
Switch# show memory platform

Virtual memory : 12874653696
Pages resident : 627041
Major page faults: 2220
Minor page faults: 2348631

Architecture : mips64
Memory (kB)
Physical : 3976852
Total : 3976852
Used : 2761276
Free : 1215576
Active : 2128196
Inactive : 1581856
Inact-dirty : 0
Inact-clean : 0
Dirty : 0
AnonPages : 1294984
Bounce : 0
Cached : 1978168
Commit Limit : 1988424
Committed As : 3343324
High Total : 0
High Free : 0
```

**show memory platform**

```

Low Total      : 3976852
Low Free       : 1215576
Mapped          : 516316
NFS Unstable   : 0
Page Tables    : 17124
Slab            : 0
VMmalloc Chunk : 1069542588
VMmalloc Total : 1069547512
VMmalloc Used  : 2588
Writeback       : 0
HugePages Total: 0
HugePages Free : 0
HugePages Rsvd : 0
HugePage Size  : 2048

Swap (kB)
Total          : 0
Used           : 0
Free           : 0
Cached          : 0

Buffers (kB)     : 437136

Load Average
1-Min          : 1.04
5-Min          : 1.16
15-Min         : 0.94

```

The following is sample output from the **show memory platform information** command:

```

Device# show memory platform information

Virtual memory   : 12870438912
Pages resident   : 626833
Major page faults: 2222
Minor page faults: 2362455

Architecture     : mips64
Memory (kB)
Physical          : 3976852
Total             : 3976852
Used              : 2761224
Free               : 1215628
Active             : 2128060
Inactive            : 1584444
Inact-dirty        : 0
Inact-clean        : 0
Dirty              : 284
AnonPages          : 1294656
Bounce             : 0
Cached              : 1979644
Commit Limit       : 1988424
Committed As       : 3342184
High Total          : 0
High Free           : 0
Low Total           : 3976852
Low Free            : 1215628
Mapped              : 516212
NFS Unstable        : 0
Page Tables         : 17096
Slab                : 0
VMmalloc Chunk     : 1069542588
VMmalloc Total      : 1069547512

```

```
VMmalloc Used    : 2588
Writeback       : 0
HugePages Total: 0
HugePages Free : 0
HugePages Rsvd : 0
HugePage Size   : 2048

Swap (kB)
Total          : 0
Used           : 0
Free           : 0
Cached         : 0

Buffers (kB)    : 438228

Load Average
1-Min          : 1.54
5-Min          : 1.27
15-Min         : 0.99
```

**show module**

# show module

To display module information such as switch number, model number, serial number, hardware revision number, software version, MAC address and so on, use this command in user EXEC or privileged EXEC mode.

```
show module [{switch-num}]
```

<b>Syntax Description</b>	<i>switch-num</i> (Optional) Number of the switch.	
<b>Command Default</b>	None	
<b>Command Modes</b>	User EXEC (>) Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Denali 16.1.1	<b>Modification</b> This command was introduced.
<b>Usage Guidelines</b>	Entering the <b>show module</b> command without the <i>switch-num</i> argument is the same as entering the show module all command.	
<b>Examples</b>	This example shows how to display information for all the modules on a Cisco Catalyst 3850 Series switch:	

```
Device# show module
Switch Ports Model Serial No. MAC address Hw Ver. Sw Ver.
----- ----- -----
2      32    WS-C3850-24P  FCW1934D0ZN 3820.56b8.d000 V06   16.01.00xxxx
```

# show mgmt-infra trace messages ilpower

To display inline power messages within a trace buffer, use the **show mgmt-infra trace messages ilpower** command in privileged EXEC mode.

**show mgmt-infra trace messages ilpower [switch stack-member-number]**

<b>Syntax Description</b>	<b>switch stack-member-number</b> (Optional) Specifies the stack member number for which to display inline power messages within a trace buffer.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="0"> <tr> <td><b>Release</b></td><td><b>Modification</b></td></tr> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

This is an output example from the **show mgmt-infra trace messages ilpower** command:

```
Device# show mgmt-infra trace messages ilpower
[10/23/12 14:05:10.984 UTC 1 3] Initialized inline power system configuration fo
r slot 1.
[10/23/12 14:05:10.984 UTC 2 3] Initialized inline power system configuration fo
r slot 2.
[10/23/12 14:05:10.984 UTC 3 3] Initialized inline power system configuration fo
r slot 3.
[10/23/12 14:05:10.984 UTC 4 3] Initialized inline power system configuration fo
r slot 4.
[10/23/12 14:05:10.984 UTC 5 3] Initialized inline power system configuration fo
r slot 5.
[10/23/12 14:05:10.984 UTC 6 3] Initialized inline power system configuration fo
r slot 6.
[10/23/12 14:05:10.984 UTC 7 3] Initialized inline power system configuration fo
r slot 7.
[10/23/12 14:05:10.984 UTC 8 3] Initialized inline power system configuration fo
r slot 8.
[10/23/12 14:05:10.984 UTC 9 3] Initialized inline power system configuration fo
r slot 9.
[10/23/12 14:05:10.984 UTC a 3] Inline power subsystem initialized.
[10/23/12 14:05:18.908 UTC b 264] Create new power pool for slot 1
[10/23/12 14:05:18.909 UTC c 264] Set total inline power to 450 for slot 1
[10/23/12 14:05:20.273 UTC d 3] PoE is not supported on .
[10/23/12 14:05:20.288 UTC e 3] PoE is not supported on .
[10/23/12 14:05:20.299 UTC f 3] PoE is not supported on .
[10/23/12 14:05:20.311 UTC 10 3] PoE is not supported on .
[10/23/12 14:05:20.373 UTC 11 98] Inline power process post for switch 1
[10/23/12 14:05:20.373 UTC 12 98] PoE post passed on switch 1
[10/23/12 14:05:20.379 UTC 13 3] Slot #1: PoE initialization for board id 16387
[10/23/12 14:05:20.379 UTC 14 3] Set total inline power to 450 for slot 1
[10/23/12 14:05:20.379 UTC 15 3] Gi1/0/1 port config Initialized
[10/23/12 14:05:20.379 UTC 16 3] Interface Gi1/0/1 initialization done.
[10/23/12 14:05:20.380 UTC 17 3] Gi1/0/24 port config Initialized
[10/23/12 14:05:20.380 UTC 18 3] Interface Gi1/0/24 initialization done.
[10/23/12 14:05:20.380 UTC 19 3] Slot #1: initialization done.
```

```
show mgmt-infra trace messages ilpower
```

```
[10/23/12 14:05:50.440 UTC 1a 3] Slot #1: PoE initialization for board id 16387
[10/23/12 14:05:50.440 UTC 1b 3] Duplicate init event
```

# show mgmt-infra trace messages ilpower-ha

To display inline power high availability messages within a trace buffer, use the **show mgmt-infra trace messages ilpower-ha** command in privileged EXEC mode.

```
show mgmt-infra trace messages ilpower-ha [switch stack-member-number]
```

<b>Syntax Description</b>	<b>switch stack-member-number</b> (Optional) Specifies the stack member number for which to display inline power messages within a trace buffer.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

This is an output example from the **show mgmt-infra trace messages ilpower-ha** command:

```
Device# show mgmt-infra trace messages ilpower-ha
[10/23/12 14:04:48.087 UTC 1 3] NG3K_ILPOWER_HA: Created NGWC ILP CF client successfully.
```

show mgmt-infra trace messages platform-mgr-poe

## show mgmt-infra trace messages platform-mgr-poe

To display platform manager Power over Ethernet (PoE) messages within a trace buffer, use the **show mgmt-infra trace messages platform-mgr-poe** privileged EXEC command.

**show mgmt-infra trace messages platform-mgr-poe [switch stack-member-number]**

<b>Syntax Description</b>	switch <i>stack-member-number</i> (Optional) Specifies the stack member number for which to display messages within a trace buffer.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

This is an example of partial output from the **show mgmt-infra trace messages platform-mgr-poe** command:

```
Device# show mgmt-infra trace messages platform-mgr-poe
[10/23/12 14:04:06.431 UTC 1 5495] PoE Info: get power controller param sent:
[10/23/12 14:04:06.431 UTC 2 5495] PoE Info: POE_SHUT sent for port 1 (0:0)
[10/23/12 14:04:06.431 UTC 3 5495] PoE Info: POE_SHUT sent for port 2 (0:1)
[10/23/12 14:04:06.431 UTC 4 5495] PoE Info: POE_SHUT sent for port 3 (0:2)
[10/23/12 14:04:06.431 UTC 5 5495] PoE Info: POE_SHUT sent for port 4 (0:3)
[10/23/12 14:04:06.431 UTC 6 5495] PoE Info: POE_SHUT sent for port 5 (0:4)
[10/23/12 14:04:06.431 UTC 7 5495] PoE Info: POE_SHUT sent for port 6 (0:5)
[10/23/12 14:04:06.431 UTC 8 5495] PoE Info: POE_SHUT sent for port 7 (0:6)
[10/23/12 14:04:06.431 UTC 9 5495] PoE Info: POE_SHUT sent for port 8 (0:7)
[10/23/12 14:04:06.431 UTC a 5495] PoE Info: POE_SHUT sent for port 9 (0:8)
[10/23/12 14:04:06.431 UTC b 5495] PoE Info: POE_SHUT sent for port 10 (0:9)
[10/23/12 14:04:06.431 UTC c 5495] PoE Info: POE_SHUT sent for port 11 (0:10)
[10/23/12 14:04:06.431 UTC d 5495] PoE Info: POE_SHUT sent for port 12 (0:11)
[10/23/12 14:04:06.431 UTC e 5495] PoE Info: POE_SHUT sent for port 13 (e:0)
[10/23/12 14:04:06.431 UTC f 5495] PoE Info: POE_SHUT sent for port 14 (e:1)
[10/23/12 14:04:06.431 UTC 10 5495] PoE Info: POE_SHUT sent for port 15 (e:2)
[10/23/12 14:04:06.431 UTC 11 5495] PoE Info: POE_SHUT sent for port 16 (e:3)
[10/23/12 14:04:06.431 UTC 12 5495] PoE Info: POE_SHUT sent for port 17 (e:4)
[10/23/12 14:04:06.431 UTC 13 5495] PoE Info: POE_SHUT sent for port 18 (e:5)
[10/23/12 14:04:06.431 UTC 14 5495] PoE Info: POE_SHUT sent for port 19 (e:6)
[10/23/12 14:04:06.431 UTC 15 5495] PoE Info: POE_SHUT sent for port 20 (e:7)
[10/23/12 14:04:06.431 UTC 16 5495] PoE Info: POE_SHUT sent for port 21 (e:8)
[10/23/12 14:04:06.431 UTC 17 5495] PoE Info: POE_SHUT sent for port 22 (e:9)
[10/23/12 14:04:06.431 UTC 18 5495] PoE Info: POE_SHUT sent for port 23 (e:10)
```

# show network-policy profile

To display the network-policy profiles, use the **show network policy profile** command in privileged EXEC mode.

**show network-policy profile [profile-number]**

<b>Syntax Description</b>	<i>profile-number</i> (Optional) Displays the network-policy profile number. If no profile is entered, all network-policy profiles appear.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

This is an example of output from the **show network-policy profile** command:

```
Device# show network-policy profile
Network Policy Profile 60
  Interface:
    none
```

**show platform hardware fed switch forward**

# show platform hardware fed switch forward

To display device-specific hardware information, use the **show platform hardware fed switch *switch\_number*** command.

This topic elaborates only the forwarding-specific options, that is, the options available with the **show platform hardware fed switch {*switch\_num* | active | standby} forward summary** command.

The output of the **show platform hardware fed switch *switch\_number* forward summary** displays all the details about the forwarding decision taken for the packet.

**show platform hardware fed switch {*switch\_num* | active | standby} forward summary**

---

<b>Syntax Description</b>	<b>switch {<i>switch_num</i>   active   standby}</b> The switch for which you want to display information. You have the following options : <ul style="list-style-type: none"> <li>• <i>switch_num</i>—ID of the switch.</li> <li>• <b>active</b>—Displays information relating to the active switch.</li> <li>• <b>standby</b>—Displays information relating to the standby switch, if available.</li> </ul>								
<b>forward summary</b>	Displays packet forwarding information.								
<b>Note</b>	The keyword <b>summary</b> was added in the Cisco IOS XE Denali 16.3.1 release.								
	Support for the keyword <b>summary</b> has been discontinued in the Cisco IOS XE Everest 16.6.1 release and later releases.								
<b>Command Modes</b>	Privileged EXEC								
<b>Command History</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding-bottom: 5px;"><b>Release</b></th><th style="text-align: right; padding-bottom: 5px;"><b>Modification</b></th></tr> </thead> <tbody> <tr> <td style="padding-bottom: 5px;">Cisco IOS XE 3.2SE</td><td style="text-align: right; padding-bottom: 5px;">This command was introduced.</td></tr> <tr> <td style="padding-bottom: 5px;">Cisco IOS XE Denali 16.3.1</td><td style="text-align: right; padding-bottom: 5px;">Support for the keyword <b>summary</b> was added.</td></tr> <tr> <td style="padding-bottom: 5px;">Cisco IOS XE Everest 16.6.1 and later releases</td><td style="text-align: right; padding-bottom: 5px;">Support for the keyword <b>summary</b> was discontinued.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.	Cisco IOS XE Denali 16.3.1	Support for the keyword <b>summary</b> was added.	Cisco IOS XE Everest 16.6.1 and later releases	Support for the keyword <b>summary</b> was discontinued.
<b>Release</b>	<b>Modification</b>								
Cisco IOS XE 3.2SE	This command was introduced.								
Cisco IOS XE Denali 16.3.1	Support for the keyword <b>summary</b> was added.								
Cisco IOS XE Everest 16.6.1 and later releases	Support for the keyword <b>summary</b> was discontinued.								

---

**Usage Guidelines**      Do not use this command unless a technical support representative asks you to. Use this command only when you are working directly with a technical support representative while troubleshooting a problem.

Fields displayed in the command output are explained below.

- Station Index : The Station Index is the result of the layer 2 lookup and points to a station descriptor which provides the following:
  - Destination Index : Determines the egress port(s) to which the packets should be sent to. Global Port Number(GPN) can be used as the destination index. A destination index with 15 down to 12

bits set indicates the GPN to be used. For example, destination index - 0xF04E corresponds to GPN - 78 (0x4e).

- Rewrite Index : Determines what needs to be done with the packets. For layer 2 switching, this is typically a bridging action
- Flexible Lookup Pipeline Stages(FPS) : Indicates the forwarding decision that was taken for the packet - routing or bridging
- Replication Bit Map : Determines if the packets should be sent to CPU or stack
  - Local Data Copy = 1
  - Remote Data copy = 0
  - Local CPU Copy = 0
  - Remote CPU Copy = 0

### Example

This is an example of output from the **show platform hardware fed switch {switch\_num | active | standby } forward summary** command.

```
Device#show platform hardware fed switch 1 forward summary
Time: Fri Sep 16 08:25:00 PDT 2016

Incomming Packet Details:

###[ Ethernet ]###
dst      = 00:51:0f:f2:0e:11
src      = 00:1d:01:85:ba:22
type     = ARP
###[ ARP ]###
    hwtype   = 0x1
    ptype    = IPv4
    hwlen    = 6
    plen     = 4
    op       = is-at
    hwsrc   = 00:1d:01:85:ba:22
    psrc    = 10.10.1.33
    hwdst   = 00:51:0f:f2:0e:11
    pdst    = 10.10.1.1

Ingress:
Switch          : 1
Port            : GigabitEthernet1/0/1
Global Port Number : 1
Local Port Number : 1
Asic Port Number : 21
ASIC Number     : 0
STP state       :
                  blkLrn31to0: 0xffdffffdf
                  blkFwd31to0: 0xffdffffdf
Vlan            : 1
Station Descriptor : 170
DestIndex       : 0xF009
DestModIndex    : 2
RewriteIndex    : 2
Forwarding Decision: FPS 2A L2 Destination
```

```
show platform hardware fed switch forward
```

```
Replication Bitmap:  
Local CPU copy      : 0  
Local Data copy     : 1  
Remote CPU copy    : 0  
Remote Data copy   : 0  
  
Egress:  
Switch             : 1  
Outgoing Port      : GigabitEthernet1/0/9  
Global Port Number : 9  
ASIC Number        : 0  
Vlan               : 1
```

# show platform hardware fed switch forward interface

To debug forwarding information and to trace the packet path in the hardware forwarding plane, use the **show platform hardware fed switch *switch\_number* forward interface** command. This command simulates a user-defined packet and retrieves the forwarding information from the hardware forwarding plane. A packet is generated on the ingress port based on the packet parameters that you have specified in this command. You can also provide a complete packet from the captured packets stored in a PCAP file.

This topic elaborates only the interface forwarding-specific options, that is, the options available with the **show platform hardware fed switch {*switch\_num* | active | standby} forward interface** command.

**show platform hardware fed switch {*switch\_num* | active | standby} forward interface *interface-type* *interface-number* source-mac-address *destination-mac-address* {*protocol-number* | arp | cos | ipv4 | ipv6 | mpls}**

**show platform hardware fed switch {*switch\_num* | active | standby} forward interface *interface-type* *interface-number* pcap *pcap-file-name* **number** *packet-number* **data****

**show platform hardware fed switch {*switch\_num* | active | standby} forward interface *interface-type* *interface-number* **vlan** *vlan-id* source-mac-address *destination-mac-address* {*protocol-number* | arp | cos | ipv4 | ipv6 | mpls}**

## Syntax Description

**switch {*switch\_num* | active | standby }** The switch on which packet tracing has to be scheduled. The input port should be available on this switch. You have the following options :

- *switch\_num*—ID of the switch on which the ingress port is present.
- **active**—indicates the active switch on which the the ingress port is present.
- **standby**—indicates the standby switch on which the ingress port is present.

**Note** This keyword is not supported.

---

<b>interface <i>interface-type</i> <i>interface-number</i></b>	The input interface on which packet trace is simulated.
<b>source-mac-address</b>	The source MAC address of the packet you want to simulate.
<b>destination-mac-address</b>	The MAC address of the destination interface in hexadecimal format.
<b>protocol-number</b>	The number assigned to any L3 protocol.
<b>arp</b>	The Address Resolution Protocol (ARP) parameters.
<b>ipv4</b>	The IPv4 packet parameters.
<b>ipv6</b>	The IPv6 packet parameters.
<b>mpls</b>	The Multiprotocol Label Switching (MPLS) label parameters.

---

**show platform hardware fed switch forward interface**

<b>cos</b>	The class of service (CoS) number from 0 to 7 to set priority.
<b>pcap</b> <i>pcap-file-name</i>	Name of the pcap file in internal flash (flash:). Ensure that the file already exists in flash:.
<b>number</b> <i>packet-number</i>	Specifies the packet number in the pcap file.
<b>vlan</b> <i>vlan-id</i>	VLAN id of the dot1q header in the simulated packet. The range is 1 to 4096.

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

**Usage Guidelines** Do not use this command unless a technical support representative asks you to. Use this command only when you are working directly with a technical support representative while troubleshooting a problem.

This command supports the following packet types:

- Non-IP packets with any L3 protocol
- ARP packets
- IPv4 packets with any L4 protocol
- IPv4 packets with TCP/UDP/IGMP/ICMP/SCTP payload
- VxLAN packets
- MPLS packets with up to 3 Labels and meta data
- MPLS packets with IPv4/IPv6 payload
- IPv6 packets with TCP/UDP/IGMP/ICMP/SCTP payload

In a stack environment, you can trace packets across the stack irrespective of the number of stack members and topology. The **show platform hardware fed switch** *switch-number* **forward interface** *interface-type interface-number* command consolidates packet-forwarding information of all the stack members on the ingress switch. To achieve this, ensure that the switch number specified in the *switch\_num* and *interface-number* arguments are of the input switch and that the number matches.

To trace any particular packet from the captured packets stored in a PCAP file, use the **show platform hardware fed switch forward interface** *interface-type interface-number* **pcap** *pcap-file-name number packet-number* **data** command.

### Example

This is an example of output from the **show platform hardware fed switch** {*switch\_num* | **active** | **standby**} **forward interface** command.

```
Device#show platform hardware fed switch active forward interface gigabitEthernet 1/0/35
0000.0022.0055 0000.0055.0066 ipv4 44.44.0.2 55.55.0.2 udp 1222 3333
```

Show forward is running in the background. After completion, syslog will be generated.

```
*Sep 24 05:57:36.614: %SHFWD-6-PACKET_TRACE_DONE: Switch 1 R0/0: fed: Packet Trace Complete:  
Execute (show platform hardware fed switch <> forward last summary|detail)  
*Sep 24 05:57:36.614: %SHFWD-6-PACKET_TRACE_FLOW_ID: Switch 1 R0/0: fed: Packet Trace Flow  
id is 150323855361
```

#### Related Commands

Command	Description
<b>monitor capture interface</b>	Configures monitor capture points specifying an attachment point and the packet flow direction.
<b>monitor capture start</b>	Starts the capture of packet data at a traffic trace point into a buffer.
<b>monitor capture stop</b>	Stops the capture of packet data at a traffic trace point.
<b>monitor capture export</b>	Saves the captured packets in the buffer. Use this command to export the monitor capture buffer to a pcap file in flash: that you can use as an input in the <b>show forward with pcap</b> .

**show platform hardware fed switch forward last summary**

# show platform hardware fed switch forward last summary

To display a summary of packet tracing data from a switch or switches in a stack, use the **show platform hardware fed switch *switch\_number* forward last summary** command.

The output of the **show platform hardware fed switch *switch\_number* forward last summary** command displays all the details about the forwarding decision taken for the packet from the last time the **show forward** command was run.

**show platform hardware fed switch {*switch\_number* | active | standby} forward last summary**

<b>Syntax Description</b>	<b>switch {<i>switch_number</i>   active   standby}</b>	The switch on which you want to schedule a packet capture for a port. You have the following options : <ul style="list-style-type: none"> <li>• <i>switch_num</i>—ID of the switch on which the ingress port is present.</li> <li>• <b>active</b>—indicates the active switch on which the the ingress port is present.</li> <li>• <b>standby</b>—indicates the standby switch on which the ingress port is present.</li> </ul>
		<b>Note</b> This keyword is not supported.
	<b>forward last summary</b>	Displays packet forwarding information.
<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Gibraltar 16.11.1	<b>Modification</b> This command was introduced.
<b>Usage Guidelines</b>	Do not use this command unless a technical support representative asks you to. Use this command only when you are working directly with a technical support representative while troubleshooting a problem.  With Cisco IOS XE Gibraltar 16.10.1, <b>show platform hardware fed switch forward last summary</b> command is enhanced to: <ul style="list-style-type: none"> <li>• Inject the debug packets from the CPU to simulate the incoming port and packets</li> <li>• Use the debug packets to trace the packet in hardware data-path to provide forwarding details such as lookup, adjacency, rewrite information, drop decision, outgoing port and so on</li> <li>• Drop the original packets at egress so as not to transmit the packet to the outgoing port</li> <li>• Send a copy of all the packets to the CPU and display the details in the packet tracing output</li> </ul>	

## Example

This is an example of output from the **show platform hardware fed switch {*switch\_number* | active | standby} forward last summary** command.



**show platform hardware fed switch forward last summary**

# show platform resources

To display platform resource information, use the **show platform resources** command in privileged EXEC mode.

## show platform resources

This command has no arguments or keywords.

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	The output of this command displays the used memory, which is total memory minus the accurate free memory.
-------------------------	--

## Example

The following is sample output from the **show platform resources** command:

Switch# show platform resources					
**State Acronym: H - Healthy, W - Warning, C - Critical					
Resource State		Usage	Max	Warning	Critical
<hr/>					
Control Processor	H	7.20%	100%	90%	95%
DRAM	H	2701MB (69%)	3883MB	90%	95%

**show platform software fed switch punt cpuq rates**

# show platform software fed switch punt cpuq rates

To display the rate at which packets are punted, including the drops in the punted path, use the **show platform software fed switch punt cpuq rates** command in privileged EXEC mode.

**show platform software fed switch {switch-number | active | standby} punt cpuq rates**

<b>Syntax Description</b>	<b>switch{switch-number   active   standby}</b>	Displays information about the switch. You have the following options:
		<ul style="list-style-type: none"> <li>• <i>switch-number</i>:</li> <li>• <b>active</b>—Displays information relating to the active switch.</li> <li>• <b>standby</b>—Displays information relating to the standby switch, if available.</li> </ul>
		<b>Note</b> This keyword is not supported.
	<b>punt</b>	Specifies the punt information.
	<b>cpuq</b>	Specifies information about CPU receive queue.
	<b>rates</b>	Specifies the rate at which the packets are punted.

<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.				
<b>Usage Guidelines</b>	The output of this command displays the rate in packets per second at intervals of 10 seconds, 1 minute and 5 minutes.				

## Example

The following is sample output from the **show platform software fed switch active punt cpuq rates** command.

```
Device#show platform software fed switch active punt cpuq rates
Punt Rate CPU Q Statistics

Packets per second averaged over 10 seconds, 1 min and 5 mins
=====
Q  |      Queue      | Rx    | Rx   | Rx   | Drop  | Drop  | Drop
no |      Name       | 10s  | 1min | 5min | 10s  | 1min | 5min
=====
0  CPU_Q_DOT1X_AUTH      0      0      0      0      0      0
1  CPU_Q_L2_CONTROL      0      0      0      0      0      0
2  CPU_Q_FORUS_TRAFFIC  336    266    320    0      0      0
```

3	CPU_Q_ICMP_GEN	0	0	0	0	0	0
4	CPU_Q_ROUTING_CONTROL	0	0	0	0	0	0
5	CPU_Q_FORUS_ADDR_RESOLUTION	0	0	0	0	0	0
6	CPU_Q_ICMP_REDIRECT	0	0	0	0	0	0
7	CPU_Q_INTER_FED_TRAFFIC	0	0	0	0	0	0
8	CPU_Q_L2LVX_CONTROL_PKT	0	0	0	0	0	0
9	CPU_Q_EWLC_CONTROL	0	0	0	0	0	0
10	CPU_Q_EWLC_DATA	0	0	0	0	0	0
11	CPU_Q_L2LVX_DATA_PKT	0	0	0	0	0	0
12	CPU_Q_BROADCAST	0	0	0	0	0	0
13	CPU_Q_LEARNING_CACHE_OVFL	0	0	0	0	0	0
14	CPU_Q_SW_FORWARDING	0	0	0	0	0	0
15	CPU_Q_TOPOLOGY_CONTROL	0	0	0	0	0	0
16	CPU_Q_PROTO_SNOOPING	0	0	0	0	0	0
17	CPU_Q_DHCP_SNOOPING	0	0	0	0	0	0
18	CPU_Q_TRANSIT_TRAFFIC	0	0	0	0	0	0
19	CPU_Q_RPF_FAILED	0	0	0	0	0	0
20	CPU_Q_MCAST_END_STATION_SERVICE	0	0	0	0	0	0
21	CPU_Q_LOGGING	0	0	0	0	0	0
22	CPU_Q_PUNT_WEBAUTH	0	0	0	0	0	0
23	CPU_Q_HIGH_RATE_APP	0	0	0	0	0	0
24	CPU_Q_EXCEPTION	0	0	0	0	0	0
25	CPU_Q_SYSTEM_CRITICAL	0	0	0	0	0	0
26	CPU_Q_NFL_SAMPLED_DATA	0	0	0	0	0	0
27	CPU_Q_LOW_LATENCY	0	0	0	0	0	0
28	CPU_Q_EGR_EXCEPTION	0	0	0	0	0	0
29	CPU_Q_FSS	0	0	0	0	0	0
30	CPU_Q_MCAST_DATA	0	0	0	0	0	0
31	CPU_Q_GOLD_PKT	0	0	0	0	0	0

The table below describes the significant fields shown in the display.

**Table 8: show platform software fed switch active punt cpuq rates Field Descriptions**

Field	Description
Queue Name	Name of the queue.
Rx	The rate at which the packets are received per second in 10s, 1 minute and 5 minutes.
Drop	The rate at which the packets are dropped per second in 10s, 1 minute and 5 minutes.

show platform software fed switch punt packet-capture display

# show platform software fed switch punt packet-capture display

To display packet capture information during high CPU utilization, use the **show platform software fed switch active punt packet-capture display** command in privileged EXEC mode.

**show platform software fed switch active punt packet-capture display { detailed | hexdump }**

<b>Syntax Description</b>	<b>switch{switch-number   active   standby}</b>	Displays information about a switch. You have the following options:
		<ul style="list-style-type: none"> <li>• <b>active</b>—Displays information relating to the active switch.</li> <li>• <b>standby</b>—Displays information relating to the standby switch, if available.</li> </ul>
		<p><b>Note</b>      The <b>standby</b> keyword is not supported.</p>
	<b>punt</b>	Specifies punt information.
	<b>packet-capture display</b>	Specifies information about the captured packet.
	<b>detailed</b>	Specifies detailed information about the captured packet.
	<b>hex-dump</b>	Specifies information about the captured packet, in hex format.

<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td> <td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.				

<b>Usage Guidelines</b>	The output of this command displays the periodic and persistent logs of CPU-bound packets, inband CPU traffic rates, and running CPU processes when the CPU passes a high CPU utilization threshold.
-------------------------	--

<b>Examples</b>	The following is a sample output from the <b>show platform software fed switch active punt packet-capture display detailed</b> command:
-----------------	---

```
Device# show platform software fed switch active punt packet-capture display detailed
Punt packet capturing: disabled. Buffer wrapping: disabled
Total captured so far: 101 packets. Capture capacity : 4096 packets
----- Packet Number: 1, Timestamp: 2018/09/04 23:22:10.179 -----
interface : GigabitEthernet2/0/2 [if-id: 0x00000032] (physical)
ether hdr : dest mac: 0100.0ccc.ccc, src mac: 2c36.f8fc.4884
ether hdr : ethertype: 0x0032
Doppler Frame Descriptor :
```

```
0000000044004E04 C00F402D94510000 0000000000000100 0000400401000000
000000001000050 000000006D000100 000000025836200 0000000000000000

Packet Data Dump (length: 68 bytes) :
01000CCCCCD2C36 F8FC48840032AAAA 0300000C010B0000 00000080012C36F8
FC48800000000080 012C36F8FC488080 040000140002000F 0071000000020001
244E733E

----- Packet Number: 2, Timestamp: 2018/09/04 23:22:10.179 -----
interface : GigabitEthernet2/0/2 [if-id: 0x00000032] (physical)
ether hdr : dest mac: 0180.c200.0000, src mac: 2c36.f8fc.4884
ether hdr : ethertype: 0x0026
!
!
!
```

show platform software fed switch punt rates interfaces

# show platform software fed switch punt rates interfaces

To display the overall statistics of punt rate for all the interfaces, use the **show platform software fed switch punt rates interfaces** command in privileged EXEC mode.

**show platform software fed switch {switch-number | active | standby} punt rates interfaces[interface-id]**

<b>Syntax Description</b>	<b>switch{switch-number   active   standby}</b>	Displays information about the switch. You have the following options:				
		<ul style="list-style-type: none"> <li>• <b>switch-number</b>.</li> <li>• <b>active</b>—Displays information relating to the active switch.</li> <li>• <b>standby</b>—Displays information relating to the standby switch, if available.</li> </ul>				
		<b>Note</b> This keyword is not supported.				
	<b>punt</b>	Specifies the punt information.				
	<b>rates</b>	Specifies the rate at which the packets are punted.				
	<b>interfaces[interface-id]</b>	(Optional) Displays the overall statistics for an interface and also the per-queue configuration for the interface at an interval of 10 seconds.				
<b>Command Modes</b>	Privileged EXEC (#)					
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.	
Release	Modification					
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.					
<b>Usage Guidelines</b>	The output displays the punt rates in packets per second at intervals of 10 seconds, 1 minute and 5 minutes.					
	<b>Example</b>					
	<p>The following is sample output from the <b>show platform software fed switch active punt rates interfaces</b> command for all the interfaces.</p> <pre>Device#show platform software fed switch active punt rates interfaces Punt Rate on Interfaces Statistics Packets per second averaged over 10 seconds, 1 min and 5 mins ===== Interface Name            IF_ID        Rx 10s   Rx 1min   Rx 5min   Drop 10s   Drop 1min   Drop 5min =====</pre>					

```
=====
Vlan3          0x00000034    1000    1000    520      0      0      0
=====
```

The table below describes the significant fields shown in the display.

**Table 9: show platform software fed switch active punt rates interfaces Field Descriptions**

Field	Description
Interface Name	Name of the physical interface.
IF_ID	ID of the physical interface.
Rx	The per second rate at which the packets are received in 10s, 1 minute and 5 minutes.
Drop	The per second rate at which the packets are dropped in 10s, 1 minute and 5 minutes.

The following is sample output from the **show platform software fed switch active punt rates interfaces interface-id** command for a specific interface.

```
Device#show platform software fed switch active punt rates interfaces 0x31
Punt Rate on Single Interfaces Statistics
```

```
Interface : Port-channel1 [if_id: 0x31]
```

Received	Dropped
-----	-----
Total : 29617	Total : 0
10 sec average : 0	10 sec average : 0
1 min average : 0	1 min average : 0
5 min average : 0	5 min average : 0

```
Per CPUQ punt stats on the interface (rate averaged over 10s interval)
=====
```

Q no	Queue Name	Recv		Drop	
		Total	Rate	Total	Rate
0	CPU_Q_DOT1X_AUTH	0	0	0	0
1	CPU_Q_L2_CONTROL	29519	0	0	0
2	CPU_Q_FORUS_TRAFFIC	0	0	0	0
3	CPU_Q_ICMP_GEN	0	0	0	0
4	CPU_Q_ROUTING_CONTROL	0	0	0	0
5	CPU_Q_FORUS_ADDR_RESOLUTION	0	0	0	0
6	CPU_Q_ICMP_REDIRECT	0	0	0	0
7	CPU_Q_INTER_FED_TRAFFIC	0	0	0	0
8	CPU_Q_L2LVX_CONTROL_PKT	0	0	0	0
9	CPU_Q_EWLC_CONTROL	0	0	0	0
10	CPU_Q_EWLC_DATA	0	0	0	0
11	CPU_Q_L2LVX_DATA_PKT	0	0	0	0
12	CPU_Q_BROADCAST	0	0	0	0
13	CPU_Q_LEARNING_CACHE_OVFL	0	0	0	0
14	CPU_Q_SW_FORWARDING	0	0	0	0
15	CPU_Q_TOPOLOGY_CONTROL	98	0	0	0
16	CPU_Q_PROTO_SNOOPING	0	0	0	0
17	CPU_Q_DHCP_SNOOPING	0	0	0	0
18	CPU_Q_TRANSIT_TRAFFIC	0	0	0	0
19	CPU_Q_RPF_FAILED	0	0	0	0

**show platform software fed switch punt rates interfaces**

```

20  CPU_Q_MCAST_END_STATION_SERVICE      0      0      0      0
21  CPU_Q_LOGGING                      0      0      0      0
22  CPU_Q_PUNT_WEBAUTH                 0      0      0      0
23  CPU_Q_HIGH_RATE_APP                0      0      0      0
24  CPU_Q_EXCEPTION                   0      0      0      0
25  CPU_Q_SYSTEM_CRITICAL              0      0      0      0
26  CPU_QNFL_SAMPLED_DATA             0      0      0      0
27  CPU_Q_LOW_LATENCY                  0      0      0      0
28  CPU_Q_EGR_EXCEPTION               0      0      0      0
29  CPU_Q_FSS                         0      0      0      0
30  CPU_Q_MCAST_DATA                  0      0      0      0
31  CPU_Q_GOLD_PKT                     0      0      0      0
-----
```

The table below describes the significant fields shown in the display.

**Table 10: show platform software fed switch punt rates interfaces interface-id Field Descriptions**

Field	Description
Queue Name	Name of the queue.
Recv Total	Total number of packets received.
Recv Rate	Per second rate at which the packets are received.
Drop Total	Total number of packets dropped.
Drop Rate	Per second rate at which the packets are dropped.

# show platform software ilpower

To display the inline power details of all the PoE ports on the device, use the **show platform software ilpower** command in privileged EXEC mode.

```
show platform software ilpower {details | port {GigabitEthernet interface-number } | system slot-number }
```

<b>Syntax Description</b>	<b>details</b> Displays inline power details for all the interfaces. <b>port</b> Displays inline power port configuration. <b>GigabitEthernet interface-number</b> The GigabitEthernet interface number. Values range from 0 to 9. <b>system slot-number</b> Displays inline power system configuration.
---------------------------	---

<b>Command Modes</b>	Privileged EXEC (#)						
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.2</td> <td>This command was modified. The keyword <b>details</b> argument was added.</td> </tr> <tr> <td>Cisco IOS XE Denali 16.1.1</td> <td>The command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.2	This command was modified. The keyword <b>details</b> argument was added.	Cisco IOS XE Denali 16.1.1	The command was introduced.
<b>Release</b>	<b>Modification</b>						
Cisco IOS XE Denali 16.3.2	This command was modified. The keyword <b>details</b> argument was added.						
Cisco IOS XE Denali 16.1.1	The command was introduced.						

<b>Examples</b>	<p>The following is sample output from the <b>show platform software ilpower details</b> command:</p> <pre>Device# show platform software ilpower details ILP Port Configuration for interface Gi1/0/1 Initialization Done: Yes ILP Supported: Yes ILP Enabled: Yes POST: Yes Detect On: No Powered Device Detected: No Powered Device Class Done: No Cisco Powered Device: No Power is On: No Power Denied: No Powered Device Type: Null Powered Device Class: Null Power State: NULL Current State: NGWC_ILP_DETECTING_S Previous State: NGWC_ILP_SHUT_OFF_S Requested Power in milli watts: 0 Short Circuit Detected: 0 Short Circuit Count: 0 Cisco Powerd Device Detect Count: 0 Spare Pair mode: 0 IEEE Detect: Stopped IEEE Short: Stopped Link Down: Stopped Voltage sense: Stopped Spare Pair Architecture: 1</pre>
-----------------	--

```
show platform software ilpower
```

```
Signal Pair Power allocation in milli watts: 0
Spare Pair Power On: 0
Powered Device power state: 0
Timer:
  Power Good: Stopped
  Power Denied: Stopped
  Cisco Powered Device Detect: Stopped
```

# show platform software memory

To display memory information for a specified switch, use the **show platform software memory** command in privileged EXEC mode.

**show platform software memory [{chunk | database | messaging}] process slot**

---

## Syntax Description

### Syntax Description

<b>chunk</b>	(Optional) Displays chunk memory information for the specified process.
<b>database</b>	(Optional) Displays database memory information for the specified process.
<b>messaging</b>	(Optional) Displays messaging memory information for the specified process. The information displayed is for internal debugging purposes only.

show platform software memory

---

*process*

---

Level that is being set. Options include:

- **bt-logger**—The Binary-Tracing Logger process.
- **btrace-manager**—The Btrace Manager process.
- **chassis-manager**—The Chassis Manager process.
- **cli-agent**—The CLI Agent process.
- **cmm**—The CMM process.
- **dbm**—The Database Manager process.
- **dmiauthd**—The DMI Authentication Daemon process.
- **emd**—The Environmental Monitoring process.
- **fed**—The Forwarding Engine Driver process.
- **forwarding-manager**—The Forwarding Manager process.
- **geo**—The Geo Manager process.
- **gnmi**—The GNMI process.
- **host-manager**—The Host Manager process.
- **interface-manager**—The Interface Manager process.
- **iomd**—The Input/Output Module daemon (IOMd) process.
- **ios**—The IOS process.
- **iox-manager**—The IOx Manager process.
- **license-manager**—The License Manager process.
- **logger**—The Logging Manager process.
- **mdt-pubd**—The Model Defined Telemetry Publisher process.
- **ndbman**—The Netconf DataBase Manager process.
- **nesd**—The Network Element Synchronizer Daemon process.
- **nginx**—The Nginx Webserver process.
- **nif\_mgr**—The NIF Manager process.
- **platform-mgr**—The Platform Manager process.
- **pluggable-services**—The Pluggable Services process.
- **replication-mgr**—The Replication Manager process.
- **shell-manager**—The Shell Manager process.
- **sif**—The Stack Interface (SIF) Manager process.
- **smd**—The Session Manager process.
- **stack-mgr**—The Stack Manager process.

**show platform software memory**

- **syncfd**—The SyncmDaemon process.
- **table-manager**—The Table Manager Server.
- **thread-test**—The Multithread Manager process.
- **virt-manager**—The Virtualization Manager process.

---

<i>slot</i>	Hardware slot where the process for which the level is set, is running. Options include: <ul style="list-style-type: none"> <li>• <i>number</i>—Number of the SIP slot of the hardware module where the level is set. For instance, if you want to specify the SIP in SIP slot 2 of the switch, enter 2.</li> <li>• <i>SIP-slot / SPA-bay</i>—Number of the SIP switch slot and the number of the shared port adapter (SPA) bay of that SIP. For instance, if you want to specify the SPA in bay 2 of the SIP in switch slot 3, enter 3/2.</li> <li>• <b>F0</b>—The Embedded Service Processor slot 0.</li> <li>• <b>FP active</b>—The active Embedded Service Processor.</li> <li>• <b>R0</b>—The route processor in slot 0.</li> <li>• <b>RP active</b>—The active route processor.</li> <li>• <b>switch &lt;number&gt;</b>—The switch, with its number specified.</li> <li>• <b>switch active</b>—The active switch.</li> <li>• <b>switch standby</b>—The standby switch.               <ul style="list-style-type: none"> <li>• <i>number</i>—Number of the SIP slot of the hardware module where the level is set. For instance, if you want to specify the SIP in SIP slot 2 of the switch, enter 2.</li> <li>• <i>SIP-slot / SPA-bay</i>—Number of the SIP switch slot and the number of the shared port adapter (SPA) bay of that SIP. For instance, if you want to specify the SPA in bay 2 of the SIP in switch slot 3, enter 3/2.</li> <li>• <b>F0</b>—The Embedded Service Processor in slot 0.</li> <li>• <b>FP active</b>—The active Embedded Service Processor.</li> <li>• <b>R0</b>—The route processor in slot 0.</li> <li>• <b>RP active</b>—The active route processor.</li> </ul> </li> </ul>
-------------	---

---

**Command Default** No default behavior or values.

**Command Modes** Privileged EXEC (#)

**Command History****Command History****Release****Modification**

Cisco IOS XE Gibraltar 16.11.1

This command

The following is a sample output displaying the abbreviated (brief keyword) memory information for the Forwarding Manager process for Cisco Catalyst 3000 Series ESP slot 0:

```
Device# show platform software memory forwarding-manager switch 1 fp active brief
      module      allocated      requested      allocs      frees
-----+
Summary          5702540       5619788     121888      116716
AOM object       1920374       1920310        4          0
AOM links array   880379        880315        4          0
smc_message      819575        819511        4          0
AOM update state  640380       640316        4          0
dpidb-config     208776       203544       351         24
fman-infra-avl    178016       153680      1521         0
AOM batch         152373       152309        4          0
AOM asynchronous conte 128388       128324        4          0
AOM basic data    124824       124760        5         1
eventutil         118939       118299       50         10
AOM tree node     96465        96385        5          0
AOM tree root      72377        72313        4          0
acl                36090        31914       504        243
fman-infra-ipc    35326        24366      115097      114412
AOM uplink update node 32386        32322        4          0
unknown           30528        23808       424         4
uipeer             27232        27152        5          0
fman-infra-qos    26872        24712       164         29
cce-class          19427        15411       251         0
l2 control protocol 15472        12896       325        164
fman-infra-cce    15272        13576       106         0
smc_channel        15223        15159        4          0
unknown           14208        8736        447        105
chunk              12513       12033        33         3
cce-bind            8496        7552        82         23
MATM mac entry     8040        5928       544        412
adj                7064        6312       157        110
route-pfx           6116        5412       157        113
Filter_rules        4912        4896        1          0
fman-infra-dpidb   4130        2338       112         0
SMC Buffer          3794        3202        43         6
urpf-list           3028        2100        85         27
lookup              2480        2160        30         10
MATM mac table      2432        1600       148         96
cdllib              1688        1672        1          0
route-tbl            1600        1264       21         0
FNF Flowdef          1492        1460        3          1
acl-ref              1120        1024        8          2
cgm-lib              1120        880        410        395
pbr_if_cfg           1088        976        205        198
FNF Monitor           1048        1032        1          0
pbr_routemap         960         864        18         12
!
!
!
```

The following table describes the significant fields shown in the display.

**show platform software memory****Table 11: show platform software memory brief Field Descriptions**

Field	Description
module	Name of submodule.
allocated	Memory, allocated in bytes.
requested	Number of bytes requested by application.
allocs	Number of discrete allocation event attempts.
frees	Number of free events.

# show platform software process list

To display the list of running processes on a platform, use the **show platform software process list** command in privileged EXEC mode.

```
show platform software process list switch {switch-number | active | standby} {0 | F0 | R0}
[ {name process-name | process-id process-ID | sort memory | summary}]
```

## Syntax Description

<b>switch</b> <i>switch-number</i>	Displays information about the switch. Valid values for <i>switch-number</i> argument are from 0 to 9.
<b>active</b>	Displays information about the active instance of the switch.
<b>standby</b>	Displays information about the standby instance of the switch.
<b>0</b>	Displays information about the shared port adapters (SPA) Interface Processor slot 0.
<b>F0</b>	Displays information about the Embedded Service Processor (ESP) slot 0.
<b>R0</b>	Displays information about the Route Processor (RP) slot 0.
<b>name</b> <i>process-name</i>	(Optional) Displays information about the specified process. Enter the process name.
<b>process-id</b> <i>process-ID</i>	(Optional) Displays information about the specified process ID. Enter the process ID.
<b>sort</b>	(Optional) Displays information sorted according to processes.
<b>memory</b>	(Optional) Displays information sorted according to memory.
<b>summary</b>	(Optional) Displays a summary of the process memory of the host device.

## Command Modes

Privileged EXE (#)

## Command History

Release	Modification
---------	--------------

Cisco IOS XE Denali 16.1.1 The command was introduced.

## Usage Guidelines

Prior to Cisco IOS XE Denali 16.3.1, the Free Memory displayed in the command output was obtained from the underlying Linux kernel. This value was not accurate because some memory chunks that were available for use was not considered as free memory.

In Cisco IOS XE Denali 16.3.1, the free memory is accurately computed and displayed in the Free Memory field of the command output.

## Examples

The following is sample output from the **show platform software process list switch active R0** command:

```
Switch# show platform software process list switch active R0 summary
```

```
Total number of processes: 278
```

**show platform software process list**

```

Running          : 2
Sleeping         : 276
Disk sleeping    : 0
Zombies          : 0
Stopped          : 0
Paging           : 0

Up time          : 8318
Idle time        : 0
User time         : 216809
Kernel time       : 78931

Virtual memory   : 12933324800
Pages resident    : 634061
Major page faults: 2228
Minor page faults: 3491744

Architecture      : mips64
Memory (kB)
  Physical          : 3976852
  Total              : 3976852
  Used               : 2766952
  Free               : 1209900
  Active              : 2141344
  Inactive             : 1589672
  Inact-dirty          : 0
  Inact-clean           : 0
  Dirty                : 4
  AnonPages            : 1306800
  Bounce                : 0
  Cached                : 1984688
  Commit Limit          : 1988424
  Committed As          : 3358528
  High Total             : 0
  High Free              : 0
  Low Total              : 3976852
  Low Free               : 1209900
  Mapped                : 520528
  NFS Unstable           : 0
  Page Tables            : 17328
  Slab                  : 0
  VMmalloc Chunk          : 1069542588
  VMmalloc Total           : 1069547512
  VMmalloc Used             : 2588
  Writeback              : 0
  HugePages Total          : 0
  HugePages Free             : 0
  HugePages Rsvd             : 0
  HugePage Size             : 2048

Swap (kB)
  Total                : 0
  Used                 : 0
  Free                  : 0
  Cached                : 0

Buffers (kB)        : 439528

Load Average
  1-Min                : 1.13
  5-Min                : 1.18
  15-Min               : 0.92

```

The following is sample output from the **show platform software process list switch active R0** command:

```
Device# show platform software process list switch active R0
Name          Pid   PPid  Group Id Status  Priority  Size
-----
systemd        1     0      1   S       20      7892
kthreadadd    2     0      0   S       20      0
ksoftirqd/0   3     2      0   S       20      0
kworker/0:0H   5     2      0   S       0       0
rcu_sched     7     2      0   S       20      0
rcu_bh        8     2      0   S       20      0
migration/0   9     2      0   S       4294967196 0
migration/1   10    2      0   S       4294967196 0
ksoftirqd/1   11    2      0   S       20      0
kworker/1:0H   13    2      0   S       0       0
migration/2   14    2      0   S       4294967196 0
ksoftirqd/2   15    2      0   S       20      0
kworker/2:0H   17    2      0   S       0       0
systemd-journal 221   1      221 S       20      4460
kworker/1:3   246   2      0   S       20      0
systemd-udevd 253   1      253 S       20      5648
kvm-irqfd-clean 617   2      0   S       0       0
scsi_eh_6     620   2      0   S       20      0
scsi_tmf_6     621   2      0   S       0       0
usb-storage   622   2      0   S       20      0
scsi_eh_7     625   2      0   S       20      0
scsi_tmf_7     626   2      0   S       0       0
usb-storage   627   2      0   S       20      0
kworker/7:1   630   2      0   S       20      0
bioset         631   2      0   S       0       0
kworker/3:1H   648   2      0   S       0       0
kworker/0:1H   667   2      0   S       0       0
kworker/1:1H   668   2      0   S       0       0
bioset         669   2      0   S       0       0
kworker/6:2   698   2      0   S       20      0
kworker/2:2   699   2      0   S       20      0
kworker/2:1H   703   2      0   S       0       0
kworker/7:1H   748   2      0   S       0       0
kworker/5:1H   749   2      0   S       0       0
kworker/6:1H   754   2      0   S       0       0
kworker/7:2   779   2      0   S       20      0
audited       838   1      838 S       16      2564
.
.
.
```

The table below describes the significant fields shown in the displays.

**Table 12: show platform software process list Field Descriptions**

Field	Description
Name	Displays the command name associated with the process. Different threads in the same process may have different command values.
Pid	Displays the process ID that is used by the operating system to identify and keep track of the processes.

**show platform software process list**

Field	Description
PPid	Displays process ID of the parent process.
Group Id	Displays the group ID
Status	Displays the process status in human readable form.
Priority	Displays the negated scheduling priority.
Size	Prior to Cisco IOS XE Gibraltar 16.10.1: Displays Virtual Memory size. From Cisco IOS XE Gibraltar 16.10.1 onwards: Displays the Resident Set Size (RSS) that shows how much memory is allocated to that process in the RAM.

# show platform software process memory

To display the amount of memory used by each system process, use the **show platform software process memory** command in privileged EXEC mode.

## show platform process memory

```
switch {switch-number | active | standby} {0 | F0 | FP | R0} {all [sorted | virtual [sorted] ] | name process-name {maps | smaps [summary] } | process-id process-id{maps | smaps [summary] } }
```

Syntax Description		
<b>switch</b> <i>switch-number</i>		Displays information about the switch. Enter the switch number.
<b>active</b>		Specifies the active instance of the device.
<b>standby</b>		Specifies the standby instance of the device.
<b>0</b>		Specifies the Shared Port Adapter (SPA) Interface Processor slot 0.
<b>F0</b>		Specifies the Embedded Service Processor (ESP) slot 0.
<b>FP</b>		Specifies the Embedded Service Processor (ESP).
<b>R0</b>		Specifies the Route Processor (RP) slot 0.
<b>all</b>		Lists all processes.
<b>sorted</b>		(Optional) Sorts the output based on Resident Set Size (RSS).
<b>virtual</b>		(Optional) Specifies virtual memory.
<b>name</b> <i>process-name</i>		Specifies a process name.
<b>maps</b>		Specifies the memory maps of a process.
<b>smaps summary</b>		Specifies the smaps summary of a process.
<b>process-id</b> <i>process-id</i>		Specifies a process identifier.

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

## Command Modes

Privileged EXEC(#)

## Examples:

The following is a sample output from the **show platform software process memory active R0 all** command:

**show platform software process memory**

```
Device# show platform software process memory switch active R0 all
```

Pid	RSS	PSS	Heap	Shared	Private	Name
1	4876	3229	1064	1808	3068	systemd
118	3184	1327	132	2352	832	systemd-journal
159	3008	1191	396	1996	1012	systemd-udevd
407	3192	1262	132	2196	996	dbus-daemon
3406	4772	3064	264	1940	2832	virtlogd
3411	5712	3474	2964	2344	3368	droputil.sh
3416	2588	358	132	2336	252	libvirttd.sh
3420	5708	3484	2976	2308	3400	reflector.sh
3424	1804	263	132	1632	172	xinetd
3425	964	118	132	872	92	sleep
3434	3060	844	528	2304	756	oom.sh
3442	2068	606	132	1604	464	rpcbind
3485	2380	845	132	1636	744	rpc.statd
3486	1632	338	132	1348	284	boothelper_evt.
3493	1136	156	132	1004	132	inotifywait
3504	2048	753	132	1372	676	rpc.mountd
3584	2868	620	36	2384	484	rotee
3649	1032	116	132	944	88	sleep
3705	2784	613	36	2296	488	rotee
3718	2856	610	36	2376	480	rotee
3759	1292	184	132	1136	156	inotifywait
3787	4256	2040	1640	2300	1956	iptbl.sh
3894	2948	637	36	2460	488	rotee
4017	1380	175	132	1236	144	inotifywait
4866	1820	287	132	1624	196	xinetd
5887	1692	257	132	1508	184	xinetd
5891	7248	4984	4584	2348	4900	rollback_timer.
5893	1764	257	132	1588	176	xinetd
6031	2804	601	36	2332	472	rotee
6037	1228	163	132	1092	136	inotifywait
6077	4736	3389	2992	1368	3368	psvp.sh
6115	1620	476	36	1152	468	rotee
6122	624	149	132	480	144	inotifywait
6127	5440	4077	3680	1384	4056	pvp.sh
6165	1736	592	36	1152	584	rotee
6245	624	149	132	480	144	inotifywait
6353	2592	1260	924	1352	1240	pman.sh
6470	1632	488	36	1152	480	rotee
6499	2588	1262	924	1348	1240	pman.sh
6666	1640	496	36	1152	488	rotee
6718	2584	1258	800	1348	1236	pman.sh
6736	8360	7020	6640	1360	7000	auto_upgrade_cl
6909	1636	492	36	1152	484	rotee
6955	2588	1262	928	1348	1240	pman.sh
7029	2196	679	40	1552	644	auto_upgrade_se
7149	1636	492	36	1152	484	rotee
7224	13200	4595	48	9368	3832	bt_logger
7295	2588	1262	800	1348	1240	pman.sh

The table below describes the significant fields shown in the displays.

**Table 13: show platform software process memory Field Descriptions**

<b>Field</b>	<b>Description</b>
PID	Displays the process ID that is used by the operating system to identify and keep track of the processes.
RSS	Displays the Resident Set Size (in kilobytes (KB)) that shows how much memory is allocated to that process in the RAM.
PSS	Displays the Proportional Set Size of a process. This is the count of pages it has in memory, where each page is divided by the number of processes sharing it.
Heap	Displays where all user-allocated memory is located.
Shared	Shared clean + Shared dirty
Private	Private clean + Private dirty
Name	Displays the command name associated with the process. Different threads in the same process may have different command values.

**show platform software process slot switch**

# show platform software process slot switch

To display platform software process switch information, use the **show platform software process slot switch** command in privileged EXEC mode.

```
show platform software process slot switch {switch-number | active | standby} {0 | F0 | R0}
monitor [{cycles no-of-times [{interval delay [{lines number}]}]}]
```

## Syntax Description

<i>switch-number</i>	Switch number.
<b>active</b>	Specifies the active instance.
<b>standby</b>	Specifies the standby instance.
<b>0</b>	Specifies the shared port adapter (SPA) interface processor slot 0.
<b>F0</b>	Specifies the Embedded Service Processor (ESP) slot 0.
<b>R0</b>	Specifies the Route Processor (RP) slot 0.
<b>monitor</b>	Monitors the running processes.
<b>cycles no-of-times</b>	(Optional) Sets the number of times to run monitor command. Valid values are from 1 to 4294967295. The default is 5.
<b>interval delay</b>	(Optional) Sets a delay after each . Valid values are from 0 to 300. The default is 3.
<b>lines number</b>	(Optional) Sets the number of lines of output displayed. Valid values are from 0 to 512. The default is 0.

## Command Modes

Privileged EXEC (#)

## Command History

Release	Modification
---------	--------------

Cisco IOS XE Denali 16.1.1 This command was introduced.

## Usage Guidelines

The output of the **show platform software process slot switch** and **show processes cpu platform monitor location** commands display the output of the Linux **top** command. The output of these commands display Free memory and Used memory as displayed by the Linux **top** command. The values displayed for the Free memory and Used memory by these commands do not match the values displayed by the output of other platform-memory related CLIs.

## Examples

The following is sample output from the **show platform software process slot switch active R0 monitor** command:

```

Switch# show platform software process slot switch active R0 monitor

top - 00:01:52 up 1 day, 11:20, 0 users, load average: 0.50, 0.68, 0.83
Tasks: 311 total, 2 running, 309 sleeping, 0 stopped, 0 zombie
Cpu(s): 7.4%us, 3.3%sy, 0.0%ni, 89.2%id, 0.0%wa, 0.0%hi, 0.1%si, 0.0%st
Mem: 3976844k total, 3955036k used, 21808k free, 419312k buffers
Swap: Ok total, Ok used, Ok free, 1946764k cached

      PID USER      PR  NI   VIRT   RES   SHR S %CPU %MEM     TIME+   COMMAND
 5693 root      20   0 3448 1368 912 R    7  0.0  0:00.07 top
17546 root      20   0 2044m 244m 79m S    7  6.3 186:49.08 fed main event
18662 root      20   0 1806m 678m 263m S   5 17.5 215:32.38 linux_iosd-imag
30276 root      20   0 171m 42m 33m S   5  1.1 125:06.77 repm
17835 root      20   0 935m 74m 63m S   4  1.9 82:28.31 sif_mgr
18534 root      20   0 182m 150m 10m S   2  3.9 8:12.08 smand
  1 root      20   0 8440 4740 2184 S   0  0.1 0:09.52 systemd
  2 root      20   0 0 0 0 S   0  0.0 0:00.00 kthreadd
  3 root      20   0 0 0 0 S   0  0.0 0:02.86 ksoftirqd/0
  5 root      0 -20 0 0 0 S   0  0.0 0:00.00 kworker/0:0H
  7 root      RT  0 0 0 0 S   0  0.0 0:01.44 migration/0
  8 root      20   0 0 0 0 S   0  0.0 0:00.00 rcu_bh
  9 root      20   0 0 0 0 S   0  0.0 0:23.08 rcu_sched
 10 root      20   0 0 0 0 S   0  0.0 0:58.04 rcuc/0
 11 root      20   0 0 0 0 S   0  0.0 21:35.60 rcuc/1
 12 root      RT  0 0 0 0 S   0  0.0 0:01.33 migration/1

```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show processes cpu platform monitor location</b>	Displays information about the CPU utilization of the IOS-XE processes.

show platform software status control-processor

# show platform software status control-processor

To display platform software control-processor status, use the **show platform software status control-processor** command in privileged EXEC mode.

**show platform software status control-processor [{brief}]**

<b>Syntax Description</b>	brief (Optional) Displays a summary of the platform control-processor status.				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.1.1	This command was introduced.
Release	Modification				
Cisco IOS XE Denali 16.1.1	This command was introduced.				
<b>Usage Guidelines</b>	<p>Prior to Cisco IOS XE Denali 16.3.1, the Free Memory displayed in the command output was obtained from the underlying Linux kernel. This value was not accurate because some memory chunks that were available for use was not considered as free memory.</p> <p>In Cisco IOS XE Denali 16.3.1, the free memory is accurately computed and displayed in the Free Memory field of the command output.</p>				
<b>Examples</b>	<p>The following is sample output from the <b>show platform memory software status control-processor</b> command:</p> <pre>Switch# show platform software status control-processor  2-RP0: online, statistics updated 7 seconds ago Load Average: healthy   1-Min: 1.00, status: healthy, under 5.00   5-Min: 1.21, status: healthy, under 5.00   15-Min: 0.90, status: healthy, under 5.00 Memory (kb): healthy   Total: 3976852   Used: 2766284 (70%), status: healthy   Free: 1210568 (30%)   Committed: 3358008 (84%), under 95% Per-core Statistics CPU0: CPU Utilization (percentage of time spent)   User: 4.40, System: 1.70, Nice: 0.00, Idle: 93.80   IRQ: 0.00, SIRQ: 0.10, IOwait: 0.00 CPU1: CPU Utilization (percentage of time spent)   User: 3.80, System: 1.20, Nice: 0.00, Idle: 94.90   IRQ: 0.00, SIRQ: 0.10, IOwait: 0.00 CPU2: CPU Utilization (percentage of time spent)   User: 7.00, System: 1.10, Nice: 0.00, Idle: 91.89   IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00 CPU3: CPU Utilization (percentage of time spent)   User: 4.49, System: 0.69, Nice: 0.00, Idle: 94.80   IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00  3-RP0: unknown, statistics updated 2 seconds ago Load Average: healthy   1-Min: 0.24, status: healthy, under 5.00   5-Min: 0.27, status: healthy, under 5.00</pre>				

```
15-Min: 0.32, status: healthy, under 5.00
Memory (kb): healthy
  Total: 3976852
  Used: 2706768 (68%), status: healthy
  Free: 1270084 (32%)
  Committed: 3299332 (83%), under 95%
Per-core Statistics
CPU0: CPU Utilization (percentage of time spent)
  User: 4.50, System: 1.20, Nice: 0.00, Idle: 94.20
  IRQ: 0.00, SIRQ: 0.10, IOwait: 0.00
CPU1: CPU Utilization (percentage of time spent)
  User: 5.20, System: 0.50, Nice: 0.00, Idle: 94.29
  IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU2: CPU Utilization (percentage of time spent)
  User: 3.60, System: 0.70, Nice: 0.00, Idle: 95.69
  IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU3: CPU Utilization (percentage of time spent)
  User: 3.00, System: 0.60, Nice: 0.00, Idle: 96.39
  IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00

4-RP0: unknown, statistics updated 2 seconds ago
Load Average: healthy
  1-Min: 0.21, status: healthy, under 5.00
  5-Min: 0.24, status: healthy, under 5.00
  15-Min: 0.24, status: healthy, under 5.00
Memory (kb): healthy
  Total: 3976852
  Used: 1452404 (37%), status: healthy
  Free: 2524448 (63%)
  Committed: 1675120 (42%), under 95%
Per-core Statistics
CPU0: CPU Utilization (percentage of time spent)
  User: 2.30, System: 0.40, Nice: 0.00, Idle: 97.30
  IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU1: CPU Utilization (percentage of time spent)
  User: 4.19, System: 0.69, Nice: 0.00, Idle: 95.10
  IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU2: CPU Utilization (percentage of time spent)
  User: 4.79, System: 0.79, Nice: 0.00, Idle: 94.40
  IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU3: CPU Utilization (percentage of time spent)
  User: 2.10, System: 0.40, Nice: 0.00, Idle: 97.50
  IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00

9-RP0: unknown, statistics updated 4 seconds ago
Load Average: healthy
  1-Min: 0.20, status: healthy, under 5.00
  5-Min: 0.35, status: healthy, under 5.00
  15-Min: 0.35, status: healthy, under 5.00
Memory (kb): healthy
  Total: 3976852
  Used: 1451328 (36%), status: healthy
  Free: 2525524 (64%)
  Committed: 1675932 (42%), under 95%
Per-core Statistics
CPU0: CPU Utilization (percentage of time spent)
  User: 1.90, System: 0.50, Nice: 0.00, Idle: 97.60
  IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU1: CPU Utilization (percentage of time spent)
  User: 4.39, System: 0.19, Nice: 0.00, Idle: 95.40
  IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU2: CPU Utilization (percentage of time spent)
  User: 5.70, System: 1.00, Nice: 0.00, Idle: 93.30
  IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
```

**show platform software status control-processor**

```
CPU3: CPU Utilization (percentage of time spent)
  User: 1.30, System: 0.60, Nice: 0.00, Idle: 98.00
  IRQ: 0.00, SIRQ: 0.10, IOwait: 0.00
```

The following is sample output from the **show platform memory software status control-processor brief** command:

```
Switch# show platform software status control-processor brief

Load Average
  Slot Status 1-Min 5-Min 15-Min
2-RP0 Healthy 1.10 1.21 0.91
3-RP0 Healthy 0.23 0.27 0.31
4-RP0 Healthy 0.11 0.21 0.22
9-RP0 Healthy 0.10 0.30 0.34

Memory (kB)
  Slot Status Total Used (Pct) Free (Pct) Committed (Pct)
2-RP0 Healthy 3976852 2766956 (70%) 1209896 (30%) 3358352 (84%)
3-RP0 Healthy 3976852 2706824 (68%) 1270028 (32%) 3299276 (83%)
4-RP0 Healthy 3976852 1451888 (37%) 2524964 (63%) 1675076 (42%)
9-RP0 Healthy 3976852 1451580 (37%) 2525272 (63%) 1675952 (42%)

CPU Utilization
  Slot CPU User System Nice Idle IRQ SIRQ IOwait
2-RP0 0 4.10 2.00 0.00 93.80 0.00 0.10 0.00
      1 4.60 1.00 0.00 94.30 0.00 0.10 0.00
      2 6.50 1.10 0.00 92.40 0.00 0.00 0.00
      3 5.59 1.19 0.00 93.20 0.00 0.00 0.00
3-RP0 0 2.80 1.20 0.00 95.90 0.00 0.10 0.00
      1 4.49 1.29 0.00 94.20 0.00 0.00 0.00
      2 5.30 1.60 0.00 93.10 0.00 0.00 0.00
      3 5.80 1.20 0.00 93.00 0.00 0.00 0.00
4-RP0 0 1.30 0.80 0.00 97.89 0.00 0.00 0.00
      1 1.30 0.20 0.00 98.50 0.00 0.00 0.00
      2 5.60 0.80 0.00 93.59 0.00 0.00 0.00
      3 5.09 0.19 0.00 94.70 0.00 0.00 0.00
9-RP0 0 3.99 0.69 0.00 95.30 0.00 0.00 0.00
      1 2.60 0.70 0.00 96.70 0.00 0.00 0.00
      2 4.49 0.89 0.00 94.60 0.00 0.00 0.00
      3 2.60 0.20 0.00 97.20 0.00 0.00 0.00
```

# show platform software thread list

To display the list of threads on a platform, use the **show platform software thread list** command in privileged EXEC mode.

```
show platform software thread list switch {switch-number | active | standby} {0 | F0 | FP
active | R0} pname {cdman | vidman | all} tname {main | pktio | rt | all}
```

Syntax Description		
<b>switch</b> <i>switch-number</i>		Displays information about the switch. Enter the switch number.
<b>active</b>		Specifies the active instance of the device.
<b>standby</b>		Specifies standby instance of the device.
<b>0</b>		Specifies the Shared Port Adapter (SPA) Interface Processor slot 0.
<b>F0</b>		Specifies the Embedded Service Processor (ESP) slot 0.
<b>FP active</b>		Specifies the active instance of Embedded Service Processor (ESP).
<b>R0</b>		Specifies the Route Processor (RP) slot 0.
<b>pname</b>		Specifies a process name. The possible values are <b>cdman</b> , <b>vidman</b> , and <b>all</b> .
<b>tname</b>		Specifies a thread name. The possible values are <b>main</b> , <b>pktio</b> , <b>rt</b> , and <b>all</b> .
Command History	Release	Modification
Cisco IOS XE Gibraltar 16.11.1		This command was introduced.
Command Modes	Privileged EXEC(#)	

## Examples:

The following is sample output from the **show platform software thread list switch active R0 pname cdman tname all** command:

```
Device# show platform software thread list switch active R0 pname cdman tname all
```

Name TIME+	Tid	PPid	Group	Id	Core	Vcswch	Nvcswch	Status	Priority
cdman 12309	8407	7295		8407	1	0	0	S	20

The table below describes the significant fields shown in the displays.

**show platform software thread list**

**Table 14: show platform software thread list Field Descriptions**

Field	Description
Name	Displays the command name associated with the process. Different threads in the same process may have different command values.
Tid	Displays the process ID.
PPid	Displays the process ID of the parent process.
Group Id	Displays the group ID.
Core	Displays processor information.
Vcswch	Displays the number of voluntary context switches.
Nvcswch	Displays the number of non-voluntary context switches.
Status	Displays the process status in human readable form.
Priority	Displays the negated scheduling priority.
TIME+	Displays the time since the start of the process.
Size	Displays the Resident Set Size (in kilobytes (KB)) that shows how much memory is allocated to that process in the RAM.

# show processes cpu platform

To display information about the CPU utilization of the IOS-XE processes, use the **show processes cpu platform** command in privileged EXEC mode.

```
show processes cpu platform [ [ sorted [1min | 5min | 5sec] ] location
switch {switch-number | active | standby} {F0 | FP active | R0 | RP active} }
```

Syntax Description	sorted	(Optional) Displays output sorted based on percentage of CPU usage on a platform.
	1min	(Optional) Sorts based on 1 minute intervals.
	5min	(Optional) Sorts based on 5 minute intervals.
	5sec	(Optional) Sorts based on 5 second intervals.
	location	Specifies the Field Replaceable Unit (FRU) location.
	switch <i>switch-number</i>	Displays information about the switch. Enter the switch number.
	active	Specifies the active instance of the device.
	standby	Specifies the standby instance of the device.
	F0	Specifies the Embedded Service Processor (ESP) slot 0.
	FP active	Specifies active instances on the Embedded Service Processor (ESP).
	R0	Specifies the Route Processor (RP) slot 0.
	RP active	Specifies active instances on the Route Processor (RP).

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

**Command Modes** Privileged EXEC (#)

## Examples:

The following is sample output from the **show processes cpu platform** command:

```
Device# show processes cpu platform

CPU utilization for five seconds: 1%, one minute: 3%, five minutes: 2%
Core 0: CPU utilization for five seconds: 2%, one minute: 2%, five minutes: 2%
Core 1: CPU utilization for five seconds: 2%, one minute: 1%, five minutes: 1%
Core 2: CPU utilization for five seconds: 3%, one minute: 1%, five minutes: 1%
Core 3: CPU utilization for five seconds: 2%, one minute: 5%, five minutes: 2%
      Pid  PPid   5Sec   1Min   5Min Status     Size  Name
----- 
      1      0    0%    0%    0%   S        4876  systemd
```

```
show processes cpu platform
```

2	0	0%	0%	0%	S	0	kthreadd
3	2	0%	0%	0%	S	0	ksoftirqd/0
5	2	0%	0%	0%	S	0	kworker/0:0H
7	2	0%	0%	0%	S	0	rcu_sched
8	2	0%	0%	0%	S	0	rcu_bh
9	2	0%	0%	0%	S	0	migration/0
10	2	0%	0%	0%	S	0	watchdog/0
11	2	0%	0%	0%	S	0	watchdog/1
12	2	0%	0%	0%	S	0	migration/1
13	2	0%	0%	0%	S	0	ksoftirqd/1
15	2	0%	0%	0%	S	0	kworker/1:0H
16	2	0%	0%	0%	S	0	watchdog/2
17	2	0%	0%	0%	S	0	migration/2
18	2	0%	0%	0%	S	0	ksoftirqd/2
20	2	0%	0%	0%	S	0	kworker/2:0H
21	2	0%	0%	0%	S	0	watchdog/3
22	2	0%	0%	0%	S	0	migration/3
23	2	0%	0%	0%	S	0	ksoftirqd/3
24	2	0%	0%	0%	S	0	kworker/3:0
25	2	0%	0%	0%	S	0	kworker/3:0H
26	2	0%	0%	0%	S	0	kdevtmpfs
27	2	0%	0%	0%	S	0	netns
28	2	0%	0%	0%	S	0	perf
29	2	0%	0%	0%	S	0	khungtaskd
30	2	0%	0%	0%	S	0	writeback
31	2	7%	8%	8%	S	0	ksmd
32	2	0%	0%	0%	S	0	khugepaged
33	2	0%	0%	0%	S	0	crypto
34	2	0%	0%	0%	S	0	bioset
35	2	0%	0%	0%	S	0	kblockd
36	2	0%	0%	0%	S	0	ata_sff
37	2	0%	0%	0%	S	0	rpcliod
63	2	0%	0%	0%	S	0	kswapd0
64	2	0%	0%	0%	S	0	vmstat
65	2	0%	0%	0%	S	0	fsnotify_mark

The following is sample output from the **show processes cpu platform sorted 5min location switch 5 R0**

```
Device# show processes cpu platform sorted 5min location switch 5 R0
```

CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 0%  
Core 0: CPU utilization for five seconds: 1%, one minute: 1%, five minutes: 1%  
Core 1: CPU utilization for five seconds: 1%, one minute: 1%, five minutes: 1%  
Core 2: CPU utilization for five seconds: 1%, one minute: 1%, five minutes: 1%  
Core 3: CPU utilization for five seconds: 2%, one minute: 2%, five minutes: 1%  
Core 4: CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 0%  
Core 5: CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 0%  
Core 6: CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 0%  
Core 7: CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 0%

Pid	PPid	5Sec	1Min	5Min	Status	Size	Name
16358	15516	4%	4%	4%	S	221376	fed main event
14062	12756	1%	1%	1%	S	52140	sif_mgr
32105	8618	0%	0%	0%	S	260	inotifywait
31396	31393	0%	0%	0%	S	36516	python2.7
31393	31271	0%	0%	0%	S	2744	rdope.sh
31319	1	0%	0%	0%	S	2648	rotee
31271	1	0%	0%	0%	S	3852	pman.sh
29671	2	0%	0%	0%	S	0	kworker/u16:0
29341	29329	0%	0%	0%	S	1780	sntp
29329	1	0%	0%	0%	S	2788	stack_sntp.sh

The following is sample output from the **show processes cpu platform location switch 7 R0** command:

```
Device# show processes cpu platform location switch 7 R0
```

```
CPU utilization for five seconds: 3%, one minute: 3%, five minutes: 3%
Core 0: CPU utilization for five seconds: 1%, one minute: 5%, five minutes: 5%
Core 1: CPU utilization for five seconds: 1%, one minute: 11%, five minutes: 5%
Core 2: CPU utilization for five seconds: 22%, one minute: 7%, five minutes: 6%
Core 3: CPU utilization for five seconds: 5%, one minute: 6%, five minutes: 6%
Core 4: CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 0%
Core 5: CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 0%
Core 6: CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 0%
Core 7: CPU utilization for five seconds: 0%, one minute: 0%, five minutes: 6%
      Pid      PPid     5Sec    1Min    5Min Status        Size   Name
-----
```

Pid	PPid	5Sec	1Min	5Min	Status	Size	Name
1	0	0%	0%	0%	S	8044	systemd
2	0	0%	0%	0%	S	0	kthreadd

```
.
```

```
.
```

show processes cpu platform history

# show processes cpu platform history

To display information about the CPU usage history of a system, use the **show processes cpu platform history** command.

**show processes cpu platform history [1min | 5min | 5sec | 60min] location  
switch {switch-number | active | standby} {0 | F0 | FP active | R0}**

<b>1min</b>	(Optional) Displays CPU utilization history with 1 minute intervals.
<b>5min</b>	(Optional) Displays CPU utilization history with 5 minute intervals.
<b>5sec</b>	(Optional) Displays CPU utilization history with 5 second intervals.
<b>60min</b>	(Optional) Displays CPU utilization history with 60 minute intervals.
<b>location</b>	Specifies the Field Replaceable Unit (FRU) location.
<b>switch switch-number</b>	Displays information about the switch. Enter the switch number.
<b>active</b>	Specifies the active instance of the device.
<b>standby</b>	Specifies the standby instance of the device.
<b>0</b>	Specifies the Shared Port Adapter (SPA) Interface Processor slot 0.
<b>F0</b>	Specifies the Embedded Service Processor (ESP) slot 0.
<b>FP active</b>	Specifies active instances on the Embedded Service Processor (ESP).
<b>R0</b>	Specifies the Route Processor (RP) slot 0.

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

## Examples:

The following is sample output from the **show processes cpu platform** command:

```
Device# show processes cpu platform
```

CPU utilization for five seconds: 1%, one minute: 3%, five minutes: 2%  
Core 0: CPU utilization for five seconds: 2%, one minute: 2%, five minutes: 2%  
Core 1: CPU utilization for five seconds: 2%, one minute: 1%, five minutes: 1%  
Core 2: CPU utilization for five seconds: 3%, one minute: 1%, five minutes: 1%  
Core 3: CPU utilization for five seconds: 2%, one minute: 5%, five minutes: 2%

Pid	PPid	5Sec	1Min	5Min	Status	Size	Name
1	0	0%	0%	0%	S	4876	systemd
2	0	0%	0%	0%	S	0	kthreadd
3	2	0%	0%	0%	S	0	ksoftirqd/0
5	2	0%	0%	0%	S	0	kworker/0:0H
7	2	0%	0%	0%	S	0	rcu_sched
8	2	0%	0%	0%	S	0	rcu_bh
9	2	0%	0%	0%	S	0	migration/0
10	2	0%	0%	0%	S	0	watchdog/0
11	2	0%	0%	0%	S	0	watchdog/1
12	2	0%	0%	0%	S	0	migration/1
13	2	0%	0%	0%	S	0	ksoftirqd/1
15	2	0%	0%	0%	S	0	kworker/1:0H
16	2	0%	0%	0%	S	0	watchdog/2
17	2	0%	0%	0%	S	0	migration/2
18	2	0%	0%	0%	S	0	ksoftirqd/2
20	2	0%	0%	0%	S	0	kworker/2:0H
21	2	0%	0%	0%	S	0	watchdog/3
22	2	0%	0%	0%	S	0	migration/3
23	2	0%	0%	0%	S	0	ksoftirqd/3
24	2	0%	0%	0%	S	0	kworker/3:0
25	2	0%	0%	0%	S	0	kworker/3:0H
26	2	0%	0%	0%	S	0	kdevtmpfs
27	2	0%	0%	0%	S	0	netns
28	2	0%	0%	0%	S	0	perf
29	2	0%	0%	0%	S	0	khungtaskd
30	2	0%	0%	0%	S	0	writeback
31	2	7%	8%	8%	S	0	ksmd
32	2	0%	0%	0%	S	0	khugepaged
33	2	0%	0%	0%	S	0	crypto
34	2	0%	0%	0%	S	0	bioset
35	2	0%	0%	0%	S	0	kblockd
36	2	0%	0%	0%	S	0	ata_sff
37	2	0%	0%	0%	S	0	rpciod
63	2	0%	0%	0%	S	0	kswapd0
64	2	0%	0%	0%	S	0	vmstat
65	2	0%	0%	0%	S	0	fsnotify_mark
.	.	.	.	.	.	.	.

The following is sample output from the **show processes cpu platform history 5sec** command:

```
Device# show processes cpu platform history 5sec

5 seconds ago, CPU utilization: 0%
10 seconds ago, CPU utilization: 0%
15 seconds ago, CPU utilization: 0%
20 seconds ago, CPU utilization: 0%
25 seconds ago, CPU utilization: 0%
30 seconds ago, CPU utilization: 0%
35 seconds ago, CPU utilization: 0%
40 seconds ago, CPU utilization: 0%
45 seconds ago, CPU utilization: 0%
50 seconds ago, CPU utilization: 0%
55 seconds ago, CPU utilization: 0%
60 seconds ago, CPU utilization: 0%
65 seconds ago, CPU utilization: 0%
70 seconds ago, CPU utilization: 0%
```

```
show processes cpu platform history
```

```
75 seconds ago, CPU utilization: 0%
80 seconds ago, CPU utilization: 0%
85 seconds ago, CPU utilization: 0%
90 seconds ago, CPU utilization: 0%
95 seconds ago, CPU utilization: 0%
100 seconds ago, CPU utilization: 0%
105 seconds ago, CPU utilization: 0%
110 seconds ago, CPU utilization: 0%
115 seconds ago, CPU utilization: 0%
120 seconds ago, CPU utilization: 0%
125 seconds ago, CPU utilization: 0%
130 seconds ago, CPU utilization: 0%
135 seconds ago, CPU utilization: 0%
140 seconds ago, CPU utilization: 0%
145 seconds ago, CPU utilization: 1%
150 seconds ago, CPU utilization: 0%
155 seconds ago, CPU utilization: 0%
160 seconds ago, CPU utilization: 0%
165 seconds ago, CPU utilization: 0%
170 seconds ago, CPU utilization: 0%
175 seconds ago, CPU utilization: 0%
180 seconds ago, CPU utilization: 0%
185 seconds ago, CPU utilization: 0%
190 seconds ago, CPU utilization: 0%
195 seconds ago, CPU utilization: 0%
200 seconds ago, CPU utilization: 0%
205 seconds ago, CPU utilization: 0%
210 seconds ago, CPU utilization: 0%
215 seconds ago, CPU utilization: 0%
220 seconds ago, CPU utilization: 0%
225 seconds ago, CPU utilization: 0%
230 seconds ago, CPU utilization: 0%
235 seconds ago, CPU utilization: 0%
240 seconds ago, CPU utilization: 0%
245 seconds ago, CPU utilization: 0%
250 seconds ago, CPU utilization: 0%
```

```
.
```

```
.
```

```
.
```

# show processes cpu platform monitor

To displays information about the CPU utilization of the IOS-XE processes, use the **show processes cpu platform monitor** command in privileged EXEC mode.

```
show processes cpu platform monitor location switch {switch-number | active | standby} {0 | F0 | R0}
```

<b>Syntax Description</b>	<b>location</b> Displays information about the Field Replaceable Unit (FRU) location. <b>switch</b> Specifies the switch. <b>switch-number</b> Switch number. <b>active</b> Specifies the active instance. <b>standby</b> Specifies the standby instance. <b>0</b> Specifies the shared port adapter (SPA) interface processor slot 0. <b>F0</b> Specifies the Embedded Service Processor (ESP) slot 0. <b>R0</b> Specifies the Route Processor (RP) slot 0.
---------------------------	---

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	The output of the <b>show platform software process slot switch</b> and <b>show processes cpu platform monitor location</b> commands display the output of the Linux <b>top</b> command. The output of these commands display Free memory and Used memory as displayed by the Linux <b>top</b> command. The values displayed for the Free memory and Used memory by these commands do not match the values displayed by the output of other platform-memory related CLIs.
-------------------------	---

<b>Examples</b>	The following is sample output from the <b>show processes cpu monitor location switch active R0</b> command:
-----------------	--

```
Switch# show processes cpu platform monitor location switch active R0

top - 00:04:21 up 1 day, 11:22, 0 users, load average: 0.42, 0.60, 0.78
Tasks: 312 total, 4 running, 308 sleeping, 0 stopped, 0 zombie
Cpu(s): 7.4%us, 3.3%sy, 0.0%ni, 89.2%id, 0.0%wa, 0.0%hi, 0.1%si, 0.0%st
Mem: 3976844k total, 3956928k used, 19916k free, 419312k buffers
Swap: 0k total, 0k used, 0k free, 1947036k cached

      PID USER      PR  NI    VIRT    RES    SHR S %CPU %MEM     TIME+ COMMAND
 6294 root      20   0  3448 1368  912 R    9  0.0  0:00.07 top
17546 root      20   0 2044m 244m 79m S   7  6.3 187:02.07 fed main event
30276 root      20   0  171m  42m 33m S   7  1.1 125:15.54 repm
 16 root      20   0      0      0    0 S   5  0.0 22:07.92 rcuc/2
 21 root      20   0      0      0    0 R   5  0.0 22:13.24 rcuc/3
```

**show processes cpu platform monitor**

```

18662 root      20   0 1806m 678m 263m R    5 17.5 215:47.59 linux_iosd-imag
  11 root      20   0     0     0 S    4 0.0 21:37.41 rcuc/1
10333 root      20   0 6420 3916 1492 S   4 0.1 4:47.03 btrace_rotate.s
  10 root      20   0     0     0 S    2 0.0 0:58.13 rcuc/0
  6304 root      20   0 776   12   0 R    2 0.0 0:00.01 ls
17835 root      20   0 935m 74m  63m S   2 1.9 82:34.07 sif_mgr
  1 root      20   0 8440 4740 2184 S   0 0.1 0:09.52 systemd
  2 root      20   0     0     0 S    0 0.0 0:00.00 kthreadd
  3 root      20   0     0     0 S    0 0.0 0:02.86 ksoftirqd/0
  5 root      0 -20   0     0     0 S    0 0.0 0:00.00 kworker/0:0H
  7 root      RT   0     0     0 S    0 0.0 0:01.44 migration/0

```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show platform software process slot switch</b>	Displays platform software process switch information.

# show processes memory platform

To display memory usage for each Cisco IOS XE process, use the **show processes memory platform** command in privileged EXEC mode.

```
show processes memory platform [ [ detailed { name process-name | process-id process-ID } [ location | maps [ location ] | smaps [ location ] ] | location | sorted [ location ] ] switch { switch-number | active | standby } { 0 | F0 | R0 } | accounting ]
```

Syntax Description		
	<b>accounting</b>	(Optional) Displays the top memory allocators for each Cisco IOS XE process.
	<b>detailed</b>	(Optional) Displays detailed memory information for a specified Cisco IOS XE process.
	<b>name</b> <i>process-name</i>	(Optional) Displays the Cisco IOS XE process name. Enter the process name.
	<b>process-id</b> <i>process-ID</i>	(Optional) Displays the Cisco IOS XE process ID. Enter the process ID.
	<b>location</b>	(Optional) Displays information about the Field Replaceable Unit (FRU) location.
	<b>maps</b>	(Optional) Displays memory maps of a process.
	<b>smaps</b>	(Optional) Displays static memory maps of a process.
	<b>sorted</b>	(Optional) Displays the sorted output based on the Resident Set Size (RSS) memory used by Cisco IOS XE process.
	<b>switch</b> <i>switch-number</i>	Displays information about the device.
	<b>active</b>	Displays information about the active instance of the device.
	<b>standby</b>	Displays information about the standby instance of the device.
	<b>0</b>	Displays information about Shared Port Adapter (SPA)-Inter-Processor slot 0.
	<b>F0</b>	Displays information about Embedded Service Processor (ESP) slot 0.
	<b>R0</b>	Displays information about Route Processor (RP) slot 0.

## Command Modes

Privileged EXEC (#)

show processes memory platform

Command History	Release	Modification
		This command was introduced.
	Cisco IOS XE Gibraltar 16.11.1	This command was modified. The keyword <b>accounting</b> was added.
		The <b>Total</b> column was deleted from the output.

## Examples

The following is a sample output from the **show processes memory platform** command:

```
device# show processes memory platform

System memory: 3976852K total, 2761580K used, 1215272K free,
Lowest: 1215272K
      Pid   Text      Data     Stack    Dynamic      RSS           Name
-----+
      1   1246     4400     132    1308     4400           systemd
     96   233     2796     132     132    2796       systemd-journal
    105   284     1796     132     176    1796       systemd-udevd
    707    52     2660     132     172    2660      in.telnetd
    744   968     3264     132    1700    3264      brelay.sh
    835    52     2660     132     172    2660      in.telnetd
    863   968     3264     132    1700    3264      brelay.sh
    928   968     3996     132    2312    3996      reflector.sh
    933   968     3976     132    2312    3976      droputil.sh
    934   968     2140     132     528    2140        oom.sh
    936   173      936     132     132     936        xinetd
    945   968     1472     132     132    1472      libvirtd.sh
    947   592    43164     132    3096    43164        repm
    954    45      932     132     132     932      rpcbind
    986   482     3476     132     132    3476      libvirtd
    988    66      940     132     132     940      rpc.statd
    993   968      928     132     132     928      boothelper_evt.
   1017    21      640     132     132     640      inotifywait
   1089   102     1200     132     132    1200      rpc.mountd
   1328     9     2940     132     148    2940        rotee
   1353    39      532     132     132     532        sleep
!
!
!
```

The following is a sample output from the **show processes memory platform accounting** command:

```
device# show processes memory platform accounting
Hourly Stats

      process          callsite_ID(bytes)  max_diff_bytes  callsite_ID(calls)
max_diff_calls      tracekey                           timestamp(UTC)
-----+
smand_rp_0          3624155137          172389          3624155138          50
                    1#a3e0e4361082c702e5bf1afbd90e6313          2018-09-04 14:23
linux_iosd-img_rp_0  3626295305          49188          3624155138          12
                    1#545420bd869d25eb5ab826182ee5d9ce          2018-09-04 12:03
btman_rp_0          3624737792          17080          2953915394          64
                    1#d6888bd9564a3c4fcf049c31ba07a036          2018-09-04 22:29
```

fman_fp_image_fp_0	3624059905	16960	4027402242	298
	1#921ba4d9df5b0a6e946a3b270bd6592d		2018-09-04 22:55	
fed_main_event_fp_0	3626295305	16396	4027402242	32
	1#27083f7bf3985d892505806cae2bfb0d		2018-09-04 12:03	
dbm_rp_0	3626295305	16396	4027402242	3
	1#2b878f802bd7703c5298d37e7a4e8ac3		2018-09-04 12:02	
tamd_proc_rp_0	3895208962	12632	3624667171	7
	1#5b0ed8f88ef5f873abcaf8a744037a44		2018-09-04 18:47	
btman_fp_0	3624233985	12288	3624737792	9
	1#d6888bd9564a3c4fcf049c31ba07a036		2018-09-04 15:23	
sif_mgr_rp_0	3624059907	8216	4027402242	4
	1#de2a951a8a7bae83ca2c04c56810eb72		2018-09-04 14:21	
python2.7_fp_0	2954560513	8000	2954560513	1
			2018-09-04 12:16	
nginx_rp_0	3357041665	4608	4027402242	4
	1#32e56bb09e0509c5fa5ac32093631206		2018-09-04 16:18	
rotee_FRU_SLOT_NUM	3624667169	4097	3624667169	1
	1#ff68e5150a698cd59fa28614995b		2018-09-04 10:43	
hman_rp_0	3893617664	1488	3893617664	1
	1#1c4aadada30083c5d6f66dc8ca8cd4cb		2018-09-04 10:42	
tams_proc_rp_0	3895096320	1024	3895096320	1
	1#a36a3afa9884c8dc4d40af1e80cacd26		2018-09-04 10:42	
stack_mgr_rp_0	4027402242	904	4027402242	4
	1#ca902eab11a18ab056b16554f49871e8		2018-09-04 14:21	
sessmgrd_rp_0	3491618816	848	3624155138	8
	1#720239fc8bddcabc059768c55a1640ed		2018-09-04 14:32	
psd_rp_0	4027402242	696	4027402242	4
	1#98cf04e0ddd78c2400b3ca3b5f298594		2018-09-04 14:21	
lman_rp_0	4027402242	592	4027402242	4
	1#dc8ed9e428d36477a617d56c51d5caf2		2018-09-04 14:21	
bt_logger_rp_0	4027402242	592	4027402242	4
	1#ba882be1ed783e72575e97cc0908e0e8		2018-09-04 14:21	
repm_rp_0	4027402242	592	4027402242	4
	1#ae461a05430efa767427f2ab40aba372		2018-09-04 14:21	
fman_rp_rp_0	4027402242	592	4027402242	3
	1#09def9cc1390911be9e3a7a9c89f4cf7		2018-09-04 12:16	
epc_ws_liaison_fp_0	4027402242	592	4027402242	4
	1#41451626dcce9d1478b22e2ebbbdcf54		2018-09-04 14:21	
cli_agent_rp_0	4027402242	592	4027402242	4
	1#92d3882919daf3a9e210807c61de0552		2018-09-04 14:21	
cmm_rp_0	4027402242	592	4027402242	4
	1#15ed1d79e96874b1e0621c42c3de6166		2018-09-04 14:21	
tms_rp_0	4027402242	352	4027402242	4
	1#5c6efe2e21f15aa16318576d3ec9153c		2018-09-04 12:03	
plogd_rp_0	4027402242	48	4027402242	1
	1#2d7f2ef57206f4fa763d7f2f5400bf1b		2018-09-04 10:43	
cmand_rp_0	3624155137	17	3624155137	1
	1#f1f41f61c44d73014023db5d8a46ecf5		2018-09-04 10:42	
!				
!				
!				

The following is a sample output from the **show processes memory platform sorted** command:

```
device# show processes memory platform sorted
System memory: 3976852K total, 2762884K used, 1213968K free,
Lowest: 1213968K
```

Pid	Text	Data	Stack	Dynamic	RSS	Name
<hr/>						
7885	149848	684864	136	80	684864	linux_iosd-imag
9655	3787	264964	136	18004	264964	wcm

**show processes memory platform**

Pid	Text	Data	Stack	Dynamic	RSS	Name
17261	324	248588	132	103908	248588	fed main event
4268	391	102084	136	5596	102084	cli_agent
4856	357	93388	132	3680	93388	dbm
17067	1087	77912	136	1796	77912	platform_mgr
!						
!						
!						

The following is sample output from the **show processes memory platform sorted location switch active R0** command:

```
device# show processes memory platform sorted location switch active R0
System memory: 3976852K total, 2762884K used, 1213968K free,
Lowest: 1213968K
```

Pid	Text	Data	Stack	Dynamic	RSS	Name
7885	149848	684864	136	80	684864	linux_iosd-imag
9655	3787	264964	136	18004	264964	wcm
17261	324	248588	132	103908	248588	fed main event
4268	391	102084	136	5596	102084	cli_agent
4856	357	93388	132	3680	93388	dbm
17067	1087	77912	136	1796	77912	platform_mgr
!						
!						
!						

# show processes platform

To display information about the IOS-XE processes running on a platform, use the **show processes platform** command in privileged EXEC mode.

**show processes platform [detailed name *process-name*] [location  
switch {switch-number | active | standby} {0 | F0 | FP active | R0}]**

<b>detailed</b>	(Optional) Displays detailed information of the specified IOS-XE process.
<b>name <i>process-name</i></b>	(Optional) Specifies the process name.
<b>location</b>	(Optional) Specifies the Field Replaceable Unit (FRU) location.
<b>switch switch-number</b>	(Optional) Displays information about the switch.
<b>active</b>	(Optional) Specifies the active instance of the device.
<b>standby</b>	(Optional) Specifies standby instance of the device.
<b>0</b>	Specifies the Shared Port Adapter (SPA) Interface Processor slot 0.
<b>F0</b>	Specifies the Embedded Service Processor (ESP) slot 0.
<b>FP active</b>	Specifies the active instance in the Embedded Service Processor (ESP).
<b>R0</b>	Specifies the Route Processor (RP) slot 0.

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

Command Modes	Privileged EXEC(#)
---------------	--------------------

## Examples:

The following is sample output from the **show processes platform** command:

```
Device# show processes platform
```

```
CPU utilization for five seconds: 1%, one minute: 2%, five minutes: 1%
  Pid  PPid Status      Size  Name
-----
   1     0   S       4876  systemd
   2     0   S          0  kthreadd
   3     2   S          0  ksoftirqd/0
   5     2   S          0  kworker/0:0H
   7     2   S          0  rcu_sched
   8     2   S          0  rcu_bh
   9     2   S          0  migration/0
  10     2   S          0  watchdog/0
  11     2   S          0  watchdog/1
  12     2   S          0  migration/1
```

**show processes platform**

```

13      2 S          0 ksoftirqd/1
15      2 S          0 kworker/1:0H
16      2 S          0 watchdog/2
17      2 S          0 migration/2
18      2 S          0 ksoftirqd/2
20      2 S          0 kworker/2:0H
21      2 S          0 watchdog/3
22      2 S          0 migration/3
23      2 S          0 ksoftirqd/3
24      2 S          0 kworker/3:0
25      2 S          0 kworker/3:0H
26      2 S          0 kdevtmpfs
27      2 S          0 netns
28      2 S          0 perf
29      2 S          0 khungtaskd
30      2 S          0 writeback
31      2 S          0 ksmd
32      2 S          0 khugepaged
33      2 S          0 crypto
34      2 S          0 bioset
35      2 S          0 kblockd
36      2 S          0 ata_sff
37      2 S          0 rpciod
63      2 S          0 kswapd0
64      2 S          0 vmstat
65      2 S          0 fsnotify_mark
66      2 S          0 nfsiod
74      2 S          0 bioset
75      2 S          0 bioset
76      2 S          0 bioset
77      2 S          0 bioset
78      2 S          0 bioset
79      2 S          0 bioset
80      2 S          0 bioset
81      2 S          0 bioset
82      2 S          0 bioset
83      2 S          0 bioset
84      2 S          0 bioset
85      2 S          0 bioset
86      2 S          0 bioset
87      2 S          0 bioset
88      2 S          0 bioset
89      2 S          0 bioset
90      2 S          0 bioset
91      2 S          0 bioset
92      2 S          0 bioset
93      2 S          0 bioset
94      2 S          0 bioset
95      2 S          0 bioset
96      2 S          0 bioset
97      2 S          0 bioset
100     2 S          0 ipv6_addrconf
102     2 S          0 deferwq

```

The table below describes the significant fields shown in the displays.

**Table 15: show processes platform Field Descriptions**

Field	Description
Pid	Displays the process ID.

Field	Description
PPid	Displays the process ID of the parent process.
Status	Displays the process status in human readable form.
Size	Displays the Resident Set Size (in kilobytes (KB)) that shows how much memory is allocated to that process in the RAM.
Name	Displays the command name associated with the process. Different threads in the same process may have different command values.

**show power inline**

# show power inline

To display the Power over Ethernet (PoE) status for the specified PoE port, the specified stack member, or for all PoE ports in the switch stack, use the **show power inline** command in EXEC mode.

**show power inline [{police | priority}] [{interface-id | module stack-member-number}] [detail]**

<b>Syntax Description</b>	<b>police</b> <b>priority</b> <i>interface-id</i> <b>module</b> <i>stack-member-number</i> <b>detail</b>	(Optional) Displays the power policing information about real-time power consumption. (Optional) Displays the power inline port priority for each port. (Optional) ID of the physical interface. (Optional) Limits the display to ports on the specified stack member. The range is 1 to 9. This keyword is supported only on stacking-capable switches. (Optional) Displays detailed output of the interface or module.
<b>Command Modes</b>	User EXEC Privileged EXEC	
<b>Command History</b>	<b>Release</b> Cisco IOS XE 3.2SE	<b>Modification</b> This command was introduced.

## Examples

This is an example of output from the **show power inline** command. The table that follows describes the output fields.

```
Device> show power inline
Module Available Used Remaining
      (Watts) (Watts) (Watts)
-----
 1       n/a   n/a   n/a
 2       n/a   n/a   n/a
 3     1440.0  15.4  1424.6
 4      720.0   6.3   713.7
Interface Admin Oper Power Device Class Max
          (Watts)
-----
Gi3/0/1  auto  off   0.0   n/a   n/a  30.0
Gi3/0/2  auto  off   0.0   n/a   n/a  30.0
Gi3/0/3  auto  off   0.0   n/a   n/a  30.0
Gi3/0/4  auto  off   0.0   n/a   n/a  30.0
Gi3/0/5  auto  off   0.0   n/a   n/a  30.0
Gi3/0/6  auto  off   0.0   n/a   n/a  30.0
Gi3/0/7  auto  off   0.0   n/a   n/a  30.0
Gi3/0/8  auto  off   0.0   n/a   n/a  30.0
```

```

Gi3/0/9  auto  off      0.0    n/a      n/a  30.0
Gi3/0/10 auto  off      0.0    n/a      n/a  30.0
Gi3/0/11 auto  off      0.0    n/a      n/a  30.0
Gi3/0/12 auto  off      0.0    n/a      n/a  30.0
<output truncated>

```

This is an example of output from the **show power inline interface-id** command on a switch port:

```

Device> show power inline gigabitethernet1/0/1
Interface Admin Oper      Power   Device          Class Max
                  (Watts)           (Watts)
-----
Gi1/0/1  auto  off      0.0    n/a      n/a  30.0

```

This is an example of output from the **show power inline module switch-number** command on stack member 3. The table that follows describes the output fields.

```

Device> show power inline module 3
Module Available      Used      Remaining
          (Watts)       (Watts)     (Watts)
-----
3        865.0        864.0     1.0
Interface Admin Oper      Power   Device          Class Max
                  (Watts)           (Watts)
-----
Gi3/0/1  auto  power-deny 4.0    n/a      n/a  15.4
Gi3/0/2  auto  off      0.0    n/a      n/a  15.4
Gi3/0/3  auto  off      0.0    n/a      n/a  15.4
Gi3/0/4  auto  off      0.0    n/a      n/a  15.4
Gi3/0/5  auto  off      0.0    n/a      n/a  15.4
Gi3/0/6  auto  off      0.0    n/a      n/a  15.4
Gi3/0/7  auto  off      0.0    n/a      n/a  15.4
Gi3/0/8  auto  off      0.0    n/a      n/a  15.4
Gi3/0/9  auto  off      0.0    n/a      n/a  15.4
Gi3/0/10 auto  off      0.0    n/a      n/a  15.4
<output truncated>

```

**Table 16: show power inline Field Descriptions**

Field	Description
Available	The total amount of configured power <sup>1</sup> on the PoE switch in watts (W).
Used	The amount of configured power that is allocated to PoE ports in watts.
Remaining	The amount of configured power in watts that is not allocated to ports in the system. (Available – Used = Remaining)
Admin	Administration mode: auto, off, static.

**show power inline**

Field	Description
Oper	Operating mode: <ul style="list-style-type: none"> <li>on—The powered device is detected, and power is applied.</li> <li>off—No PoE is applied.</li> <li>faulty—Device detection or a powered device is in a faulty state.</li> <li>power-deny—A powered device is detected, but no PoE is available, or the maximum wattage exceeds the detected powered-device maximum.</li> </ul>
Power	The maximum amount of power that is allocated to the powered device in watts. This value is the same as the value in the <i>Cutoff Power</i> field in the <b>show power inline police</b> command output.
Device	The device type detected: n/a, unknown, Cisco powered-device, IEEE powered-device, or the name from CDP.
Class	The IEEE classification: n/a or a value from 0 to 4.
Max	The maximum amount of power allocated to the powered device in watts.
AdminPowerMax	The maximum amount power allocated to the powered device in watts when the switch polices the real-time power consumption. This value is the same as the <i>Max</i> field value.
AdminConsumption	The power consumption of the powered device in watts when the switch polices the real-time power consumption. If policing is disabled, this value is the same as the <i>AdminPowerMax</i> field value.

<sup>1</sup> The configured power is the power that you manually specify or that the switch specifies by using CDP power negotiation or the IEEE classification, which is different than the real-time power that is monitored with the power sensing feature.

This is an example of output from the **show power inline police** command on a stacking-capable switch:

```
Device> show power inline police
Module   Available     Used      Remaining
          (Watts)    (Watts)    (Watts)
-----  -----
1        370.0        0.0       370.0
3        865.0        864.0      1.0

          Admin   Oper      Admin   Oper      Cutoff   Oper
Interface State   State   Police   Police   Power   Power
-----  -----
Gi1/0/1  auto    off      none    n/a      n/a     0.0
Gi1/0/2  auto    off      log     n/a      5.4     0.0
Gi1/0/3  auto    off      errdisable n/a      5.4     0.0
Gi1/0/4  off     off      none    n/a      n/a     0.0
Gi1/0/5  off     off      log     n/a      5.4     0.0
Gi1/0/6  off     off      errdisable n/a      5.4     0.0
Gi1/0/7  auto    off      none    n/a      n/a     0.0
Gi1/0/8  auto    off      log     n/a      5.4     0.0
Gi1/0/9  auto    on       none    n/a      n/a     5.1
Gi1/0/10 auto   on       log     ok      5.4     4.2
Gi1/0/11 auto   on       log     log    5.4     5.9
Gi1/0/12 auto   on       errdisable ok      5.4     4.2
```

```
Gi1/0/13 auto errdisable errdisable n/a      5.4    0.0
<output truncated>
```

In the previous example:

- The Gi1/0/1 port is shut down, and policing is not configured.
- The Gi1/0/2 port is shut down, but policing is enabled with a policing action to generate a syslog message.
- The Gi1/0/3 port is shut down, but policing is enabled with a policing action is to shut down the port.
- Device detection is disabled on the Gi1/0/4 port, power is not applied to the port, and policing is disabled.
- Device detection is disabled on the Gi1/0/5 port, and power is not applied to the port, but policing is enabled with a policing action to generate a syslog message.
- Device detection is disabled on the Gi1/0/6 port, and power is not applied to the port, but policing is enabled with a policing action to shut down the port.
- The Gi1/0/7 port is up, and policing is disabled, but the switch does not apply power to the connected device.
- The Gi1/0/8 port is up, and policing is enabled with a policing action to generate a syslog message, but the switch does not apply power to the powered device.
- The Gi1/0/9 port is up and connected to a powered device, and policing is disabled.
- The Gi1/0/10 port is up and connected to a powered device, and policing is enabled with a policing action to generate a syslog message. The policing action does not take effect because the real-time power consumption is less than the cutoff value.
- The Gi1/0/11 port is up and connected to a powered device, and policing is enabled with a policing action to generate a syslog message.
- The Gi1/0/12 port is up and connected to a powered device, and policing is enabled with a policing action to shut down the port. The policing action does not take effect because the real-time power consumption is less than the cutoff value.
- The Gi1/0/13 port is up and connected to a powered device, and policing is enabled with a policing action to shut down the port.

This is an example of output from the **show power inline police interface-id** command on a standalone switch. The table that follows describes the output fields.

Device> show power inline police gigabitethernet1/0/1						
Interface	Admin State	Oper State	Admin Police	Oper Police	Cutoff Power	Oper Power
Gi1/0/1	auto	off	none	n/a	n/a	0.0

**show power inline****Table 17: show power inline police Field Descriptions**

<b>Field</b>	<b>Description</b>
Available	The total amount of configured power <sup>2</sup> on the switch in watts (W).
Used	The amount of configured power allocated to PoE ports in watts.
Remaining	The amount of configured power in watts that is not allocated to ports in the system. (Available – Used = Remaining)
Admin State	Administration mode: auto, off, static.
Oper State	<p>Operating mode:</p> <ul style="list-style-type: none"> <li>• errdisable—Policing is enabled.</li> <li>• faulty—Device detection on a powered device is in a faulty state.</li> <li>• off—No PoE is applied.</li> <li>• on—The powered device is detected, and power is applied.</li> <li>• power-deny—A powered device is detected, but no PoE is available, or the real-time power consumption exceeds the maximum power allocation.</li> </ul> <p><b>Note</b> The operating mode is the current PoE state for the specified PoE port, the specified stack member, or for all PoE ports on the switch.</p>
Admin Police	Status of the real-time power-consumption policing feature: <ul style="list-style-type: none"> <li>• errdisable—Policing is enabled, and the switch shuts down the port when the real-time power consumption exceeds the maximum power allocation.</li> <li>• log—Policing is enabled, and the switch generates a syslog message when the real-time power consumption exceeds the maximum power allocation.</li> <li>• none—Policing is disabled.</li> </ul>
Oper Police	Policing status: <ul style="list-style-type: none"> <li>• errdisable—The real-time power consumption exceeds the maximum power allocation, and the switch shuts down the PoE port.</li> <li>• log—The real-time power consumption exceeds the maximum power allocation, and the switch generates a syslog message.</li> <li>• n/a—Device detection is disabled, power is not applied to the PoE port, or no policing action is configured.</li> <li>• ok—Real-time power consumption is less than the maximum power allocation.</li> </ul>
Cutoff Power	The maximum power allocated on the port. When the real-time power consumption is greater than this value, the switch takes the configured policing action.
Oper Power	The real-time power consumption of the powered device.

<sup>2</sup> The configured power is the power that you manually specify or that the switch specifies by using CDP power negotiation or the IEEE classification, which is different than the real-time power that is monitored with the power sensing feature.

This is an example of output from the **show power inline priority** command on a standalone switch.

```
Device> show power inline priority
Interface Admin Oper Priority
          State State
-----
Gi1/0/1    auto  off   low
Gi1/0/2    auto  off   low
Gi1/0/3    auto  off   low
Gi1/0/4    auto  off   low
Gi1/0/5    auto  off   low
Gi1/0/6    auto  off   low
Gi1/0/7    auto  off   low
Gi1/0/8    auto  off   low
Gi1/0/9    auto  off   low
```

**show stack-power**

# show stack-power

To display information about StackPower stacks or switches in a power stack, use the **show stack-power** command in EXEC mode.

```
{show stack-power [{budgeting | detail | load-shedding | neighbors}] [order power-stack-name] | [stack-name [stack-id] | switch [switch-id]]]}
```

Syntax Description		
<b>budgeting</b>	(Optional)	Displays the stack power budget table.
<b>detail</b>	(Optional)	Displays the stack power stack details.
<b>load-shedding</b>	(Optional)	Displays the stack power load shedding table.
<b>neighbors</b>	(Optional)	Displays the stack power neighbor table.
<b>order power-stack-name</b>	(Optional)	Displays the load shedding priority for a power stack.
	<b>Note</b>	This keyword is available only after the <b>load-shedding</b> keyword.
<b>stack-name</b>	(Optional)	Displays budget table, details, or neighbors for all power stacks or the specified power stack.
	<b>Note</b>	This keyword is not available after the <b>load-shedding</b> keyword.
<b>stack-id</b>	(Optional)	Power stack ID for the power stack. The stack ID must be 31 characters or less.
<b>switch</b>	(Optional)	Displays budget table, details, load-shedding, or neighbors for all switches or the specified switch.
<b>switch-id</b>	(Optional)	Switch ID for the switch. The switch number is from 1 to 9.
Command Modes	Privileged EXEC	
Command History	Release	Modification
	Cisco IOS XE Denali 16.3.2	Support for all the options was enabled for this command.
	Cisco IOS XE Denali 16.1.1	This command was reintroduced.
Usage Guidelines	<p>This command is available only on switch stacks running the IP Base or IP Services image. If a switch is shut down because of load shedding, the output of the <b>show stack-power</b> command still includes the MAC address of the shutdown neighbor switch. The command output shows the stack power topology even if there is not enough power to power a switch.</p>	
Examples	This is an example of output from the <b>show stack-power</b> command:	

```
Device# show stack-power
Power Stack      Stack   Stack   Total   Rsvd   Alloc   Unused   Num   Num
Name           Mode    Topolgy  Pwr(W)  Pwr(W)  Pwr(W)  Pwr(W)  SW    PS
-----  -----  -----  -----  -----  -----  -----  -----  -----
Powerstack-1   SP-PS  Stndaln  350    150    200    0       1     1
```

This is an example of output from the **show stack-power budgeting** command:

```
Device# show stack-power budgeting
Power Stack      Stack   Stack   Total   Rsvd   Alloc   Unused   Num   Num
Name           Mode    Topolgy  Pwr(W)  Pwr(W)  Pwr(W)  Pwr(W)  SW    PS
-----  -----  -----  -----  -----  -----  -----  -----  -----
Powerstack-1   SP-PS  Stndaln  350    150    200    0       1     1

      Power Stack      PS-A   PS-B   Power   Alloc   Avail   Consumd Pwr
      SW  Name          (W)    (W)   Budget (W)  Power (W)  Pwr (W)  Sys/PoE (W)
---  -----  -----  -----  -----  -----  -----  -----
1   Powerstack-1     350    0      200      200      0       60     /0
---  -----  -----  -----  -----  -----  -----  -----
Totals:                                200      0       60     /0
```

**show system mtu**

## show system mtu

To display the global maximum transmission unit (MTU) or maximum packet size set for the switch, use the **show system mtu** command in privileged EXEC mode.

**show system mtu**

<b>Syntax Description</b>	This command has no arguments or keywords.	
<b>Command Default</b>	None	
<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
<b>Usage Guidelines</b>	For information about the MTU values and the stack configurations that affect the MTU values, see the <b>system mtu</b> command.	
<b>Examples</b>	This is an example of output from the <b>show system mtu</b> command:	

```
Device# show system mtu
Global Ethernet MTU is 1500 bytes.
```

# show tech-support

To automatically run **show** commands that display system information, use the **show tech-support** command in the privilege EXEC mode.

## show tech-support

[**cef** | **cft** | **eigrp** | **evc** | **fif** | **ipc** | **ipmulticast** | **ipsec** | **mfib** | **nat** | **nbar** | **onep** | **ospf** | **page** | **password** | **rsvp** | **subscriber** | **vrrp** | **wccp**]

### Syntax Description

<b>cef</b>	(Optional) Displays CEF related information.
<b>cft</b>	(Optional) Displays CFT related information.
<b>eigrp</b>	(Optional) Displays EIGRP related information.
<b>evc</b>	(Optional) Displays EVC related information.
<b>fif</b>	(Optional) Displays flexible netflow related information.
<b>ipc</b>	(Optional) Displays IPC related information.
<b>ipmulticast</b>	(Optional) Displays IP multicast related information.
<b>ipsec</b>	(Optional) Displays IPSEC related information.
<b>mfib</b>	(Optional) Displays MFIB related information.
<b>nat</b>	(Optional) Displays NAT related information.
<b>onep</b>	(Optional) Displays ONEP related information.
<b>ospf</b>	(Optional) Displays OSPF related information.
<b>page</b>	(Optional) Displays the command output on a single page at a time. Use the Return key to display the next line of output or use the space bar to display the next page of information. If not used, the output scrolls (that is, it does not stop for page breaks).  Press the <b>Ctrl-C</b> keys to stop the command output.
<b>password</b>	(Optional) Leaves passwords and other security information in the output. If not used, passwords and other security-sensitive information in the output are replaced with the label "<removed>".
<b>subscriber</b>	(Optional) Displays subscriber related information.
<b>vrrp</b>	(Optional) Displays VRRP related information.
<b>wccp</b>	(Optional) Displays WCCP related information.

### Command Modes

Privileged EXEC (#)

**show tech-support**

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was enhanced to display the output of the <b>show logging onboard uptime</b> command
	Cisco IOS XE Denali 16.3.2	This command was enhanced to display of the outputs of the following commands in the output modifier : <ul style="list-style-type: none"><li>• <b>show power inline</b></li><li>• <b>show platform software ilpower details</b></li><li>• <b>show power inline police</b></li><li>• <b>show stack-power budgeting</b></li></ul>
	Cisco IOS XE Denali 16.1.1	This command was implemented on the Cisco Catalyst 3850 Series Switches

#### Usage Guidelines

The output of the **show logging onboard uptime** command is displayed in the output of the **show tech-support** command.

The output from the **show tech-support** command is very long. To better manage this output, you can redirect the output to a file (for example, **show tech-support >filename** ) in the local writable storage file system or the remote file system. Redirecting the output to a file also makes sending the output to your Cisco Technical Assistance Center (TAC) representative easier.

You can use one of the following redirection methods:

- **> filename** - Redirects the output to a file.
- **>> filename** - Redirects the output to a file in append mode.

# show tech-support diagnostic

To display diagnostic information for technical support, use the **show tech-support diagnostic** command in privileged EXEC mode.

## show tech-support diagnostic

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

<b>Usage Guidelines</b>	The output of this command is very long. To better manage this output, you can redirect the output to a file (for example, <b>show tech-support diagnostic &gt; flash:filename</b> ) in the local writable storage file system or remote file system.
-------------------------	---



**Note** For devices that support stacking, this command is executed on every switch that is up. For devices that do not support stacking, this command is executed only on the active switch.

The output of this command displays the output of the following commands:

- **show clock**
- **show version**
- **show running-config**
- **show inventory**
- **show diagnostic bootup level**
- **show diagnostic status**
- **show diagnostic content switch all**
- **show diagnostic result switch all detail**
- **show diagnostic schedule switch all**
- **show diagnostic post**
- **show diagnostic description switch [switch number] test all**
- **show logging onboard switch [switch number] clilog detail**
- **show logging onboard switch [switch number] counter detail**
- **show logging onboard switch [switch number] environment detail**
- **show logging onboard switch [switch number] message detail**

**show tech-support diagnostic**

- **show logging onboard switch [switch number] poe detail**
  - **show logging onboard switch [switch number] status**
  - **show logging onboard switch [switch number] temperature detail**
  - **show logging onboard switch [switch number] uptime detail**
  - **show logging onboard switch [switch number] voltage detail**

## Examples

The following is a sample output from the **show tech-support diagnostic** command:

```
----- show diagnostic content switch all -----
```

```
switch 1:
```

Diagnostics test suite attributes:

```
M/C/* - Minimal bootup level test / Complete bootup level test / NA
B/* - Basic ondemand test / NA
P/V/* - Per port test / Per device test / NA
D/N/* - Disruptive test / Non-disruptive test / NA
S/* - Only applicable to standby unit / NA
X/* - Not a health monitoring test / NA
F/* - Fixed monitoring interval test / NA
E/* - Always enabled monitoring test / NA
A/I - Monitoring is active / Monitoring is inactive
```

ID	Test Name	Attributes	Test Interval	Thre-
			day hh:mm:ss.ms	shold
1)	DiagGoldPktTest -----> *BPN*X**I		not configured	n/a
2)	DiagThermalTest -----> *B*N****A		000 00:01:30.00	5
3)	DiagFanTest -----> *B*N****A		000 00:01:30.00	5
4)	DiagPhyLoopbackTest -----> *BPD*X**I		not configured	n/a
5)	DiagScratchRegisterTest -----> *B*N****A		000 00:01:30.00	5
6)	TestUnusedPortLoopback -----> *BPN****I		not configured	n/a
7)	TestPortTxMonitoring -----> *BPN****A		000 00:01:30.00	1
8)	DiagPoETest -----> ***D*X**I		not configured	n/a
9)	DiagStackCableTest -----> ***D*X**I		not configured	n/a
10)	DiagMemoryTest -----> *B*D*X**I		not configured	n/a

```
switch 2:
```

Diagnostics test suite attributes:

show tech-support diagnostic

```
M/C/* - Minimal bootup level test / Complete bootup level test / NA
B/* - Basic ondemand test / NA
P/V/* - Per port test / Per device test / NA
D/N/* - Disruptive test / Non-disruptive test / NA
S/* - Only applicable to standby unit / NA
X/* - Not a health monitoring test / NA
F/* - Fixed monitoring interval test / NA
E/* - Always enabled monitoring test / NA
A/I - Monitoring is active / Monitoring is inactive
```

ID	Test Name	Attributes	Test Interval	Thre-
			day hh:mm:ss.ms	shold
1)	DiagGoldPktTest -----> *BPN*X**I		not configured	n/a
2)	DiagThermalTest -----> *B*N****A		000 00:01:30.00	5
3)	DiagFanTest -----> *B*N****A		000 00:01:30.00	5
4)	DiagPhyLoopbackTest -----> *BPD*X**I		not configured	n/a
5)	DiagScratchRegisterTest -----> *B*N****A		000 00:01:30.00	5
6)	TestUnusedPortLoopback -----> *BPN****I		not configured	n/a
7)	TestPortTxMonitoring -----> *BPN****A		000 00:01:30.00	1
8)	DiagPoETest -----> ***D*X**I		not configured	n/a
9)	DiagStackCableTest -----> ***D*X**I		not configured	n/a
10)	DiagMemoryTest -----> *B*D*X**I		not configured	n/a
.	.	.	.	.
	----- show logging onboard switch 4 clilog detail -----			

-----  
CLI LOGGING SUMMARY INFORMATION  
-----

COUNT COMMAND  
-----

No summary data to display

```
-----  
-----  
CLI LOGGING CONTINUOUS INFORMATION  
-----
```

```
MM/DD/YYYY HH:MM:SS COMMAND  
-----
```

```
No continuous data  
-----
```

```
----- show logging onboard switch 5 clilog detail -----  
-----
```

```
CLI LOGGING SUMMARY INFORMATION  
-----
```

```
COUNT COMMAND  
-----
```

```
No summary data to display  
-----
```

```
CLI LOGGING CONTINUOUS INFORMATION  
-----
```

```
MM/DD/YYYY HH:MM:SS COMMAND  
-----
```

```
No continuous data  
-----
```

```
.  
. .
```

**speed**

# speed

To specify the speed of a 10/100/1000/2500/5000 Mbps port, use the **speed** command in interface configuration mode. To return to the default value, use the **no** form of this command.

```
speed {10 | 100 | 1000 | 2500 | 5000 | auto [{10 | 100 | 1000 | 2500 | 5000}] | nonegotiate}
no speed
```

<b>Syntax Description</b>	<b>10</b> Specifies that the port runs at 10 Mbps. <b>100</b> Specifies that the port runs at 100 Mbps. <b>1000</b> Specifies that the port runs at 1000 Mbps. This option is valid and visible only on 10/100/1000 Mb/s ports. <b>2500</b> Specifies that the port runs at 2500 Mbps. This option is valid and visible only on multi-Gigabit-supported Ethernet ports. <b>5000</b> Specifies that the port runs at 5000 Mbps. This option is valid and visible only on multi-Gigabit-supported Ethernet ports. <b>auto</b> Detects the speed at which the port should run, automatically, based on the port at the other end of the link. If you use the <b>10</b> , <b>100</b> , <b>1000</b> , <b>1000</b> , <b>2500</b> , or <b>5000</b> keyword with the <b>auto</b> keyword, the port autonegotiates only at the specified speeds. <b>nonegotiate</b> Disables autonegotiation, and the port runs at 1000 Mbps.						
<b>Command Default</b>	The default is <b>auto</b> .						
<b>Command Modes</b>	Interface configuration						
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> <tr> <td>Cisco IOS XE Denali 16.3.1</td> <td>This command was modified. The following keywords were added: <b>2500</b> and <b>5000</b>. These keywords are visible only on multi-Gigabit Ethernet port supporting devices.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.	Cisco IOS XE Denali 16.3.1	This command was modified. The following keywords were added: <b>2500</b> and <b>5000</b> . These keywords are visible only on multi-Gigabit Ethernet port supporting devices.
Release	Modification						
Cisco IOS XE 3.2SE	This command was introduced.						
Cisco IOS XE Denali 16.3.1	This command was modified. The following keywords were added: <b>2500</b> and <b>5000</b> . These keywords are visible only on multi-Gigabit Ethernet port supporting devices.						

<b>Usage Guidelines</b>	<p>You cannot configure speed on 10-Gigabit Ethernet ports.</p> <p>Except for the 1000BASE-T small form-factor pluggable (SFP) modules, you can configure the speed to not negotiate (<b>nonegotiate</b>) when an SFP module port is connected to a device that does not support autonegotiation.</p> <p>The new keywords, <b>2500</b> and <b>5000</b> are visible only on multi-Gigabit (m-Gig) Ethernet supporting devices.</p> <p>If the speed is set to <b>auto</b>, the switch negotiates with the device at the other end of the link for the speed setting, and then forces the speed setting to the negotiated value. The duplex setting remains configured on each end of the link, which might result in a duplex setting mismatch.</p>
-------------------------	---

If both ends of the line support autonegotiation, we highly recommend the default autonegotiation settings. If one interface supports autonegotiation and the other end does not, use the auto setting on the supported side, but set the duplex and speed on the other side.



**Caution** Changing the interface speed and duplex mode configuration might shut down and re-enable the interface during the reconfiguration.

For guidelines on setting the switch speed and duplex parameters, see the “Configuring Interface Characteristics” chapter in the software configuration guide for this release.

Verify your settings using the **show interfaces** privileged EXEC command.

## Examples

The following example shows how to set speed on a port to 100 Mbps:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# speed 100
```

The following example shows how to set a port to autonegotiate at only 10 Mbps:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# speed auto 10
```

The following example shows how to set a port to autonegotiate at only 10 or 100 Mbps:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# speed auto 10 100
```

# stack-power

To configure StackPower parameters for the power stack or for a switch in the power stack, use the **stack power** command in global configuration mode. To return to the default setting, use the **no** form of the command.

```
stack-power {stack power-stack-name | switch stack-member-number}
no stack-power {stack power-stack-name | switch stack-member-number}
```

<b>Syntax Description</b>	<b>stack power-stack-name</b> Specifies the name of the power stack. The name can be up to 31 characters. Entering these keywords followed by a carriage return enters power stack configuration mode.				
	<b>switch stack-member-number</b> Specifies the switch number in the stack (1 to 4) to enter switch stack-power configuration mode for the switch.				
<b>Command Default</b>	There is no default.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>When you enter the <b>stack-power stack power stack name</b> command, you enter power stack configuration mode, and these commands are available:</p> <ul style="list-style-type: none"> <li>• <b>default</b>—Returns a command to its default setting.</li> <li>• <b>exit</b>—Exits ARP access-list configuration mode.</li> <li>• <b>mode</b>—Sets the power mode for the power stack. See the <b>mode</b> command.</li> <li>• <b>no</b>—Negates a command or returns to default settings.</li> </ul> <p>If you enter the <b>stack-power switch switch-number</b> command with a switch number that is not participating in StackPower, you receive an error message.</p> <p>When you enter the <b>stack-power switch switch-number</b> command with the number of a switch participating in StackPower, you enter switch stack power configuration mode, and these commands are available:</p> <ul style="list-style-type: none"> <li>• <b>default</b>—Returns a command to its default setting.</li> <li>• <b>exit</b>—Exits switch stack power configuration mode.</li> <li>• <b>no</b>—Negates a command or returns to default settings.</li> <li>• <b>power-priority</b>—Sets the power priority for the switch and the switch ports. See the <b>power-priority</b> command.</li> <li>• <b>stack-id name</b>—Enters the name of the power stack to which the switch belongs. If you do not enter the power stack-ID, the switch does not inherit the stack parameters. The name can be up to 31 characters.</li> <li>• <b>standalone</b>—Forces the switch to operate in standalone power mode. This mode shuts down both stack power ports.</li> </ul>				
<b>Examples</b>	<p>This example removes switch 2, which is connected to the power stack, from the power pool and shutting down both power ports:</p>				

```
Device(config)# stack-power switch 2
Device(config-switch-stackpower)# standalone
Device(config-switch-stackpower)# exit
```

# switchport block

To prevent unknown multicast or unicast packets from being forwarded, use the **switchport block** command in interface configuration mode. To allow forwarding unknown multicast or unicast packets, use the **no** form of this command.

```
switchport block {multicast | unicast}
no switchport block {multicast | unicast}
```

<b>Syntax Description</b>	<b>multicast</b> Specifies that unknown multicast traffic should be blocked. <b>Note</b> Only pure Layer 2 multicast traffic is blocked. Multicast packets that contain IPv4 or IPv6 information in the header are not blocked.				
<b>Command Default</b>	Unknown multicast and unicast traffic is not blocked.				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>By default, all traffic with unknown MAC addresses is sent to all ports. You can block unknown multicast or unicast traffic on protected or nonprotected ports. If unknown multicast or unicast traffic is not blocked on a protected port, there could be security issues.</p> <p>With multicast traffic, the port blocking feature blocks only pure Layer 2 packets. Multicast packets that contain IPv4 or IPv6 information in the header are not blocked.</p> <p>Blocking unknown multicast or unicast traffic is not automatically enabled on protected ports; you must explicitly configure it.</p> <p>For more information about blocking packets, see the software configuration guide for this release.</p> <p>This example shows how to block unknown unicast traffic on an interface:</p> <pre>Device(config-if)# switchport block unicast</pre> <p>You can verify your setting by entering the <b>show interfaces <i>interface-id</i> switchport</b> privileged EXEC command.</p>				

# system mtu

<b>Syntax Description</b>	<i>bytes</i>				
<b>Command Default</b>	The default MTU size for all ports is 1500 bytes.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** You can verify your setting by entering the **show system mtu** privileged EXEC command. The switch does not support the MTU on a per-interface basis. If you enter a value that is outside the allowed range for the specific type of interface, the value is not accepted.

**test mcu read-register**

# test mcu read-register

To enable debugging of the Power over Ethernet (PoE) controller, use the **test mcu read-register** command in privileged EXEC mode.

**test mcu read-register {det-cls-offset | manufacture-id | port-mode}**

## Syntax Description

<b>det-cls-offset</b>	Displays the read detection classification register summary.
<b>manufacture-id</b>	Displays the PoE controller manufacture ID.
<b>port-mode</b>	Displays the port mode details.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Examples

The following is sample output from the **test mcu read-register det-cls-offset 1** command:

```
Device# test mcu read-register det-cls-offset 1
DETECTION ENABLE BIT SUMMARY

Controller    port1      port2      port3      port4      register
               -----      -----      -----      -----      (hexadecimal)
-----      -----
1             1          0          1          0          5
2             1          0          1          0          5
3             1          0          1          0          5
4             1          0          1          0          5
5             1          0          1          0          5
6             1          0          1          0          5
7             1          0          1          0          5
8             1          0          1          0          5
9             1          0          1          0          5
10            1          0          1          0          5
11            0          0          1          0          4
12            1          0          0          0          1

CLASSIFICATION ENABLE BIT SUMMARY

Controller    port1      port2      port3      port4      register
               -----      -----      -----      -----      (hexadecimal)
-----      -----

```

1	1	0	1	0	5
2	1	0	1	0	5
3	1	0	1	0	5
4	1	0	1	0	5
5	1	0	1	0	5
6	1	0	1	0	5
7	1	0	1	0	5
8	1	0	1	0	5
9	1	0	1	0	5
10	1	0	1	0	5
11	0	0	1	0	4
12	1	0	0	0	1

The following is sample output from the **test mcu read-register manufacture-id** command:

```
MANUFACTURE ID : DEVICE_BCM_PALPATINE reg_val = 0x1B
```

The following is sample output from the **test mcu read-register port-mode** command:

#### PORt MODE SUMMARY

Controller	port1	port2	port3	port4	register (hexadecimal)
1	01	00	01	00	22
2	01	00	01	00	22
3	01	00	01	00	22
4	01	00	01	00	22
5	01	00	01	00	22
6	01	00	01	00	22
7	01	00	01	00	22
8	01	00	01	00	22
9	01	00	01	00	22
10	01	00	01	00	22
11	00	00	01	00	20
12	01	00	00	00	2

# voice-signaling vlan (network-policy configuration)

To create a network-policy profile for the voice-signaling application type, use the **voice-signaling vlan** command in network-policy configuration mode. To delete the policy, use the **no** form of this command.

```
voice-signaling vlan {vlan-id [{cos cos-value | dscp dscp-value}] | dot1p [{cos l2-priority | dscp dscp}] | none | untagged}
```

<b>Syntax Description</b>	<p><b>vlan-id</b> (Optional) The VLAN for voice traffic. The range is 1 to 4094.</p> <p><b>cos cos-value</b> (Optional) Specifies the Layer 2 priority class of service (CoS) for the configured VLAN. The range is 0 to 7; the default is 5.</p> <p><b>dscp dscp-value</b> (Optional) Specifies the differentiated services code point (DSCP) value for the configured VLAN. The range is 0 to 63; the default is 46.</p> <p><b>dot1p</b> (Optional) Configures the phone to use IEEE 802.1p priority tagging and to use VLAN 0 (the native VLAN).</p> <p><b>none</b> (Optional) Does not instruct the Cisco IP phone about the voice VLAN. The phone uses the configuration from the phone key pad.</p> <p><b>untagged</b> (Optional) Configures the phone to send untagged voice traffic. This is the default for the phone.</p>
---------------------------	---

**Command Default** No network-policy profiles for the voice-signaling application type are defined.

The default CoS value is 5.

The default DSCP value is 46.

The default tagging mode is untagged.

**Command Modes** Network-policy profile configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Use the **network-policy profile** global configuration command to create a profile and to enter network-policy profile configuration mode.

The voice-signaling application type is for network topologies that require a different policy for voice signaling than for voice media. This application type should not be advertised if all of the same network policies apply as those advertised in the voice policy TLV.

When you are in network-policy profile configuration mode, you can create the profile for voice-signaling by specifying the values for VLAN, class of service (CoS), differentiated services code point (DSCP), and tagging mode.

These profile attributes are contained in the Link Layer Discovery Protocol for Media Endpoint Devices (LLDP-MED) network-policy time-length-value (TLV).

To return to privileged EXEC mode from the network-policy profile configuration mode, enter the **exit** command.

This example shows how to configure voice-signaling for VLAN 200 with a priority 2 CoS:

```
Device(config)# network-policy profile 1
Device(config-network-policy)# voice-signaling vlan 200 cos 2
```

This example shows how to configure voice-signaling for VLAN 400 with a DSCP value of 45:

```
Device(config)# network-policy profile 1
Device(config-network-policy)# voice-signaling vlan 400 dscp 45
```

This example shows how to configure voice-signaling for the native VLAN with priority tagging:

```
Device(config-network-policy)# voice-signaling vlan dot1p cos 4
```

# voice vlan (network-policy configuration)

To create a network-policy profile for the voice application type, use the **voice vlan** command in network-policy configuration mode. To delete the policy, use the **no** form of this command.

```
voice vlan {vlan-id [{cos cos-value | dscp dscp-value}] | dot1p [{cos l2-priority | dscp dscp}] | none | untagged}
```

<b>Syntax Description</b>	<p><b>vlan-id</b> (Optional) The VLAN for voice traffic. The range is 1 to 4094.</p> <p><b>cos cos-value</b> (Optional) Specifies the Layer 2 priority class of service (CoS) for the configured VLAN. The range is 0 to 7; the default is 5.</p> <p><b>dscp dscp-value</b> (Optional) Specifies the differentiated services code point (DSCP) value for the configured VLAN. The range is 0 to 63; the default is 46.</p> <p><b>dot1p</b> (Optional) Configures the phone to use IEEE 802.1p priority tagging and to use VLAN 0 (the native VLAN).</p> <p><b>none</b> (Optional) Does not instruct the Cisco IP phone about the voice VLAN. The phone uses the configuration from the phone key pad.</p> <p><b>untagged</b> (Optional) Configures the phone to send untagged voice traffic. This is the default for the phone.</p>
---------------------------	---

**Command Default** No network-policy profiles for the voice application type are defined.

The default CoS value is 5.

The default DSCP value is 46.

The default tagging mode is untagged.

**Command Modes** Network-policy profile configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Use the **network-policy profile** global configuration command to create a profile and to enter network-policy profile configuration mode.

The voice application type is for dedicated IP telephones and similar devices that support interactive voice services. These devices are typically deployed on a separate VLAN for ease of deployment and enhanced security through isolation from data applications.

When you are in network-policy profile configuration mode, you can create the profile for voice by specifying the values for VLAN, class of service (CoS), differentiated services code point (DSCP), and tagging mode.

These profile attributes are contained in the Link Layer Discovery Protocol for Media Endpoint Devices (LLDP-MED) network-policy time-length-value (TLV).

To return to privileged EXEC mode from the network-policy profile configuration mode, enter the **exit** command.

This example shows how to configure the voice application type for VLAN 100 with a priority 4 CoS:

```
Device(config)# network-policy profile 1
Device(config-network-policy)# voice vlan 100 cos 4
```

This example shows how to configure the voice application type for VLAN 100 with a DSCP value of 34:

```
Device(config)# network-policy profile 1
Device(config-network-policy)# voice vlan 100 dscp 34
```

This example shows how to configure the voice application type for the native VLAN with priority tagging:

```
Device(config-network-policy)# voice vlan dot1p cos 4
```



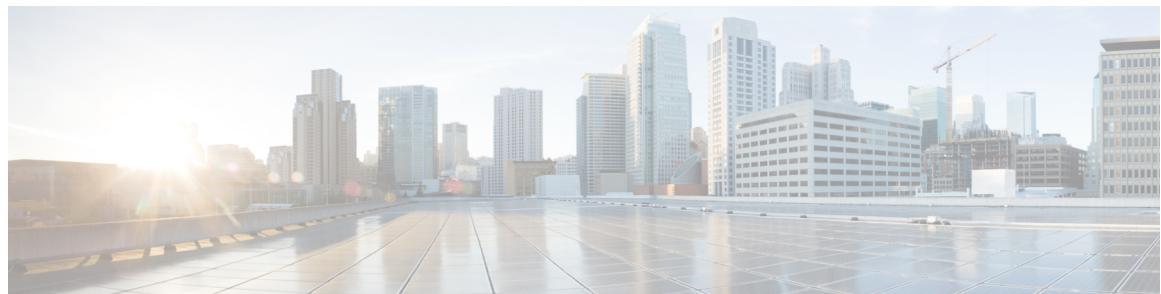


PART **III**

## **IP Addressing Services**

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## IP Commands

---

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# clear ip nhrp

To clear all dynamic entries from the Next Hop Resolution Protocol (NHRP) cache, use the **clear ip nhrp** command in user EXEC or privileged EXEC mode.

```
clear ip nhrp[{vrf {vrf-name | global}}] [{dest-ip-address [{dest-mask}] | tunnel number | counters [{interface tunnel number}]} | stats [{tunnel number [{vrf {vrf-name | global}}]}]]
```

Syntax Description	<b>vrf</b>	(Optional) Deletes entries from the NHRP cache for the specified virtual routing and forwarding (VRF) instance.
	<b>vrf-name</b>	(Optional) Name of the VRF address family to which the command is applied.
	<b>global</b>	(Optional) Specifies the global VRF instance.
	<b>dest-ip-address</b>	(Optional) Destination IP address. Specifying this argument clears NHRP mapping entries for the specified destination IP address.
	<b>dest-mask</b>	(Optional) Destination network mask.
	<b>counters</b>	(Optional) Clears the NHRP counters.
	<b>interface</b>	(Optional) Clears the NHRP mapping entries for all interfaces.
	<b>tunnel number</b>	(Optional) Removes the specified interface from the NHRP cache.
	<b>stats</b>	(Optional) Clears all IPv4 statistic information for all interfaces.

**Command Modes** User EXEC (>)

Privileged EXEC (#)

## Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** The **clear ip nhrp** command does not clear any static (configured) IP-to-NBMA address mappings from the NHRP cache.

## Examples

The following example shows how to clear all dynamic entries from the NHRP cache for an interface:

```
Switch# clear ip nhrp
```

## Related Commands

Command	Description
<b>show ip nhrp</b>	Displays NHRP mapping information.

**debug nhrp**

# debug nhrp

To enable Next Hop Resolution Protocol (NHRP) debugging, use the **debug nhrp** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

```
debug nhrp [{attribute | cache | condition {interface tunnel number | peer {nbma {ipv4-nbma-address nbma-name ipv6-nbma-address} } | unmatched | vrf vrf-name} | detail | error | extension | group | packet | rate}]
no debug nhrp [{attribute | cache | condition {interface tunnel number | peer {nbma {ipv4-nbma-address nbma-name ipv6-nbma-address} } | unmatched | vrf vrf-name} | detail | error | extension | group | packet | rate}]
```

Syntax Description	<b>attribute</b> (Optional) Enables NHRP attribute debugging operations.
	<b>cache</b> (Optional) Enables NHRP cache debugging operations.
	<b>condition</b> (Optional) Enables NHRP conditional debugging operations.
	<b>interface tunnel number</b> (Optional) Enables debugging operations for the tunnel interface.
	<b>nbma</b> (Optional) Enables debugging operations for the non-broadcast multiple access (NBMA) network.
	<i>ipv4-nbma-address</i> (Optional) Enables debugging operations based on the IPv4 address of the NBMA network.
	<i>nbma-name</i> (Optional) NBMA network name.
	<i>IPv6-address</i> (Optional) Enables debugging operations based on the IPv6 address of the NBMA network. <b>Note</b> The <i>IPv6-address</i> argument is not supported in Cisco IOS XE Denali 16.3.1.
	<b>vrf vrf-name</b> (Optional) Enables debugging operations for the virtual routing and forwarding instance.
	<b>detail</b> (Optional) Displays detailed logs of NHRP debugs.
	<b>error</b> (Optional) Enables NHRP error debugging operations.
	<b>extension</b> (Optional) Enables NHRP extension processing debugging operations.
	<b>group</b> (Optional) Enables NHRP group debugging operations.
	<b>packet</b> (Optional) Enables NHRP activity debugging.
	<b>rate</b> (Optional) Enables NHRP rate limiting.
	<b>routing</b> (Optional) Enables NHRP routing debugging operations.

## Command Default

NHRP debugging is not enabled.

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines**

**Note** In Cisco IOS XE Denali 16.3.1, this command supports only IPv4; the *IPv6-nbma-address* argument although available on the switch, will not work if configured.

Use the **debug nhrp detail** command to view the NHRP attribute logs.

The **Virtual-Access number** keyword-argument pair is visible only if the virtual access interface is available on the device.

**Examples**

The following sample output from the **debug nhrp** command displays NHRP debugging output for IPv4:

```
Switch# debug nhrp
Aug  9 13:13:41.486: NHRP: Attempting to send packet via DEST 10.1.1.99
Aug  9 13:13:41.486: NHRP: Encapsulation succeeded. Tunnel IP addr 10.11.11.99
Aug  9 13:13:41.486: NHRP: Send Registration Request via Tunnel0 vrf 0, packet size: 105
Aug  9 13:13:41.486:           src: 10.1.1.11, dst: 10.1.1.99
Aug  9 13:13:41.486: NHRP: 105 bytes out Tunnel0
Aug  9 13:13:41.486: NHRP: Receive Registration Reply via Tunnel0 vrf 0, packet size: 125
Aug  9 13:13:41.486: NHRP: netid_in = 0, to_us = 1
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show ip nhrp</b>	Displays NHRP mapping information.

**fhrp delay**

# fhrp delay

To specify the delay period for the initialization of First Hop Redundancy Protocol (FHRP) clients, use the **fhrp delay** command in interface configuration mode. To remove the delay period specified, use the **no** form of this command.

```
fhrp delay { [minimum] [reload] seconds}
no fhrp delay { [minimum] [reload] seconds}
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>minimum</b></td><td>(Optional) Configures the delay period after an interface becomes available.</td></tr> <tr> <td><b>reload</b></td><td>(Optional) Configures the delay period after the device reloads.</td></tr> <tr> <td><i>seconds</i></td><td>Delay period in seconds. The range is from 0 to 3600.</td></tr> </table>	<b>minimum</b>	(Optional) Configures the delay period after an interface becomes available.	<b>reload</b>	(Optional) Configures the delay period after the device reloads.	<i>seconds</i>	Delay period in seconds. The range is from 0 to 3600.
<b>minimum</b>	(Optional) Configures the delay period after an interface becomes available.						
<b>reload</b>	(Optional) Configures the delay period after the device reloads.						
<i>seconds</i>	Delay period in seconds. The range is from 0 to 3600.						

**Command Default** None

**Command Modes** Interface configuration (config-if)

**Examples** This example shows how to specify the delay period for the initialization of FHRP clients:

```
Device(config-if)# fhrp delay minimum 90
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>show fhrp</b>	Displays First Hop Redundancy Protocol (FHRP) information.

## fhrp version vrrp v3

To enable Virtual Router Redundancy Protocol version 3 (VRRPv3) and Virtual Router Redundancy Service (VRSS) configuration on a device, use the **fhrp version vrrp v3** command in global configuration mode. To disable the ability to configure VRRPv3 and VRSS on a device, use the **no** form of this command.

```
fhrp version vrrp v3
no fhrp version vrrp v3
```

**Syntax Description** This command has no keywords or arguments.

**Command Default** VRRPv3 and VRSS configuration on a device is not enabled.

**Command Modes** Global configuration (config)

**Usage Guidelines** When VRRPv3 is in use, VRRP version 2 (VRRPv2) is unavailable.

**Examples** In the following example, a tracking process is configured to track the state of an IPv6 object using a VRRPv3 group. VRRP on GigabitEthernet interface 0/0/0 then registers with the tracking process to be informed of any changes to the IPv6 object on the VRRPv3 group. If the IPv6 object state on serial interface VRRPv3 goes down, then the priority of the VRRP group is reduced by 20:

```
Device(config)# fhrp version vrrp v3
Device(config)# interface GigabitEthernet 0/0/0
Device(config-if)# vrrp 1 address-family ipv6
Device(config-if-vrrp)# track 1 decrement 20
```

Related Commands	Command	Description
	<b>track (VRRP)</b>	Enables an object to be tracked using a VRRPv3 group.

# glbp authentication

To configure an authentication string for the Gateway Load Balancing Protocol (GLBP), use the **glbp authentication** command in interface configuration mode. To disable authentication, use the **no** form of this command.

```
glbp group-number authentication {text string | md5 {key-string [{0 | 7}] key | key-chain name-of-chain}}
no glbp group-number authentication {text string | md5 {key-string [{0 | 7}] key | key-chain name-of-chain}}
```

<b>Syntax Description</b>	
<b>group-number</b>	GLBP group number in the range from 0 to 1023.
<b>text string</b>	Specifies an authentication string. The number of characters in the command plus the text string must not exceed 255 characters.
<b>md5</b>	Message Digest 5 (MD5) authentication.
<b>key-string key</b>	Specifies the secret key for MD5 authentication. The key string cannot exceed 100 characters in length. We recommend using at least 16 characters.
<b>0</b>	(Optional) Unencrypted key. If no prefix is specified, the key is unencrypted.
<b>7</b>	(Optional) Encrypted key.
<b>key-chain name-of-chain</b>	Identifies a group of authentication keys.

**Command Default** No authentication of GLBP messages occurs.

**Command Modes** Interface configuration (config-if)

**Usage Guidelines** The same authentication method must be configured on all the devices that are configured to be members of the same GLBP group, to ensure interoperation. A device will ignore all GLBP messages that contain the wrong authentication information.

If password encryption is configured with the **service password-encryption** command, the software saves the key string in the configuration as encrypted text.

**Examples** The following example configures stringxyz as the authentication string required to allow GLBP devices in group 10 to interoperate:

```
Device(config)# interface GigabitEthernet 1/0/1
Device(config-if)# glbp 10 authentication text stringxyz
```

In the following example, GLBP queries the key chain “AuthenticateGLBP” to obtain the current live key and key ID for the specified key chain:

```
Device(config)# key chain AuthenticateGLBP
Device(config-keychain)# key 1
Device(config-keychain-key)# key-string ThisIsASecretKey
Device(config-keychain-key)# exit
```

```
Device(config-keychain)# exit
Device(config)# interface GigabitEthernet 1/0/1
Device(config-if)# ip address 10.0.0.1 255.255.255.0
Device(config-if)# glbp 2 authentication md5 key-chain AuthenticateGLBP
```

**Related Commands**

Command	Description
<b>glbp ip</b>	Enables GLBP.

**glbp forwarder preempt**

# glbp forwarder preempt

To configure a device to take over as active virtual forwarder (AVF) for a Gateway Load Balancing Protocol (GLBP) group if the current AVF falls below its low weighting threshold, use the **glbp forwarder preempt** command in interface configuration mode. To disable this function, use the **no** form of this command.

```
glbp group forwarder preempt [delay minimum seconds]
no glbp group forwarder preempt [delay minimum]
```

<b>Syntax Description</b>	<i>group</i>	GLBP group number in the range from 0 to 1023.
	<b>delay minimum</b> <i>seconds</i>	(Optional) Specifies a minimum number of seconds that the device will delay before taking over the role of AVF. The range is from 0 to 3600 seconds with a default delay of 30 seconds.

**Command Default** Forwarder preemption is enabled with a default delay of 30 seconds.

**Command Modes** Interface configuration (config-if)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Release 16.2.1	This command was introduced..

## Examples

The following example shows a device being configured to preempt the current AVF when the current AVF falls below its low weighting threshold. If the device preempts the current AVF, it waits 60 seconds before taking over the role of the AVF.

```
Device(config-if)# glbp 10 forwarder preempt delay minimum 60
```

## Related Commands

<b>Command</b>	<b>Description</b>
<b>glbp ip</b>	Enables GLBP.

# glbp ip

To activate the Gateway Load Balancing Protocol (GLBP), use the **glbp ip** command in interface configuration mode. To disable GLBP, use the **no** form of this command.

```
glbp group ip [ip-address [secondary]]
no glbp group ip [ip-address [secondary]]
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><i>group</i></td><td>GLBP group number in the range from 0 to 1023.</td></tr> <tr> <td><i>ip-address</i></td><td>(Optional) Virtual IP address for the GLBP group. The IP address must be in the same subnet as the interface IP address.</td></tr> <tr> <td><b>secondary</b></td><td>(Optional) Indicates that the IP address is a secondary GLBP virtual address.</td></tr> </table>	<i>group</i>	GLBP group number in the range from 0 to 1023.	<i>ip-address</i>	(Optional) Virtual IP address for the GLBP group. The IP address must be in the same subnet as the interface IP address.	<b>secondary</b>	(Optional) Indicates that the IP address is a secondary GLBP virtual address.
<i>group</i>	GLBP group number in the range from 0 to 1023.						
<i>ip-address</i>	(Optional) Virtual IP address for the GLBP group. The IP address must be in the same subnet as the interface IP address.						
<b>secondary</b>	(Optional) Indicates that the IP address is a secondary GLBP virtual address.						

**Command Default** GLBP is disabled by default.

**Command Modes** Interface configuration (config-if)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Release 16.2.1	This command was introduced.

**Usage Guidelines** The **glbp ip** command activates GLBP on the configured interface. If an IP address is specified, that address is used as the designated virtual IP address for the GLBP group. If no IP address is specified, the designated address is learned from another device configured to be in the same GLBP group. For GLBP to elect an active virtual gateway (AVG), at least one device on the cable must have been configured with the designated address. A device must be configured with, or have learned, the virtual IP address of the GLBP group before assuming the role of a GLBP gateway or forwarder. Configuring the designated address on the AVG always overrides a designated address that is in use.

When the **glbp ip** command is enabled on an interface, the handling of proxy Address Resolution Protocol (ARP) requests is changed (unless proxy ARP was disabled). ARP requests are sent by hosts to map an IP address to a MAC address. The GLBP gateway intercepts the ARP requests and replies to the ARP on behalf of the connected nodes. If a forwarder in the GLBP group is active, proxy ARP requests are answered using the MAC address of the first active forwarder in the group. If no forwarder is active, proxy ARP responses are suppressed.

## Examples

The following example activates GLBP for group 10 on GigabitEthernet interface 1/0/1. The virtual IP address to be used by the GLBP group is set to 10.21.8.10.

```
Device(config)# interface GigabitEthernet 1/0/1
Device(config-if)# ip address 10.21.8.32 255.255.255.0
Device(config-if)# glbp 10 ip 10.21.8.10
```

**glbp ip****Related Commands**

Command	Description
<b>show glbp</b>	Displays GLBP information.

# glbp load-balancing

To specify the load-balancing method used by the active virtual gateway (AVG) of the Gateway Load Balancing Protocol (GLBP), use the **glbp load-balancing** command in interface configuration mode. To disable load balancing, use the **no** form of this command.

```
glbp group load-balancing [{host-dependent | round-robin | weighted}]
no glbp group load-balancing
```

Syntax Description	<i>group</i> GLBP group number in the range from 0 to 1023.
<b>host-dependent</b>	(Optional) Specifies a load balancing method based on the MAC address of a host where the same forwarder is always used for a particular host while the number of GLBP group members remains unchanged.
<b>round-robin</b>	(Optional) Specifies a load balancing method where each virtual forwarder in turn is included in address resolution replies for the virtual IP address. This method is the default.
<b>weighted</b>	(Optional) Specifies a load balancing method that is dependent on the weighting value advertised by the gateway.

**Command Default** The round-robin method is the default.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
Cisco IOS XE Release 16.2.1		This command was introduced..

**Usage Guidelines** Use the host-dependent method of GLBP load balancing when you need each host to always use the same device. Use the weighted method of GLBP load balancing when you need unequal load balancing because devices in the GLBP group have different forwarding capacities.

**Examples** The following example shows the host-dependent load-balancing method being configured for the AVG of the GLBP group 10:

```
Device(config)# interface GigabitEthernet 1/0/1
Device(config-if)# glbp 10 ip 10.21.8.10
Device(config-if)# glbp 10 load-balancing host-dependent
```

Related Commands	Command	Description
	<b>show glbp</b>	Displays GLBP information.

**glbp name**

# glbp name

To enable IP redundancy by assigning a name to the Gateway Load Balancing Protocol (GLBP) group, use the **glbp name** command in interface configuration mode. To disable IP redundancy for a group, use the **no** form of this command.

```
glbp group-number name group-name
no glbp group-number name group-name
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><i>group-number</i></td><td>GLBP group number. Range is from 0 to 1023.</td></tr> <tr> <td><i>group-name</i></td><td>GLBP group name specified as a character string. Maximum number of characters is 255.</td></tr> </table>	<i>group-number</i>	GLBP group number. Range is from 0 to 1023.	<i>group-name</i>	GLBP group name specified as a character string. Maximum number of characters is 255.
<i>group-number</i>	GLBP group number. Range is from 0 to 1023.				
<i>group-name</i>	GLBP group name specified as a character string. Maximum number of characters is 255.				

<b>Command Default</b>	IP redundancy for a group is disabled.
------------------------	--

<b>Command Modes</b>	Interface configuration (config-if)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Release 2.1	This command was introduced..

<b>Usage Guidelines</b>	The GLBP redundancy client must be configured with the same GLBP group name so that the redundancy client and the GLBP group can be connected.
-------------------------	--

<b>Examples</b>	The following example assigns the abccomp name to GLBP group 10:
-----------------	--

```
Device(config-if)# glbp 10 name abccomp
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>glbp authentication</b>	Configures an authentication string for the GLBP.
	<b>glbp forwarder preempt</b>	Configures a device to take over as AVF for a GLBP group if it has higher priority than the current AVF.
	<b>glbp ip</b>	Activates GLBP.
	<b>glbp load-balancing</b>	Specifies the load-balancing method used by the AVG of GLBP.
	<b>glbp preempt</b>	Configures the gateway to take over as AVG for a GLBP group if it has higher priority than the current AVG.
	<b>glbp priority</b>	Sets the priority level of the gateway within a GLBP group.
	<b>glbp timers</b>	Configures the time between hello packets sent by the GLBP gateway and the time for which the virtual gateway and virtual forwarder information is considered valid.

Command	Description
<b>glbp timers redirect</b>	Configures the time during which the AVG for a GLBP group continues to redirect clients to a secondary AVF.
<b>glbp weighting</b>	Specifies the initial weighting value of the GLBP gateway.
<b>glbp weighting track</b>	Specifies a tracking object where the GLBP weighting changes based on the availability of the object being tracked.
<b>show glbp</b>	Displays GLBP information.
<b>track</b>	Configures an interface to be tracked where the GLBP weighting changes based on the state of the interface.

# glbp preempt

To configure the gateway to take over as active virtual gateway (AVG) for a Gateway Load Balancing Protocol (GLBP) group if it has higher priority than the current AVG, use the **glbp preempt** command in interface configuration mode. To disable this function, use the **no** form of this command.

```
glbp group preempt [delay minimum seconds]
no glbp group preempt [delay minimum]
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>group</b></td><td>GLBP group number in the range from 0 to 1023.</td></tr> <tr> <td><b>delay minimum seconds</b></td><td>(Optional) Specifies a minimum number of seconds that the device will delay before taking over the role of AVG. The range is from 0 to 3600 seconds with a default delay of 30 seconds.</td></tr> </table>	<b>group</b>	GLBP group number in the range from 0 to 1023.	<b>delay minimum seconds</b>	(Optional) Specifies a minimum number of seconds that the device will delay before taking over the role of AVG. The range is from 0 to 3600 seconds with a default delay of 30 seconds.
<b>group</b>	GLBP group number in the range from 0 to 1023.				
<b>delay minimum seconds</b>	(Optional) Specifies a minimum number of seconds that the device will delay before taking over the role of AVG. The range is from 0 to 3600 seconds with a default delay of 30 seconds.				

**Command Default** A GLBP device with a higher priority than the current AVG cannot assume the role of AVG. The default delay value is 30 seconds.

**Command Modes** Interface configuration (config-if)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Release 2.1	This command was introduced..

**Examples** The following example shows a device being configured to preempt the current AVG when its priority of 254 is higher than that of the current AVG. If the device preempts the current AVG, it waits 60 seconds before assuming the role of AVG.

```
Device(config-if)# glbp 10 preempt delay minimum 60
Device(config-if)# glbp 10 priority 254
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>glbp ip</b>	Enables GLBP.
	<b>glbp priority</b>	Sets the priority level of the device within a GLBP group.

# glbp priority

To set the priority level of the gateway within a Gateway Load Balancing Protocol (GLBP) group, use the **glbp priority** command in interface configuration mode. To remove the priority level of the gateway, use the **no** form of this command.

**glbp group priority level**  
**no glbp group priority level**

<b>Syntax Description</b>	<table border="1"> <tr> <td><i>group</i></td><td>GLBP group number in the range from 0 to 1023.</td></tr> <tr> <td><i>level</i></td><td>Priority of the gateway within the GLBP group. The range is from 1 to 255. The default is 100.</td></tr> </table>	<i>group</i>	GLBP group number in the range from 0 to 1023.	<i>level</i>	Priority of the gateway within the GLBP group. The range is from 1 to 255. The default is 100.
<i>group</i>	GLBP group number in the range from 0 to 1023.				
<i>level</i>	Priority of the gateway within the GLBP group. The range is from 1 to 255. The default is 100.				

**Command Default** The GLBP virtual gateway preemptive scheme is disabled

**Command Modes** Interface configuration (config-if)

**Usage Guidelines** Use this command to control which virtual gateway becomes the active virtual gateway (AVG). After the priorities of several different virtual gateways are compared, the gateway with the numerically higher priority is elected as the AVG. If two virtual gateways have equal priority, the gateway with the higher IP address is selected.

**Examples** The following example shows a virtual gateway being configured with a priority of 254:

```
Device(config-if)# glbp 10 priority 254
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>glbp ip</b>	Enables GLBP.
	<b>glbp preempt</b>	Configures a device to take over as the AVG for a GLBP group if it has higher priority than the current AVG.

# glbp timers

To configure the time between hello packets sent by the Gateway Load Balancing Protocol (GLBP) gateway and the time that the virtual gateway and virtual forwarder information is considered valid, use the **glbp timers** command in interface configuration mode. To restore the timers to their default values, use the **no** form of this command.

```
glbp group timers {helotime{holdtime | msec holdtime} | msec { holdtime | msec holdtime} | redirect time-interval-to-redirect | timeout}
no glbp group timers {helotime{holdtime | msec holdtime} | msec { holdtime | msec holdtime} | redirect time-interval-to-redirect | timeout}
```

Syntax Description	<table border="1"> <tr> <td><b>group</b></td><td>GLBP group number in the range from 0 to 1023.</td></tr> <tr> <td><b>msec</b></td><td>(Optional) Specifies that the following (<i>helotime</i> or <i>holdtime</i>) argument value will be expressed in milliseconds rather than seconds.</td></tr> <tr> <td><i>helotime</i></td><td>Hello interval. The default is 3 seconds (3000 milliseconds).</td></tr> <tr> <td><i>holdtime</i></td><td>Time before the virtual gateway and virtual forwarder information contained in the hello packet is considered invalid. The default is 10 seconds (10,000 milliseconds).</td></tr> <tr> <td><b>redirect</b></td><td>Specifies time interval during which the active virtual gateway (AVG) for a Gateway Load Balancing Protocol (GLBP) group continues to redirect clients to a secondary active virtual forwarder (AVF) and time-out values for failed forwarders.</td></tr> <tr> <td><i>time-interval-to-redirect</i></td><td>The redirect timer interval in the range from 0 to 3600 seconds. The default is 600 seconds (10 minutes).              <b>Note</b> The zero value for the <i>time-interval-to-redirect</i> argument cannot be removed from the range of acceptable values because preexisting configurations of Cisco IOS software already using the zero value could be negatively affected during an upgrade. However, be advised that a zero setting is not recommended and <i>time-interval-to-redirect</i>, if used, results in a redirect timer that never expires. If the redirect timer does not expire, then when a device fails, new hosts continue to be assigned to the failed device instead of being redirected to the backup.         </td></tr> <tr> <td><i>timeout</i></td><td>The time interval, in the range from 600 to 64,800 seconds, before the secondary virtual forwarder becomes unavailable. The default is 14,400 seconds (4 hours).</td></tr> </table>	<b>group</b>	GLBP group number in the range from 0 to 1023.	<b>msec</b>	(Optional) Specifies that the following ( <i>helotime</i> or <i>holdtime</i> ) argument value will be expressed in milliseconds rather than seconds.	<i>helotime</i>	Hello interval. The default is 3 seconds (3000 milliseconds).	<i>holdtime</i>	Time before the virtual gateway and virtual forwarder information contained in the hello packet is considered invalid. The default is 10 seconds (10,000 milliseconds).	<b>redirect</b>	Specifies time interval during which the active virtual gateway (AVG) for a Gateway Load Balancing Protocol (GLBP) group continues to redirect clients to a secondary active virtual forwarder (AVF) and time-out values for failed forwarders.	<i>time-interval-to-redirect</i>	The redirect timer interval in the range from 0 to 3600 seconds. The default is 600 seconds (10 minutes).  <b>Note</b> The zero value for the <i>time-interval-to-redirect</i> argument cannot be removed from the range of acceptable values because preexisting configurations of Cisco IOS software already using the zero value could be negatively affected during an upgrade. However, be advised that a zero setting is not recommended and <i>time-interval-to-redirect</i> , if used, results in a redirect timer that never expires. If the redirect timer does not expire, then when a device fails, new hosts continue to be assigned to the failed device instead of being redirected to the backup.	<i>timeout</i>	The time interval, in the range from 600 to 64,800 seconds, before the secondary virtual forwarder becomes unavailable. The default is 14,400 seconds (4 hours).
<b>group</b>	GLBP group number in the range from 0 to 1023.														
<b>msec</b>	(Optional) Specifies that the following ( <i>helotime</i> or <i>holdtime</i> ) argument value will be expressed in milliseconds rather than seconds.														
<i>helotime</i>	Hello interval. The default is 3 seconds (3000 milliseconds).														
<i>holdtime</i>	Time before the virtual gateway and virtual forwarder information contained in the hello packet is considered invalid. The default is 10 seconds (10,000 milliseconds).														
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<i>time-interval-to-redirect</i>	The redirect timer interval in the range from 0 to 3600 seconds. The default is 600 seconds (10 minutes).  <b>Note</b> The zero value for the <i>time-interval-to-redirect</i> argument cannot be removed from the range of acceptable values because preexisting configurations of Cisco IOS software already using the zero value could be negatively affected during an upgrade. However, be advised that a zero setting is not recommended and <i>time-interval-to-redirect</i> , if used, results in a redirect timer that never expires. If the redirect timer does not expire, then when a device fails, new hosts continue to be assigned to the failed device instead of being redirected to the backup.														
<i>timeout</i>	The time interval, in the range from 600 to 64,800 seconds, before the secondary virtual forwarder becomes unavailable. The default is 14,400 seconds (4 hours).														

**Command Default** GLBP timers are set to their default values.

**Command Modes** Interface configuration (config-if)

**Command History**

Release	Modification
Cisco IOS XE Release 2.1	This command was introduced.

**Usage Guidelines**

Devices on which timer values are not configured can learn timer values from the active virtual gateway (AVG). The timers configured on the AVG always override any other timer settings. All devices in a GLBP group should use the same timer values. If a GLBP gateway sends a hello message, the information should be considered valid for one holdtime. Normally, holdtime is greater than three times the value of hello time, ( $holdtime > 3 * hello time$ ). The range of values for holdtime force the holdtime to be greater than the hello time.

**Examples**

The following example shows the GLBP group 10 on GigabitEthernet interface 1/0/1 timers being configured for an interval of 5 seconds between hello packets, and the time after which virtual gateway and virtual forwarder information is considered to be invalid to 18 seconds:

```
Device(config)# interface GigabitEthernet 1/0/1
Device(config-if)# glbp 10 ip
Device(config-if)# glbp 10 timers 5 18
```

**Related Commands**

Command	Description
<b>glbp ip</b>	Activates GLBP.
<b>show glbp</b>	Displays GLBP information.

# glbp weighting

To specify the initial weighting value of the Gateway Load Balancing Protocol (GLBP) gateway, use the **glbp weighting** command in interface configuration mode. To restore the default values, use the **no**form of this command.

```
glbp group weighting maximum [lower lower] [upper upper]
no glbp group weighting
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>group</b></td><td>GLBP group number in the range from 0 to 1023.</td></tr> <tr> <td><b>maximum</b></td><td>Maximum weighting value in the range from 1 to 254. Default value is 100.</td></tr> <tr> <td><b>lower lower</b></td><td>(Optional) Specifies a lower weighting value in the range from 1 to the specified maximum weighting value. Default value is 1.</td></tr> <tr> <td><b>upper upper</b></td><td>(Optional) Specifies an upper weighting value in the range from the lower weighting to the maximum weighting value. The default value is the specified maximum weighting value.</td></tr> </table>	<b>group</b>	GLBP group number in the range from 0 to 1023.	<b>maximum</b>	Maximum weighting value in the range from 1 to 254. Default value is 100.	<b>lower lower</b>	(Optional) Specifies a lower weighting value in the range from 1 to the specified maximum weighting value. Default value is 1.	<b>upper upper</b>	(Optional) Specifies an upper weighting value in the range from the lower weighting to the maximum weighting value. The default value is the specified maximum weighting value.
<b>group</b>	GLBP group number in the range from 0 to 1023.								
<b>maximum</b>	Maximum weighting value in the range from 1 to 254. Default value is 100.								
<b>lower lower</b>	(Optional) Specifies a lower weighting value in the range from 1 to the specified maximum weighting value. Default value is 1.								
<b>upper upper</b>	(Optional) Specifies an upper weighting value in the range from the lower weighting to the maximum weighting value. The default value is the specified maximum weighting value.								

**Command Default** The default gateway weighting value is 100 and the default lower weighting value is 1.

**Command Modes** Interface configuration (config-if)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Release 2.1	This command was introduced..

**Usage Guidelines** The weighting value of a virtual gateway is a measure of the forwarding capacity of the gateway. If a tracked interface on the device fails, the weighting value of the device may fall from the maximum value to below the lower threshold, causing the device to give up its role as a virtual forwarder. When the weighting value of the device rises above the upper threshold, the device can resume its active virtual forwarder role.

Use the **glbp weighting track** and **track** commands to configure parameters for an interface to be tracked. If an interface on a device goes down, the weighting for the device can be reduced by a specified value.

**Examples** The following example shows the weighting of the gateway for GLBP group 10 being set to a maximum of 110 with a lower weighting limit of 95 and an upper weighting limit of 105:

```
Device(config)# interface GigabitEthernet 1/0/1
Device(config-if)# ip address 10.21.8.32 255.255.255.0
Device(config-if)# glbp 10 weighting 110 lower 95 upper 105
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>glbp weighting track</b>	Specifies an object to be tracked that affects the weighting of a GLBP gateway.
	<b>track</b>	Configures an interface to be tracked.

# glbp weighting track

To specify a tracking object where the Gateway Load Balancing Protocol (GLBP) weighting changes based on the availability of the object being tracked, use the **glbp weighting track** command in interface configuration mode. To remove the tracking, use the **no** form of this command.

```
glbp group weighting track object-number [decrement value]
no glbp group weighting track object-number [decrement value]
```

Syntax Description	<i>group</i>	GLBP group number in the range from 0 to 1023.
	<i>object-number</i>	Object number representing an item to be tracked. The valid range is 1 to 1000. Use the <b>track</b> command to configure the tracked object.
	<b>decrement value</b>	(Optional) Specifies an amount by which the GLBP weighting for the device is decremented (or incremented) when the interface goes down (or comes back up). The value range is from 1 to 254, with a default value of 10.

**Command Default** Objects are not tracked for GLBP weighting changes.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	Cisco IOS XE Release 2.1	This command was introduced..

**Usage Guidelines** This command ties the weighting of the GLBP gateway to the availability of its interfaces. It is useful for tracking interfaces that are not configured for GLBP.

When a tracked interface goes down, the GLBP gateway weighting decreases by 10. If an interface is not tracked, its state changes do not affect the GLBP gateway weighting. For each GLBP group, you can configure a separate list of interfaces to be tracked.

The optional *value* argument specifies by how much to decrement the GLBP gateway weighting when a tracked interface goes down. When the tracked interface comes back up, the weighting is incremented by the same amount.

When multiple tracked interfaces are down, the configured weighting decrements are cumulative.

Use the **track** command to configure each interface to be tracked.

A maximum of 1000 objects can be tracked. Although 1000 tracked objects can be configured, each tracked object uses CPU resources. The amount of available CPU resources on a device is dependent upon variables such as traffic load and how other protocols are configured and run. The ability to use 1000 tracked objects is dependent upon the available CPU. Testing should be conducted on site to ensure that the service works under the specific site traffic conditions.

## Examples

In the following example, GigabitEthernet interface 1/0/1 tracks two interfaces represented by the numbers 1 and 2. If interface 1 goes down, the GLBP gateway weighting decreases by the default value of 10. If interface 2 goes down, the GLBP gateway weighting decreases by 5.

**glbp weighting track**

```
Device(config)# interface GigabitEthernet 1/0/1
Device(config-if)# ip address 10.21.8.32 255.255.255.0
Device(config-if)# glbp 10 weighting track 1
Device(config-if)# glbp 10 weighting track 2 decrement 5
```

**Related Commands**

Command	Description
<b>glbp weighting</b>	Specifies the initial weighting value of a GLBP gateway.
<b>track</b>	Configures an interface to be tracked.

# ip address dhcp

To acquire an IP address on an interface from the DHCP, use the **ip address dhcp** command in interface configuration mode. To remove any address that was acquired, use the **no** form of this command.

```
ip address dhcp [client-id interface-type number] [hostname hostname]
no ip address dhcp [client-id interface-type number] [hostname hostname]
```

Syntax Description	
<b>client-id</b>	(Optional) Specifies the client identifier. By default, the client identifier is an ASCII value. The <b>client-id interface-type number</b> option sets the client identifier to the hexadecimal MAC address of the named interface.
<b>interface-type</b>	(Optional) Interface type. For more information, use the question mark (?) online help function.
<b>number</b>	(Optional) Interface or subinterface number. For more information about the numbering syntax for your networking device, use the question mark (?) online help function.
<b>hostname</b>	(Optional) Specifies the hostname.
<b>hostname</b>	(Optional) Name of the host to be placed in the DHCP option 12 field. This name need not be the same as the hostname entered in global configuration mode.

**Command Default** The hostname is the globally configured hostname of the device. The client identifier is an ASCII value.

**Command Modes** Interface configuration (config-if)

**Usage Guidelines** The **ip address dhcp** command allows any interface to dynamically learn its IP address by using the DHCP protocol. It is especially useful on Ethernet interfaces that dynamically connect to an Internet service provider (ISP). Once assigned a dynamic address, the interface can be used with the Port Address Translation (PAT) of Cisco IOS Network Address Translation (NAT) to provide Internet access to a privately addressed network attached to the device.

The **ip address dhcp** command also works with ATM point-to-point interfaces and will accept any encapsulation type. However, for ATM multipoint interfaces you must specify Inverse ARP via the **protocol ip inarp** interface configuration command and use only the **aa15snap** encapsulation type.

Some ISPs require that the DHCPDISCOVER message have a specific hostname and client identifier that is the MAC address of the interface. The most typical usage of the **ip address dhcp client-id interface-type number hostname hostname** command is when **interface-type** is the Ethernet interface where the command is configured and **interface-type number** is the hostname provided by the ISP.

A client identifier (DHCP option 61) can be a hexadecimal or an ASCII value. By default, the client identifier is an ASCII value. The **client-id interface-type number** option overrides the default and forces the use of the hexadecimal MAC address of the named interface.

If a Cisco device is configured to obtain its IP address from a DHCP server, it sends a DHCPDISCOVER message to provide information about itself to the DHCP server on the network.

If you use the **ip address dhcp** command with or without any of the optional keywords, the DHCP option 12 field (hostname option) is included in the DISCOVER message. By default, the hostname specified in option 12 will be the globally configured hostname of the device. However, you can use the **ip address dhcp hostname**

```
ip address dhcp
```

*hostname* command to place a different name in the DHCP option 12 field than the globally configured hostname of the device.

The **no ip address dhcp** command removes any IP address that was acquired, thus sending a DHCPRELEASE message.

You might need to experiment with different configurations to determine the one required by your DHCP server. The table below shows the possible configuration methods and the information placed in the DISCOVER message for each method.

**Table 18: Configuration Method and Resulting Contents of the DISCOVER Message**

Configuration Method	Contents of DISCOVER Messages
<b>ip address dhcp</b>	The DISCOVER message contains “cisco- mac-address -Eth1” in the client ID field. The <i>mac-address</i> is the MAC address of the Ethernet 1 interface and contains the default hostname of the device in the option 12 field.
<b>ip address dhcp hostname hostname</b>	The DISCOVER message contains “cisco- mac-address -Eth1” in the client ID field. The <i>mac-address</i> is the MAC address of the Ethernet 1 interface, and contains <i>hostname</i> in the option 12 field.
<b>ip address dhcp client-id ethernet 1</b>	The DISCOVER message contains the MAC address of the Ethernet 1 interface in the client ID field and contains the default hostname of the device in the option 12 field.
<b>ip address dhcp client-id ethernet 1 hostname hostname</b>	The DISCOVER message contains the MAC address of the Ethernet 1 interface in the client ID field and contains <i>hostname</i> in the option 12 field.

## Examples

In the examples that follow, the command **ip address dhcp** is entered for Ethernet interface 1. The DISCOVER message sent by a device configured as shown in the following example would contain “cisco- mac-address -Eth1” in the client-ID field, and the value abc in the option 12 field.

```
hostname abc
!
interface GigabitEthernet 1/0/1
  ip address dhcp
```

The DISCOVER message sent by a device configured as shown in the following example would contain “cisco- mac-address -Eth1” in the client-ID field, and the value def in the option 12 field.

```
hostname abc
!
interface GigabitEthernet 1/0/1
  ip address dhcp hostname def
```

The DISCOVER message sent by a device configured as shown in the following example would contain the MAC address of Ethernet interface 1 in the client-id field, and the value abc in the option 12 field.

```
hostname abc
!
```

```
interface Ethernet 1
  ip address dhcp client-id GigabitEthernet 1/0/1
```

The DISCOVER message sent by a device configured as shown in the following example would contain the MAC address of Ethernet interface 1 in the client-id field, and the value def in the option 12 field.

```
hostname abc
!
interface Ethernet 1
  ip address dhcp client-id GigabitEthernet 1/0/1 hostname def
```

**Related Commands**

Command	Description
<b>ip dhcp pool</b>	Configures a DHCP address pool on a Cisco IOS DHCP server and enters DHCP pool configuration mode.

# ip address pool (DHCP)

To enable the IP address of an interface to be automatically configured when a Dynamic Host Configuration Protocol (DHCP) pool is populated with a subnet from IP Control Protocol (IPCP) negotiation, use the **ip address pool** command in interface configuration mode. To disable autoconfiguring of the IP address of the interface, use the **no** form of this command.

```
ip address pool name
no ip address pool
```

<b>Syntax Description</b>	<i>name</i> Name of the DHCP pool. The IP address of the interface will be automatically configured from the DHCP pool specified in <i>name</i> .
---------------------------	---

**Command Default** IP address pooling is disabled.

**Command Modes** Interface configuration

**Usage Guidelines** Use this command to automatically configure the IP address of a LAN interface when there are DHCP clients on the attached LAN that should be serviced by the DHCP pool on the device. The DHCP pool obtains its subnet dynamically through IPCP subnet negotiation.

**Examples** The following example specifies that the IP address of GigabitEthernet interface 1/0/1 will be automatically configured from the address pool named abc:

```
ip dhcp pool abc
  import all
  origin ipcp
!
interface GigabitEthernet 1/0/1
  ip address pool abc
```

Related Commands	Command	Description
	<b>show ip interface</b>	Displays the usability status of interfaces configured for IP.

# ip address

To set a primary or secondary IP address for an interface, use the **ip address** command in interface configuration mode. To remove an IP address or disable IP processing, use the noform of this command.

```
ip address ip-address mask [secondary [vrf vrf-name]]
no ip address ip-address mask [secondary [vrf vrf-name]]
```

Syntax Description	<i>ip-address</i> IP address.
<i>mask</i>	Mask for the associated IP subnet.
<b>secondary</b>	(Optional) Specifies that the configured address is a secondary IP address. If this keyword is omitted, the configured address is the primary IP address. <b>Note</b> If the secondary address is used for a VRF table configuration with the <b>vrf</b> keyword, the <b>vrf</b> keyword must be specified also.
<b>vrf</b>	(Optional) Name of the VRF table. The <i>vrf-name</i> argument specifies the VRF name of the ingress interface.

**Command Default** No IP address is defined for the interface.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	Cisco IOS XE Release 3.2SE	This command was introduced.

**Usage Guidelines** An interface can have one primary IP address and multiple secondary IP addresses. Packets generated by the Cisco IOS software always use the primary IP address. Therefore, all devices and access servers on a segment should share the same primary network number.

Hosts can determine subnet masks using the Internet Control Message Protocol (ICMP) mask request message. Devices respond to this request with an ICMP mask reply message.

You can disable IP processing on a particular interface by removing its IP address with the **no ip address** command. If the software detects another host using one of its IP addresses, it will print an error message on the console.

The optional **secondary** keyword allows you to specify an unlimited number of secondary addresses. Secondary addresses are treated like primary addresses, except the system never generates datagrams other than routing updates with secondary source addresses. IP broadcasts and Address Resolution Protocol (ARP) requests are handled properly, as are interface routes in the IP routing table.

Secondary IP addresses can be used in a variety of situations. The following are the most common applications:

- There may not be enough host addresses for a particular network segment. For example, your subnetting allows up to 254 hosts per logical subnet, but on one physical subnet you need 300 host addresses. Using

**ip address**

secondary IP addresses on the devices or access servers allows you to have two logical subnets using one physical subnet.

- Many older networks were built using Level 2 bridges. The judicious use of secondary addresses can aid in the transition to a subnetted, device-based network. Devices on an older, bridged segment can be easily made aware that many subnets are on that segment.
- Two subnets of a single network might otherwise be separated by another network. This situation is not permitted when subnets are in use. In these instances, the first network is *extended*, or layered on top of the second network using secondary addresses.

**Note**

- If any device on a network segment uses a secondary address, all other devices on that same segment must also use a secondary address from the same network or subnet. Inconsistent use of secondary addresses on a network segment can very quickly cause routing loops.
- When you are routing using the Open Shortest Path First (OSPF) algorithm, ensure that all secondary addresses of an interface fall into the same OSPF area as the primary addresses.
- If you configure a secondary IP address, you must disable sending ICMP redirect messages by entering the **no ip redirects** command, to avoid high CPU utilization.

To transparently bridge IP on an interface, you must perform the following two tasks:

- Disable IP routing (specify the **no ip routing** command).
- Add the interface to a bridge group, see the **bridge-group** command.

To concurrently route and transparently bridge IP on an interface, see the **bridge crb** command.

**Examples**

In the following example, 192.108.1.27 is the primary address and 192.31.7.17 is the secondary address for GigabitEthernet interface 1/0/1:

```
interface GigabitEthernet 1/0/1
 ip address 192.108.1.27 255.255.255.0
 ip address 192.31.7.17 255.255.255.0 secondary
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>match ip route-source</b>	Specifies a source IP address to match to required route maps that have been set up based on VRF connected routes.
<b>route-map</b>	Defines the conditions for redistributing routes from one routing protocol into another, or to enable policy routing.
<b>set vrf</b>	Enables VPN VRF selection within a route map for policy-based routing VRF selection.
<b>show ip arp</b>	Displays the ARP cache, in which SLIP addresses appear as permanent ARP table entries.
<b>show ip interface</b>	Displays the usability status of interfaces configured for IP.

Command	Description
<b>show route-map</b>	Displays static and dynamic route maps.

**ip http server**

# ip http server

To enable the HTTP server on your IP or IPv6 system, including the Cisco web browser user interface, enter the **ip http server** command in global configuration mode. To disable the HTTP server, use the **no** form of this command..

**ip http server**  
**no ip http server**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The HTTP server uses the standard port 80 by default.  
 HTTP/TCP port 8090 is open by default.

**Command Modes** Global configuration (config)

Command History	Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.	

**Usage Guidelines** The command enables both IPv4 and IPv6 access to the HTTP server. However, an access list configured with the **ip http access-class** command is applied only to IPv4 traffic. IPv6 traffic filtering is not supported.



**Caution** The standard HTTP server and the secure HTTP (HTTPS) server can run on a system at the same time. If you enable the HTTPS server using the **ip http secure-server** command, disable the standard HTTP server using the **no ip http server** command to ensure that secure data cannot be accessed through the standard HTTP connection.

To close HTTP/TCP port 8090, you must disable both the HTTP and HTTPS servers. Enter the **no http server** and the **no http secure-server** commands, respectively.

## Examples

The following example shows how to enable the HTTP server on both IPv4 and IPv6 systems.

After enabling the HTTP server, you can set the base path by specifying the location of the HTML files to be served. HTML files used by the HTTP web server typically reside in system flash memory. Remote URLs can be specified using this command, but use of remote path names (for example, where HTML files are located on a remote TFTP server) is not recommended.

```
Device(config)#ip http server
Device(config)#ip http path flash:
```

## Related Commands

Command	Description
<b>ip http access-class</b>	Specifies the access list that should be used to restrict access to the HTTP server.
<b>ip http path</b>	Specifies the base path used to locate files for use by the HTTP server.

Command	Description
<b>ip http secure-server</b>	Enables the HTTPS server.

**ip http secure-server**

# ip http secure-server

To enable a secure HTTP (HTTPS) server, enter the **ip http secure-server** command in global configuration mode. To disable the HTTPS server, use the **no** form of this command..

**ip http secure-server**  
**no ip http secure-server**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The HTTPS server is disabled.

**Command Modes** Global configuration (config)

**Command History**

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The HTTPS server uses the Secure Sockets Layer (SSL) version 3.0 protocol.



**Caution** When enabling an HTTPS server, you should always disable the standard HTTP server to prevent unsecured connections to the same services. Disable the standard HTTP server using the **no ip http server** command in global configuration mode (this step is precautionary; typically, the HTTP server is disabled by default).

If a certificate authority (CA) is used for certification, you should declare the CA trustpoint on the routing device before enabling the HTTPS server.

To close HTTP/TCP port 8090, you must disable both the HTTP and HTTPS servers. Enter the **no http server** and the **no http secure-server** commands, respectively.

**Examples**

In the following example the HTTPS server is enabled, and the (previously configured) CA trustpoint CA-trust-local is specified:

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#ip http secure-server
Device(config)#ip http secure-trustpoint CA-trust-local
Device(config)#end

Device#show ip http server secure status
HTTP secure server status: Enabled
HTTP secure server port: 443
HTTP secure server ciphersuite: 3des-edc-cbc-sha des-cbc-sha rc4-128-md5 rc4-12a
HTTP secure server client authentication: Disabled
HTTP secure server trustpoint: CA-trust-local
```

Related Commands	Command	Description
	<b>ip http secure-trustpoint</b>	Specifies the CA trustpoint that should be used for obtaining signed certificates for the HTTPS server.
	<b>ip http server</b>	Enables the HTTP server on an IP or IPv6 system, including the Cisco web browser user interface.
	<b>show ip http server secure status</b>	Displays the configuration status of the HTTPS server.

**ip nhrp map**

# ip nhrp map

To statically configure the IP-to-nonbroadcast multiaccess (NBMA) address mapping of IP destinations connected to an NBMA network, use the **ip nhrp map** command in interface configuration mode. To remove the static entry from Next Hop Resolution Protocol (NHRP) cache, use the **no** form of this command.

```
ip nhrp map ip-address {ip-nbma-address | destination-mask [{ip-nbma-address ipv6-nbma-address}]
ipv6-nbma-address}
no ip nhrp map ip-address {ip-nbma-address | destination-mask [{ip-nbma-address ipv6-nbma-address}]
ipv6-nbma-address}
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><i>ip-address</i></td><td>IP address of the destinations reachable through the NBMA network. This address is mapped to the NBMA address.</td></tr> <tr> <td><i>ip-nbma-address</i></td><td>NBMA address that is directly reachable through the NBMA network. The address format varies depending on the medium; for example, ATM has a Network Service Access Point (NSAP) address, Ethernet has a MAC address, and Switched Multimegabit Data Service (SMDS) has an E.164 address. This address is mapped to the IP address.</td></tr> <tr> <td><i>destination-mask</i></td><td>Destination address mask.</td></tr> <tr> <td><i>ipv6-nbma-address</i></td><td>IPv6 NBMA address. <b>Note</b> This argument is not supported in Cisco IOS XE Denali 16.3.1.</td></tr> </table>	<i>ip-address</i>	IP address of the destinations reachable through the NBMA network. This address is mapped to the NBMA address.	<i>ip-nbma-address</i>	NBMA address that is directly reachable through the NBMA network. The address format varies depending on the medium; for example, ATM has a Network Service Access Point (NSAP) address, Ethernet has a MAC address, and Switched Multimegabit Data Service (SMDS) has an E.164 address. This address is mapped to the IP address.	<i>destination-mask</i>	Destination address mask.	<i>ipv6-nbma-address</i>	IPv6 NBMA address. <b>Note</b> This argument is not supported in Cisco IOS XE Denali 16.3.1.
<i>ip-address</i>	IP address of the destinations reachable through the NBMA network. This address is mapped to the NBMA address.								
<i>ip-nbma-address</i>	NBMA address that is directly reachable through the NBMA network. The address format varies depending on the medium; for example, ATM has a Network Service Access Point (NSAP) address, Ethernet has a MAC address, and Switched Multimegabit Data Service (SMDS) has an E.164 address. This address is mapped to the IP address.								
<i>destination-mask</i>	Destination address mask.								
<i>ipv6-nbma-address</i>	IPv6 NBMA address. <b>Note</b> This argument is not supported in Cisco IOS XE Denali 16.3.1.								

**Command Default** No static IP-to-NBMA cache entries exist.

**Command Modes** Interface configuration(config-if)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** In Cisco IOS XE Denali 16.3.1, NHRP supports only hub-to-spoke communication; spoke-to-spoke communication is not supported.



**Note** In Cisco IOS XE Denali 16.3.1, this command supports only IPv4; the *ipv6-nbma-address* argument although available on the switch, will not work if configured.

Configure at least one static mapping to reach the next-hop server. To statistically configure multiple IP-to-NBMA address mappings, configure this command multiple times.

When using the routing protocols, Open Shortest Path First (OSPF) or Enhanced Interior Gateway Routing Protocol (EIGRP), configure the **ip ospf network point-to-multipoint** (when OSPF is used for hub-to-spoke communication) and **ip split-horizon eigrp** (when EIGRP is used) commands on the tunnel to allow the traffic.

**Examples**

In the following example, this station in a multipoint tunnel network is statically configured to be served by two next-hop servers 10.0.0.1 and 10.0.1.3. The NBMA address for 10.0.0.1 is statically configured as 192.0.2.1 and the NBMA address for 10.0.1.3 is 198.51.100.1.

```
Switch(config)# interface tunnel 0
Switch(config-if)# ip nhrp nhs 10.0.0.1
Switch(config-if)# ip nhrp nhs 10.0.1.3
Switch(config-if)# ip nhrp map 10.0.0.1 192.0.2.1
Switch(config-if)# ip nhrp map 10.0.1.3 198.51.100.1
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear ip nhrp</b>	Clears all dynamic entries from the NHRP cache.
<b>debug nhrp</b>	Enables NHRP debugging.
<b>interface</b>	Configures an interface and enters interface configuration mode.
<b>ip split-horizon eigrp</b>	Enables EIGRP split horizon.
<b>ip ospf network point-to-multipoint</b>	Configures the OSPF network type to point-to-multipoint.

**ip nhrp map multicast**

# ip nhrp map multicast

To configure nonbroadcast multiaccess (NBMA) addresses used as destinations for broadcast or multicast packets to be sent over a tunnel network, use the **ip nhrp map multicast** command in interface configuration mode. To remove the destinations, use the **no** form of this command.

```
ip nhrp map multicast {ip-nbma-address ipv6-nbma-address | dynamic}
no ip nhrp map multicast {ip-nbma-address ipv6-nbma-address | dynamic}
```

Syntax Description	<table border="1"> <tr> <td><i>ip-nbma-address</i></td><td>NBMA address that is directly reachable through the NBMA network. The address format varies depending on the medium that you are using.</td></tr> <tr> <td><i>ipv6-nbma-address</i></td><td>IPv6 NBMA address. <b>Note</b> This argument is not supported in Cisco IOS XE Denali 16.3.1.</td></tr> <tr> <td><b>dynamic</b></td><td>Dynamically learns destinations from client registrations on the hub.</td></tr> </table>	<i>ip-nbma-address</i>	NBMA address that is directly reachable through the NBMA network. The address format varies depending on the medium that you are using.	<i>ipv6-nbma-address</i>	IPv6 NBMA address. <b>Note</b> This argument is not supported in Cisco IOS XE Denali 16.3.1.	<b>dynamic</b>	Dynamically learns destinations from client registrations on the hub.
<i>ip-nbma-address</i>	NBMA address that is directly reachable through the NBMA network. The address format varies depending on the medium that you are using.						
<i>ipv6-nbma-address</i>	IPv6 NBMA address. <b>Note</b> This argument is not supported in Cisco IOS XE Denali 16.3.1.						
<b>dynamic</b>	Dynamically learns destinations from client registrations on the hub.						

**Command Default** No NBMA addresses are configured as destinations for broadcast or multicast packets.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

## Usage Guidelines



**Note** In Cisco IOS XE Denali 16.3.1, this command supports only IPv4; the *ipv6-nbma-address* argument although available on the switch, will not work if configured.

This command applies only to tunnel interfaces. This command is useful for supporting broadcasts over a tunnel network when the underlying network does not support IP multicast. If the underlying network does support IP multicast, you should use the **tunnel destination** command to configure a multicast destination for transmission of tunnel broadcasts or multicasts.

When multiple NBMA addresses are configured, the system replicates the broadcast packet for each address.

## Examples

In the following example, if a packet is sent to 10.255.255.255, it is replicated to destinations 10.0.0.1 and 10.0.0.2:

```
Switch(config)# interface tunnel 0
Switch(config-if)# ip address 10.0.0.3 255.0.0.0
Switch(config-if)# ip nhrp map multicast 10.0.0.1
Switch(config-if)# ip nhrp map multicast 10.0.0.2
```

Related Commands	Command	Description
	<b>debug nhrp</b>	Enables NHRP debugging.
	<b>interface</b>	Configures an interface and enters interface configuration mode.
	<b>tunnel destination</b>	Specifies the destination for a tunnel interface.

**ip nhrp network-id**

# ip nhrp network-id

To enable the Next Hop Resolution Protocol (NHRP) on an interface, use the **ip nhrp network-id** command in interface configuration mode. To disable NHRP on the interface, use the **no** form of this command.

```
ip nhrp network-id number
no ip nhrp network-id [{number}]
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><i>number</i></td><td>Globally unique, 32-bit network identifier from a nonbroadcast multiaccess (NBMA) network. The range is from 1 to 4294967295.</td></tr> </table>	<i>number</i>	Globally unique, 32-bit network identifier from a nonbroadcast multiaccess (NBMA) network. The range is from 1 to 4294967295.						
<i>number</i>	Globally unique, 32-bit network identifier from a nonbroadcast multiaccess (NBMA) network. The range is from 1 to 4294967295.								
<b>Command Default</b>	NHRP is disabled on an interface.								
<b>Command Modes</b>	Interface configuration (config)								
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.1</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.3.1	This command was introduced.				
Release	Modification								
Cisco IOS XE Denali 16.3.1	This command was introduced.								
<b>Usage Guidelines</b>	In general, all NHRP stations within one logical NBMA network must be configured with the same network identifier.								
<b>Examples</b>	The following example enables NHRP on the interface:								
	<pre>Switch(config-if)# <b>ip nhrp network-id</b> 1</pre>								
<b>Related Commands</b>	<table border="1"> <thead> <tr> <th>Command</th><th>Description</th></tr> </thead> <tbody> <tr> <td><b>clear ip nhrp</b></td><td>Clears all dynamic entries from the NHRP cache.</td></tr> <tr> <td><b>debug nhrp</b></td><td>Enables NHRP debugging.</td></tr> <tr> <td><b>interface</b></td><td>Configures an interface and enters interface configuration mode.</td></tr> </tbody> </table>	Command	Description	<b>clear ip nhrp</b>	Clears all dynamic entries from the NHRP cache.	<b>debug nhrp</b>	Enables NHRP debugging.	<b>interface</b>	Configures an interface and enters interface configuration mode.
Command	Description								
<b>clear ip nhrp</b>	Clears all dynamic entries from the NHRP cache.								
<b>debug nhrp</b>	Enables NHRP debugging.								
<b>interface</b>	Configures an interface and enters interface configuration mode.								

# ip nhrp nhs

To specify the address of one or more Next Hop Resolution Protocol (NHRP) servers, use the **ip nhrp nhs** command in interface configuration mode. To remove the address, use the **no** form of this command.

```
ip nhrp nhs {nhs-address [nbma {nbma-address FQDN-string}] [multicast] [priority value] [cluster value] | cluster value max-connections value | dynamic nbma {nbma-address FQDN-string} [multicast] [priority value] [cluster value] | fallback seconds}
no ip nhrp nhs {nhs-address [nbma {nbma-address FQDN-string}] [multicast] [priority value] [cluster value] | cluster value max-connections value | dynamic nbma {nbma-address FQDN-string} [multicast] [priority value] [cluster value] | fallback seconds}
```

Syntax Description	<i>nhs-address</i>	Address of the next-hop server being specified.
<b>nbma</b>	(Optional)	Specifies the nonbroadcast multiple access (NBMA) address or FQDN.
<i>nbma-address</i>		NBMA address.
<i>FQDN-string</i>		Next hop server (NHS) fully qualified domain name (FQDN) string.
<b>multicast</b>	(Optional)	Specifies the use of NBMA mapping for broadcasts and multicasts.
<b>priority value</b>		(Optional) Assigns a priority to hubs to control the order in which spokes select hubs to establish tunnels. The range is from 0 to 255; 0 is the highest and 255 is the lowest priority.
<b>cluster value</b>	(Optional)	Specifies NHS groups. The range is from 0 to 10.
<b>max-connections value</b>		Specifies the number of NHS elements from each NHS group that needs to be active. The range is from 0 to 255.
<b>dynamic</b>		Configures the spoke to learn the NHS protocol address dynamically.
<b>fallback seconds</b>		Specifies the duration, in seconds, for which the spoke must wait before falling back to an NHS of higher priority upon recovery.

**Command Default** No next-hop servers are explicitly configured, so normal network layer routing decisions are used to forward NHRP traffic.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** Use the **ip nhrp nhs** command to specify the address of a next hop server and the networks it serves. Normally, NHRP consults the network layer forwarding table to determine how to forward NHRP packets. When next hop servers are configured, these next hop addresses override the forwarding path that would otherwise be used for NHRP traffic.

**ip nhrp nhs**

For any next hop server that is configured, you can specify multiple networks by repeating the **ip nhrp nhs** command with the same *nhs-address* argument, but with different IP network addresses.

**Examples**

The following example shows how to register a hub to a spoke using NBMA and FQDN:

```
Switch# configure terminal
Switch(config)# interface tunnel 1
Switch(config-if)# ip nhrp nhs 192.0.2.1 nbma examplehub.example1.com
```

The following example shows how to configure the desired **max-connections** value:

```
Switch# configure terminal
Switch(config)# interface tunnel 1
Switch(config-if)# ip nhrp nhs cluster 5 max-connections 100
```

The following example shows how to configure the NHS fallback time:

```
Switch# configure terminal
Switch(config)# interface tunnel 1
Switch(config-if)# ip nhrp nhs fallback 25
```

The following example shows how to configure NHS priority and group values:

```
Switch# configure terminal
Switch(config)# interface tunnel 1
Switch(config-if)# ip nhrp nhs 192.0.2.1 priority 1 cluster 2
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip nhrp map</b>	Statically configures the IP-to-NBMA address mapping of IP destinations connected to an NBMA network.
<b>show ip nhrp</b>	Displays NHRP mapping information.

# ipv6 address-validate

To enable IPv6 address validation, use the **ipv6 address-validate** in global configuration mode. To disable IPv6 address validation, use the **no** form of this command.

**ipv6 address-validate**  
**no ipv6 address-validate**

<b>Command Default</b>	This command is enabled by default.
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<b>Command Modes</b>	Global configuration (config)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

<b>Usage Guidelines</b>	The <b>ipv6 address-validate</b> command is used to validate whether the interface identifiers in an assigned IPv6 address are a part of the reserved IPv6 interface identifiers range, as specified in RFC5453. If the interface identifiers of the assigned IPv6 address are a part of the reserved range, a new IPv6 address is assigned.  Only auto-configured addresses or addresses configured by DHCPv6 are validated.
-------------------------	---



<b>Note</b>	The <b>no ipv6-address validate</b> command disables the IPv6 address validation and allows assigning of IPv6 addresses with interface identifiers that are a part of the reserved IPv6 interface identifiers range. We do not recommend the use of this command.
-------------	---

<b>Examples</b>	The following example shows how to re-enable IPv6 address validation if it is disabled using the no <b>ipv6-address validate</b> command:
-----------------	---

```
Device> enable
Device# configure terminal
Device(config)# ipv6 address-validate
```

# ipv6 nd cache expire

To configure the duration of time before an IPv6 neighbor discovery cache entry expires, use the **ipv6 nd cache expire** command in the interface configuration mode. To remove this configuration, use the **no** form of this command.

```
ipv6 nd cache expire expire-time-in-seconds [refresh]
no ipv6 nd cache expire expire-time-in-seconds [refresh]
```

## Syntax Description

### Syntax Description

<i>expire-time-in-seconds</i>	The time range is from 1 through 65536 seconds. The default is 14400 seconds or 4 hours.
-------------------------------	--

<b>refresh</b>	(Optional) Automatically refreshes the neighbor discovery cache entry.
----------------	--

### Command Modes

Interface configuration (config-if)

## Command History

### Command History

<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE	This com introduce

## Usage Guidelines

By default, a neighbor discovery cache entry is expired and deleted if it remains in the STALE state for 14,400 seconds or 4 hours. The **ipv6 nd cache expire** command allows the expiry time to vary and to trigger auto refresh of an expired entry before the entry is deleted.

When the **refresh** keyword is used, a neighbor discovery cache entry is auto refreshed. The entry moves into the DELAY state and the neighbor unreachability detection process occurs, in which the entry transitions from the DELAY state to the PROBE state after 5 seconds. When the entry reaches the PROBE state, a neighbor solicitation is sent and then retransmitted as per the configuration.

## Examples

The following example shows that the neighbor discovery cache entry is configured to expire in 7200 seconds or 2 hours:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/1/4
Device(config-if)# ipv6 nd cache expire 7200
```

## Related Commands

Command	Description
<b>ipv6 nd na glean</b>	Configures neighbor discovery to glean an entry from an unsolicited neighbor advertisement.
<b>ipv6 nd nud retry</b>	Configures the number of times neighbor unreachability detection resends neighbor solicitations.

Command	Description
<b>show ipv6 interface</b>	Displays the usability status of interfaces that are configured for IPv6.

**ipv6 nd na glean**

# ipv6 nd na glean

To configure the neighbor discovery to glean an entry from an unsolicited neighbor advertisement, use the **ipv6 nd na glean** command in the interface configuration mode. To disable this feature, use the **no** form of this command.

**ipv6 nd na glean**  
**no ipv6 nd na glean**

**Command Modes** Interface configuration

**Command History** **Release**

Cisco IOS XE 3.2SE

**Usage Guidelines** IPv6 nodes may emit a multicast unsolicited neighbor advertisement packet following the successful completion of duplicate address detection (DAD). By default, other IPv6 nodes ignore these unsolicited neighbor advertisement packets. The **ipv6 nd na glean** command configures the router to create a neighbor advertisement entry on receipt of an unsolicited neighbor advertisement packet (assuming no such entry already exists and the neighbor advertisement has the link-layer address option). Use of this command allows a device to populate its neighbor advertisement cache with an entry for a neighbor before data traffic exchange with the neighbor.

## Examples

The following example shows how to configure neighbor discovery to glean an entry from an unsolicited neighbor advertisement:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/1/4
Device(config-if)# ipv6 nd na glean
```

## Related Commands

Command	Description
<b>ipv6 nd cache expire</b>	Configures the duration of time before an IPv6 neighbor discovery cache entry expires.
<b>ipv6 nd nud retry</b>	Configures the number of times neighbor unreachability detection resends neighbor solicitations.
<b>show ipv6 interface</b>	Displays the usability status of interfaces that are configured for IPv6.

# ipv6 nd nud retry

To configure the number of times the neighbor unreachability detection process resends neighbor solicitations, use the **ipv6 nd nud retry** command in the interface configuration mode. To disable this feature, use the **no** form of this command.

**ipv6 nd nud retry *base interval max-attempts {final-wait-time}***  
**no ipv6 nd nud retry *base interval max-attempts {final-wait-time}***

## Syntax Description

<i>base</i>	The neighbor unreachability detection process base value.
<i>interval</i>	The time interval, in milliseconds, between retries.  The range is from 1000 to 32000.
<i>max-attempts</i>	The maximum number of retry attempts, depending on the base value.  The range is from 1 to 128.
<i>final-wait-time</i>	The waiting time, in milliseconds, on the last probe.  The range is from 1000 to 32000.

## Command Modes

Interface configuration (config-if)

## Command History

### Release

Cisco IOS XE 3.2SE

## Usage Guidelines

When a device runs neighbor unreachability detection to resolve the neighbor detection entry for a neighbor again, it sends three neighbor solicitation packets 1 second apart. In certain situations, for example, spanning-tree events, or high-traffic events, or end-host reloads), three neighbor solicitation packets that are sent at an interval of 1 second may not be sufficient. To help maintain the neighbor cache in such situations, use the **ipv6 nd nud retry** command to configure exponential timers for neighbor solicitation retransmits.

The maximum number of retry attempts is configured using the *max-attempts* argument. The retransmit interval is calculated with the following formula:

$t_m^n$

here,

- t = Time interval
- m = Base (1, 2, or 3)
- n = Current neighbor solicitation number (where the first neighbor solicitation is 0).

Therefore, **ipv6 nd nud retry 3 1000 5** command retransmits at intervals of 1,3,9,27,81 seconds. If the final wait time is not configured, the entry remains for 243 seconds before it is deleted.

**ipv6 nd nud retry**

The **ipv6 nd nud retry** command affects only the retransmit rate for the neighbor unreachability detection process, and not for the initial resolution, which uses the default of three neighbor solicitation packets sent 1 second apart.

**Examples**

The following example shows how to configure a fixed interval of 1 second and three retransmits:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/1/4
Device(config-if)# ipv6 nd nud retry 1 1000 3
```

The following example shows how to configure a retransmit interval of 1, 2, 4, and 8:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/1/4
Device(config-if)# ipv6 nd nud retry 2 1000 4
```

The following example shows how to configure the retransmit intervals of 1, 3, 9, 27, 81:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/1/4
Device(config-if)# ipv6 nd nud retry 3 1000 5
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ipv6 nd cache expire</b>	Configures the duration of time before an IPv6 neighbor discovery (ND) cache entry expires.
<b>ipv6 nd na glean</b>	Configures neighbor discovery to glean an entry from an unsolicited neighbor advertisement.
<b>show ipv6 interface</b>	Displays the usability status of interfaces that are configured for IPv6.

# key chain

To define an authentication key chain needed to enable authentication for routing protocols and enter key-chain configuration mode, use the **key chain** command in global configuration mode. To remove the key chain, use the **no** form of this command.

```
key chain name-of-chain
no key chain name-of-chain
```

<b>Syntax Description</b>	<i>name-of-chain</i> Name of a key chain. A key chain must have at least one key and can have up to 2147483647 keys.
---------------------------	--

**Command Default** No key chain exists.

**Command Modes** Global configuration (config)

**Usage Guidelines** You must configure a key chain with keys to enable authentication.

Although you can identify multiple key chains, we recommend using one key chain per interface per routing protocol. Upon specifying the **key chain** command, you enter key chain configuration mode.

**Examples** The following example shows how to specify key chain:

```
Device(config-keychain-key)# key-string chestnut
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>accept-lifetime</b>	Sets the time period during which the authentication key on a key chain is received as valid.
	<b>key</b>	Identifies an authentication key on a key chain.
	<b>key-string (authentication)</b>	Specifies the authentication string for a key.
	<b>send-lifetime</b>	Sets the time period during which an authentication key on a key chain is valid to be sent.
	<b>show key chain</b>	Displays authentication key information.

# key-string (authentication)

To specify the authentication string for a key, use the **key-string(authentication)** command in key chain key configuration mode. To remove the authentication string, use the **no** form of this command.

```
key-string key-string text
no key-string text
```

<b>Syntax Description</b>	<i>text</i> Authentication string that must be sent and received in the packets using the routing protocol being authenticated. The string can contain from 1 to 80 uppercase and lowercase alphanumeric characters.
---------------------------	--

**Command Default** No authentication string for a key exists.

**Command Modes** Key chain key configuration (config-keychain-key)

**Examples** The following example shows how to specify the authentication string for a key:

```
Device(config-keychain-key)# key-string key1
```

Related Commands	Command	Description
	<b>accept-lifetime</b>	Sets the time period during which the authentication key on a key chain is received as valid.
	<b>key</b>	Identifies an authentication key on a key chain.
	<b>key chain</b>	Defines an authentication key-chain needed to enable authentication for routing protocols.
	<b>send-lifetime</b>	Sets the time period during which an authentication key on a key chain is valid to be sent.
	<b>show key chain</b>	Displays authentication key information.

# key

To identify an authentication key on a key chain, use the **key** command in key-chain configuration mode. To remove the key from the key chain, use the **no** form of this command.

**key** *key-id*  
**no key** *key-id*

<b>Syntax Description</b>	<i>key-id</i> Identification number of an authentication key on a key chain. The range of keys is from 0 to 2147483647. The key identification numbers need not be consecutive.
---------------------------	---

**Command Default** No key exists on the key chain.

**Command Modes** Key-chain configuration (config-keychain)

**Usage Guidelines** It is useful to have multiple keys on a key chain so that the software can sequence through the keys as they become invalid after time, based on the **accept-lifetime** and **send-lifetime** key chain key command settings.

Each key has its own key identifier, which is stored locally. The combination of the key identifier and the interface associated with the message uniquely identifies the authentication algorithm and Message Digest 5 (MD5) authentication key in use. Only one authentication packet is sent, regardless of the number of valid keys. The software starts looking at the lowest key identifier number and uses the first valid key.

If the last key expires, authentication will continue and an error message will be generated. To disable authentication, you must manually delete the last valid key.

To remove all keys, remove the key chain by using the **no key chain** command.

## Examples

The following example shows how to specify a key to identify authentication on a key-chain:

```
Device(config-keychain)# key 1
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>accept-lifetime</b>	Sets the time period during which the authentication key on a key chain is received as valid.
	<b>key chain</b>	Defines an authentication key chain needed to enable authentication for routing protocols.
	<b>key-string (authentication)</b>	Specifies the authentication string for a key.
	<b>send-lifetime</b>	Sets the time period during which an authentication key on a key chain is valid to be sent.
	<b>show key chain</b>	Displays authentication key information.

**show glbp**

# show glbp

To display Gateway Load Balancing Protocol (GLBP) information, use the **show glbp** command in privileged EXEC mode.

**capability** [*interface-type interface-number*]  
*interface-type interface-number* [*group-number*] [*state*] [**brief**]

<b>Syntax Description</b>	<b>capability</b> (Optional) Displays the GLBP capability interfaces. <i>interface-type interface-number</i> (Optional) Interface type and number for which output is displayed. <i>group-number</i> (Optional) GLBP group number in the range from 0 to 1023. <i>state</i> (Optional) State of the GLBP device, one of the following: <b>active</b> , <b>disabled</b> , <b>init</b> , <b>listen</b> , and <b>standby</b> . <b>brief</b> (Optional) Summarizes each virtual gateway or virtual forwarder with a single line of output.
---------------------------	--

**Command Modes** Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Release 2.1	This command was introduced..

**Usage Guidelines** Use the **show glbp** command to display information about GLBP groups on a device. The **brief** keyword displays a single line of information about each virtual gateway or virtual forwarder. The **capability** keyword displays all GLBP-capable interfaces.

**Examples** The following is sample output from the **show glbp** command that displays GLBP group 10:

```
Device# show glbp GigabitEthernet 1/0/1 10
GigabitEthernet1/0/1 - Group 10
  State is Active
    1 state change, last state change 00:04:52
    Virtual IP address is 10.21.8.10
    Hello time 3 sec, hold time 10 sec
      Next hello sent in 0.608 secs
    Redirect time 600 sec, forwarder time-out 14400 sec
    Preemption disabled
    Active is local
    Standby is unknown
    Priority 100 (default)
    Weighting 100 (default 100), thresholds: lower 1, upper 100
    Load balancing: round-robin
    Group members:
      ac7e.8a35.6364 (10.21.8.32) local
    There is 1 forwarder (1 active)
    Forwarder 1
      State is Active
```

```

1 state change, last state change 00:04:41
MAC address is 0007.b400.0a01 (default)
Owner ID is ac7e.8a35.6364
Redirection enabled
Preemption enabled, min delay 30 sec
Active is local, weighting 100

```

The table below describes the significant fields shown in the displays.

**Table 19: show glbp Field Descriptions**

Field	Description
GigabitEthernet1/0/1 - Group	Interface type and number and GLBP group number for the interface.
State is	<p>State of the virtual gateway or virtual forwarder. For a virtual gateway, the state can be one of the following:</p> <ul style="list-style-type: none"> <li>• Active--The gateway is the active virtual gateway (AVG) and is responsible for responding to Address Resolution Protocol (ARP) requests for the virtual IP address.</li> <li>• Disabled--The virtual IP address has not been configured or learned yet, but another GLBP configuration exists.</li> <li>• Initial--The virtual IP address has been configured or learned, but virtual gateway configuration is not complete. An interface must be up and configured to route IP, and an interface IP address must be configured.</li> <li>• Listen--The virtual gateway is receiving hello packets and is ready to change to the “speak” state if the active or standby virtual gateway becomes unavailable.</li> <li>• Speak--The virtual gateway is attempting to become the active or standby virtual gateway.</li> <li>• Standby--The gateway is next in line to be the AVG.</li> </ul>
Virtual IP address is	The virtual IP address of the GLBP group. All secondary virtual IP addresses are listed on separate lines. If one of the virtual IP addresses is a duplicate of an address configured for another device, it will be marked as “duplicate.” A duplicate address indicates that the device has failed to defend its ARP cache entry.
Hello time, hold time	The hello time is the time between hello packets (in seconds or milliseconds). The hold time is the time (in seconds or milliseconds) before other devices declare the active device to be down. All devices in a GLBP group use the hello- and hold-time values of the current AVG. If the locally configured values are different, the configured values appear in parentheses after the hello- and hold-time values.
Next hello sent in	The time until GLBP will send the next hello packet (in seconds or milliseconds).
Preemption	<p>Whether GLBP gateway preemption is enabled. If enabled, the minimum delay is the time (in seconds) for which a higher-priority nonactive device will wait before preempting the lower-priority active device.</p> <p>This field is also displayed under the forwarder section where it indicates GLBP forwarder preemption.</p>

show glbp

Field	Description
Active is	The active state of the virtual gateway. The value can be “local,” “unknown,” or an IP address. The address (and the expiration date of the address) is the address of the current AVG.  This field is also displayed under the forwarder section where it indicates the address of the current AVF.
Standby is	The standby state of the virtual gateway. The value can be “local,” “unknown,” or an IP address. The address (and the expiration date of the address) is the address of the standby gateway (the gateway that is next in line to be the AVG).
Weighting	The initial weighting value with lower and upper threshold values.
Track object	The list of objects that are being tracked and their corresponding states.
IP redundancy name is	The name of the GLBP group.

Related Commands	Command	Description
	<b>glbp ip</b>	Enables GLBP.
	<b>glbp timers</b>	Configures the time between hello messages and the time before other devices declare the active GLBP device to be down.
	<b>glbp weighting track</b>	Specifies an object to be tracked that affects the weighting of a GLBP gateway.

# show ip nhrp nhs

To display Next Hop Resolution Protocol (NHRP) next hop server (NHS) information, use the **show ip nhrp nhs** command in user EXEC or privileged EXEC mode.

```
show ip nhrp nhs [{interface}] [detail] [{redundancy [{cluster number} | preempted | running | waiting]}]
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>interface</b></td><td>(Optional) Displays NHS information currently configured on the interface. See the table below for types, number ranges, and descriptions.</td></tr> <tr> <td><b>detail</b></td><td>(Optional) Displays detailed NHS information.</td></tr> <tr> <td><b>redundancy</b></td><td>(Optional) Displays information about NHS redundancy stacks.</td></tr> <tr> <td><b>cluster number</b></td><td>(Optional) Displays redundancy cluster information.</td></tr> <tr> <td><b>preempted</b></td><td>(Optional) Displays information about NHS that failed to become active and is preempted.</td></tr> <tr> <td><b>running</b></td><td>(Optional) Displays NHSs that are currently in Responding or Expecting replies states.</td></tr> <tr> <td><b>waiting</b></td><td>(Optional) Displays NHSs awaiting to be scheduled.</td></tr> </table>	<b>interface</b>	(Optional) Displays NHS information currently configured on the interface. See the table below for types, number ranges, and descriptions.	<b>detail</b>	(Optional) Displays detailed NHS information.	<b>redundancy</b>	(Optional) Displays information about NHS redundancy stacks.	<b>cluster number</b>	(Optional) Displays redundancy cluster information.	<b>preempted</b>	(Optional) Displays information about NHS that failed to become active and is preempted.	<b>running</b>	(Optional) Displays NHSs that are currently in Responding or Expecting replies states.	<b>waiting</b>	(Optional) Displays NHSs awaiting to be scheduled.
<b>interface</b>	(Optional) Displays NHS information currently configured on the interface. See the table below for types, number ranges, and descriptions.														
<b>detail</b>	(Optional) Displays detailed NHS information.														
<b>redundancy</b>	(Optional) Displays information about NHS redundancy stacks.														
<b>cluster number</b>	(Optional) Displays redundancy cluster information.														
<b>preempted</b>	(Optional) Displays information about NHS that failed to become active and is preempted.														
<b>running</b>	(Optional) Displays NHSs that are currently in Responding or Expecting replies states.														
<b>waiting</b>	(Optional) Displays NHSs awaiting to be scheduled.														

**Command Modes** User EXEC (>)

Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** The table below lists the valid types, number ranges, and descriptions for the optional *interface* argument.



**Note** The valid types can vary according to the platform and interfaces on the platform.

**Table 20: Valid Types, Number Ranges, and Interface Descriptions**

Valid Types	Number Ranges	Interface Descriptions
<b>ANI</b>	0 to 1000	Autonomic-Networking virtual interface
<b>Auto-Template</b>	1 to 999	Auto-Template interface
<b>GMPLS</b>	0 to 1000	Multiprotocol Label Switching (MPLS) interface
<b>GigabitEthernet</b>	0 to 9	GigabitEthernet IEEE 802.3z
<b>InternalInterface</b>	0 to 9	Internal interface

show ip nhrp nhs

Valid Types	Number Ranges	Interface Descriptions
<b>LISP</b>	0 to 65520	Locator/ID Separation Protocol (LISP) virtual interface
<b>loopback</b>	0 to 2147483647	Loopback interface
<b>Null</b>	0 to 0	Null interface
<b>PROTECTION_GROUP</b>	0 to 0	Protection-group controller
<b>Port-channel</b>	1 to 128	Port channel interface
<b>TenGigabitEthernet</b>	0 to 9	TenGigabitEthernet interface
<b>Tunnel</b>	0 to 2147483647	Tunnel interface
<b>Tunnel-tp</b>	0 to 65535	MPLS Transport Profile interface
<b>Vlan</b>	1 to 4094	VLAN interface

## Examples

The following is sample output from the **show ip nhrp nhs detail** command:

```
Switch# show ip nhrp nhs detail

Legend:
  E=Expecting replies
  R=Responding
Tunnell1:
  10.1.1.1      E  req-sent 128  req-failed 1  repl-recv 0
  Pending Registration Requests:
  Registration Request: Reqid 1, Ret 64  NHS 10.1.1.1
```

The table below describes the significant field shown in the display.

**Table 21: show ip nhrp nhs Field Descriptions**

Field	Description
Tunnell1	Interface through which the target network is reached.

## Related Commands

Command	Description
<b>ip nhrp map</b>	Statically configures the IP-to-NBMA address mapping of IP destinations connected to an NBMA network.
<b>show ip nhrp</b>	Displays NHRP mapping information.

# show key chain

To display the keychain, use the **show key chain** command.

**show key chain [name-of-chain]**

<b>Syntax Description</b>	<i>name-of-chain</i> (Optional) Name of the key chain to display, as named in the key chain command.
---------------------------	--

**Command Default** If the command is used without any parameters, then it lists out all the key chains.

**Command Modes** Privileged EXEC (#)

**Examples** The following is sample output from the **show key chain** command:

```
show key chain
Device# show key chain

Key-chain AuthenticationGLBP:
    key 1 -- text "Thisisasecretkey"
        accept lifetime (always valid) - (always valid) [valid now]
        send lifetime (always valid) - (always valid) [valid now]
Key-chain glbp2:
    key 100 -- text "abc123"
        accept lifetime (always valid) - (always valid) [valid now]
        send lifetime (always valid) - (always valid) [valid now]
```

Related Commands	Command	Description
	<b>key-string</b>	Specifies the authentication string for a key.
	<b>send-lifetime</b>	Sets the time period during which an authentication key on a key chain is valid to be sent.

**show track**

# show track

To display information about objects that are tracked by the tracking process, use the **show track** command in privileged EXEC mode.

```
show track [{object-number [brief] | application [brief] | interface [brief] | ip[route [brief] | [sla [brief]] | ipv6 [route [brief]] | list [route [brief]] | resolution [ip | ipv6] | stub-object [brief] | summary | timers}]}
```

Syntax Description	<i>object-number</i> (Optional) Object number that represents the object to be tracked. The range is from 1 to 1000.
<b>brief</b>	(Optional) Displays a single line of information related to the preceding argument or keyword.
<b>application</b>	(Optional) Displays tracked application objects.
<b>interface</b>	(Optional) Displays tracked interface objects.
<b>ip route</b>	(Optional) Displays tracked IP route objects.
<b>ip sla</b>	(Optional) Displays tracked IP SLA objects.
<b>ipv6 route</b>	(Optional) Displays tracked IPv6 route objects.
<b>list</b>	(Optional) Displays the list of boolean objects.
<b>resolution</b>	(Optional) Displays resolution of tracked parameters.
<b>summary</b>	(Optional) Displays the summary of the specified object.
<b>timers</b>	(Optional) Displays polling interval timers.

Command Modes	Privileged EXEC (#)
---------------	---------------------

Command History	Release	Modification
	Cisco IOS XE Release 16.2.1	This command was integrated into Cisco IOS XE Release 2.1.
		This command was introduced.

Usage Guidelines	Use this command to display information about objects that are tracked by the tracking process. When no arguments or keywords are specified, information for all objects is displayed.
------------------	--

A maximum of 1000 objects can be tracked. Although 1000 tracked objects can be configured, each tracked object uses CPU resources. The amount of available CPU resources on a device is dependent upon variables such as traffic load and how other protocols are configured and run. The ability to use 1000 tracked objects is dependent upon the available CPU. Testing should be conducted on site to ensure that the service works under the specific site traffic conditions.

**Examples**

The following example shows information about the state of IP routing on the interface that is being tracked:

```
Device# show track 1

Track 1
  Interface GigabitEthernet 1/0/1 ip routing
    IP routing is Down (no IP addr)
      1 change, last change 00:01:08
```

The table below describes the significant fields shown in the displays.

**Table 22: show track Field Descriptions**

Field	Description
Track	Object number that is being tracked.
Interface GigabitEthernet 1/0/1 ip routing	Interface type, interface number, and object that is being tracked.
IP routing is	State value of the object, displayed as Up or Down. If the object is down, the reason is displayed.
1 change, last change	Number of times that the state of a tracked object has changed and the time (in <i>hh:mm:ss</i> ) since the last change.

**Related Commands**

Command	Description
<b>show track resolution</b>	Displays the resolution of tracked parameters.
<b>track interface</b>	Configures an interface to be tracked and enters tracking configuration mode.
<b>track ip route</b>	Tracks the state of an IP route and enters tracking configuration mode.

# track

To configure an interface to be tracked where the Gateway Load Balancing Protocol (GLBP) weighting changes based on the state of the interface, use the **track** command in global configuration mode. To remove the tracking, use the **no** form of this command.

```
track object-number interface type number {line-protocol | ip routing | ipv6 routing}
no track object-number interface type number {line-protocol | ip routing | ipv6 routing}
```

Syntax Description	<i>object-number</i>	Object number in the range from 1 to 1000 representing the interface to be tracked.
	<b>interface type number</b>	Interface type and number to be tracked.
	<b>line-protocol</b>	Tracks whether the interface is up.
	<b>ip routing</b>	Tracks whether IP routing is enabled, an IP address is configured on the interface, and the interface state is up, before reporting to GLBP that the interface is up.
	<b>ipv6 routing</b>	Tracks whether IPv6 routing is enabled, an IP address is configured on the interface, and the interface state is up, before reporting to GLBP that the interface is up.

**Command Default** The state of the interfaces is not tracked.

**Command Modes** Global configuration (config)

Command History	Release	Modification
		This command was introduced..

**Usage Guidelines** Use the **track** command in conjunction with the **glbp weighting** and **glbp weighting track** commands to configure parameters for an interface to be tracked. If a tracked interface on a GLBP device goes down, the weighting for that device is reduced. If the weighting falls below a specified minimum, the device will lose its ability to act as an active GLBP virtual forwarder.

A maximum of 1000 objects can be tracked. Although 1000 tracked objects can be configured, each tracked object uses CPU resources. The amount of available CPU resources on a device is dependent upon variables such as traffic load and how other protocols are configured and run. The ability to use 1000 tracked objects is dependent upon the available CPU. Testing should be conducted on site to ensure that the service works under the specific site traffic conditions.

**Examples** In the following example, TenGigabitEthernet interface 0/0/1 tracks whether GigabitEthernet interfaces 1/0/1 and 1/0/3 are up. If either of the GigabitEthernet interface goes down, the GLBP weighting is reduced by the default value of 10. If both GigabitEthernet interfaces go down, the GLBP weighting will fall below the lower threshold and the device will no longer be an active forwarder. To resume its role as an active forwarder, the device must have both tracked interfaces back up, and the weighting must rise above the upper threshold.

```
Device(config)# track 1 interface GigabitEthernet 1/0/1 line-protocol
Device(config-track)# exit
```

```
Device(config)# track 2 interface GigabitEthernet 1/0/3 line-protocol
Device(config-track)# exit
Device(config)# interface TenGigabitEthernet 0/0/1
Device(config-if)# ip address 10.21.8.32 255.255.255.0
Device(config-if)# glbp 10 weighting 110 lower 95 upper 105
Device(config-if)# glbp 10 weighting track 1
Device(config-if)# glbp 10 weighting track 2
```

**Related Commands**

Command	Description
<b>glbp weighting</b>	Specifies the initial weighting value of a GLBP gateway.
<b>glbp weighting track</b>	Specifies an object to be tracked that affects the weighting of a GLBP gateway.

## vrrp

To create a Virtual Router Redundancy Protocol version 3 (VRRPv3) group and enter VRRPv3 group configuration mode, use the **vrrp**. To remove the VRRPv3 group, use the **no** form of this command.

```
vrrp group-id address-family {ipv4 | ipv6}
no vrrp group-id address-family {ipv4 | ipv6}
```

<b>Syntax Description</b>	
<i>group-id</i>	Virtual router group number. The range is from 1 to 255.
<b>address-family</b>	Specifies the address-family for this VRRP group.
<b>ipv4</b>	(Optional) Specifies IPv4 address.
<b>ipv6</b>	(Optional) Specifies IPv6 address.

<b>Command Default</b>	None
------------------------	------

<b>Command Modes</b>	Interface configuration (config-if)
----------------------	-------------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
		This command was introduced..

### Usage Guidelines

#### Examples

The following example shows how to create a VRRPv3 group and enter VRRP configuration mode:

```
Device(config-if)# vrrp 3 address-family ipv4
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>timers advertise</b>	Sets the advertisement timer in milliseconds.

# vrrp description

To assign a description to the Virtual Router Redundancy Protocol (VRRP) group, use the **vrrp description** command in interface configuration mode. To remove the description, use the **no** form of this command.

**description** *text*  
**no** **description**

<b>Syntax Description</b>	<i>text</i> Text (up to 80 characters) that describes the purpose or use of the group.
---------------------------	--

<b>Command Default</b>	There is no description of the VRRP group.
------------------------	--

<b>Command Modes</b>	VRRP configuration (config-if-vrrp)
----------------------	-------------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Release 16.2.1	This command was introduced.

<b>Examples</b>	The following example enables VRRP. VRRP group 1 is described as Building A – Marketing and Administration.
-----------------	---

```
Device(config-if-vrrp)# description Building A - Marketing and Administration
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>vrrp</b>	Creates a VRRPv3 group and enters VRRPv3 group configuration mode.

# vrrp preempt

To configure the device to take over as the current primary virtual router for a Virtual Router Redundancy Protocol (VRRP) group if it has higher priority than the current primary virtual router, use the **preempt** command in VRRP configuration mode. To disable this function, use the **no** form of this command.

**preempt [delay minimum seconds]**  
**no preempt**

<b>Syntax Description</b>	<b>delay minimum seconds</b>	(Optional) Number of seconds that the device will delay before issuing an advertisement claiming primary ownership. The default delay is 0 seconds.
---------------------------	------------------------------	---

**Command Default** This command is enabled.

**Command Modes** VRRP configuration (config-if-vrrp)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Release 2.1	This command was introduced.

**Usage Guidelines** By default, the device being configured with this command will take over as primary virtual router for the group if it has a higher priority than the current primary virtual router. You can configure a delay, which will cause the VRRP device to wait the specified number of seconds before issuing an advertisement claiming primary ownership.



**Note** The device that is the IP address owner will preempt, regardless of the setting of this command.

## Examples

The following example configures the device to preempt the current primary virtual router when its priority of 200 is higher than that of the current primary virtual router. If the device preempts the current primary virtual router, it waits 15 seconds before issuing an advertisement claiming it is the primary virtual router.

```
Device(config-if-vrrp)#preempt delay minimum 15
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>vrrp</b>	Creates a VRRPv3 group and enters VRRPv3 group configuration mode.
	<b>priority</b>	Sets the priority level of the device within a VRRP group.

# vrrp priority

To set the priority level of the device within a Virtual Router Redundancy Protocol (VRRP) group, use the **priority** command in interface configuration mode. To remove the priority level of the device, use the **no** form of this command.

**priority** *level*  
**no priority** *level*

<b>Syntax Description</b>	<i>level</i> Priority of the device within the VRRP group. The range is from 1 to 254. The default is 100.
---------------------------	--

**Command Default** The priority level is set to the default value of 100.

**Command Modes** VRRP configuration (config-if-vrrp)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Release 2.1	This command was introduced.

**Usage Guidelines** Use this command to control which device becomes the primary virtual router.

**Examples** The following example configures the device with a priority of 254:

```
Device(config-if-vrrp)# priority 254
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>vrrp</b>	Creates a VRRPv3 group and enters VRRPv3 group configuration mode.
	<b>vrrp preempt</b>	Configures the device to take over as primary virtual router for a VRRP group if it has higher priority than the current primary virtual router.

# vrrp timers advertise

To configure the interval between successive advertisements by the primary virtual router in a Virtual Router Redundancy Protocol (VRRP) group, use the **timers advertise** command in VRRP configuration mode. To restore the default value, use the **no** form of this command.

```
timers advertise [msec] interval
no timers advertise [msec] interval
```

Syntax Description	<p><b>group</b> Virtual router group number. The group number range is from 1 to 255.</p> <p><b>msec</b> (Optional) Changes the unit of the advertisement time from seconds to milliseconds. Without this keyword, the advertisement interval is in seconds.</p> <p><b>interval</b> Time interval between successive advertisements by the primary virtual router. The unit of the interval is in seconds, unless the <b>msec</b> keyword is specified. The default is 1 second. The valid range is 1 to 255 seconds. When the <b>msec</b> keyword is specified, the valid range is 50 to 999 milliseconds.</p>
--------------------	---

**Command Default** The default interval of 1 second is configured.

**Command Modes** VRRP configuration (config-if-vrrp)

Command History	Release	Modification
	Cisco IOS XE Release 16.2.1	This command was introduced.

**Usage Guidelines** The advertisements being sent by the primary virtual router communicate the state and priority of the current primary virtual router.

The **vrrp timers advertise** command configures the time between successive advertisement packets and the time before other routers declare the primary router to be down. Routers or access servers on which timer values are not configured can learn timer values from the primary router. The timers configured on the primary router always override any other timer settings. All routers in a VRRP group must use the same timer values. If the same timer values are not set, the devices in the VRRP group will not communicate with each other and any misconfigured device will change its state to primary.

## Examples

The following example shows how to configure the primary virtual router to send advertisements every 4 seconds:

```
Device(config-if-vrrp)# timers advertise 4
```

Related Commands	Command	Description
	<b>vrrp</b>	Creates a VRRPv3 group and enters VRRPv3 group configuration mode.

Command	Description
<b>timers learn</b>	Configures the device, when it is acting as backup virtual router for a VRRP group, to learn the advertisement interval used by the primary virtual router.

# vrss leader

To specify a leader's name to be registered with Virtual Router Redundancy Service (VRRS), use the **vrss leader** command. To remove the specified VRRS leader, use the **no** form of this command.

```
vrss leader vrss-leader-name
no vrss leader vrss-leader-name
```

<b>Syntax Description</b>	<i>vrss-leader-name</i> Name of VRRS Tag to lead.
---------------------------	---

<b>Command Default</b>	A registered VRRS name is unavailable by default.
------------------------	---

<b>Command Modes</b>	VRRP configuration (config-if-vrrp)
----------------------	-------------------------------------

<b>Command History</b>	<b>Release</b> <b>Modification</b>
	This command was introduced.

<b>Examples</b>	The following example specifies a leader's name to be registered with VRRS:
-----------------	---

```
Device(config-if-vrrp)# vrss leader leader-1
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>vrrp</b>	Creates a VRRP group and enters VRRP configuration mode.

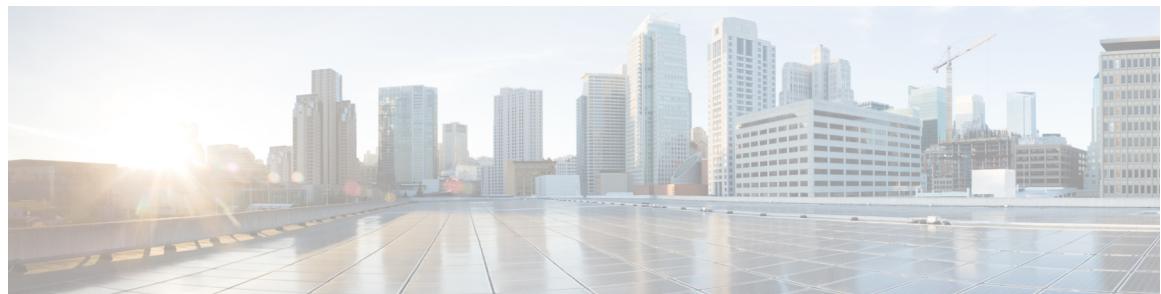


PART **IV**

## **IP Multicast Routing**

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## IP Multicast Routing Commands

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- [show mdns cache](#), on page 345
- [show mdns requests](#), on page 347
- [show mdns statistics](#), on page 348
- [show platform software fed switch ip multicast groups](#), on page 349
- [show platform software fed switch ip multicast](#), on page 350
- [show platform software fed switch ip multicast df](#), on page 353

# cache-memory-max

To set the percentage of the system memory for cache, use the **cache-memory-max** command. To remove the percentage of system memory for cache, use the **no** form of this command.

```
cache-memory-max cache-config-percentage
no cache-memory-max cache-config-percentage
```

---

**Syntax Description**

*cache-config-percentage* A percentage of the system memory for cache.

---

**Command Default**

By default, the system memory is set to 10 percent.

**Command Modes**

mDNS configuration

**Command History**

Release	Modification
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Cisco IOS XE 3.3SE	This command was introduced.
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---

**Usage Guidelines**

The number of services learned in a network could be large, so there is an upper limit on the amount of cache memory that can be used.

**Note**

You can override the default value by using this command.

---

When you try to add new records, and the cache is full, the records in the cache that are close to expiring are deleted to provide space for the new records.

**Example**

This example sets 20 percent of the system memory for cache:

```
Device(config-mdns)# cache-memory-max 20
```

**clear ip mfib counters**

# clear ip mfib counters

To clear all the active IPv4 Multicast Forwarding Information Base (MFIB) traffic counters, use the **clear ip mfib counters** command in privileged EXEC mode.

```
clear ip mfib [global | vrf *] counters [group-address] [hostname | source-address]
```

<b>Syntax Description</b>	<p><b>global</b> (Optional) Resets the IP MFIB cache to the global default configuration.</p> <p><b>vrf *</b> (Optional) Clears the IP MFIB cache for all VPN routing and forwarding instances.</p> <p><b>group-address</b> (Optional) Limits the active MFIB traffic counters to the indicated group address.</p> <p><b>hostname</b> (Optional) Limits the active MFIB traffic counters to the indicated host name.</p> <p><b>source-address</b> (Optional) Limits the active MFIB traffic counters to the indicated source address.</p>				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

## Example

The following example shows how to reset all the active MFIB traffic counters for all the multicast tables:

```
Device# clear ip mfib counters
```

The following example shows how to reset the IP MFIB cache counters to the global default configuration:

```
Device# clear ip mfib global counters
```

The following example shows how to clear the IP MFIB cache for all the VPN routing and forwarding instances:

```
Device# clear ip mfib vrf * counters
```

# clear ip mroute

To delete the entries in the IP multicast routing table, use the **clear ip mroute** command in privileged EXEC mode.

```
clear ip mroute [vrf vrf-name] {* | ip-address | group-address} [hostname | source-address]
```

<b>Syntax Description</b>	<p><b>vrf vrf-name</b> (Optional) Specifies the name that is assigned to the multicast VPN routing and forwarding (VRF) instance.</p> <p><b>*</b> Specifies all Multicast routes.</p> <p><b>ip-address</b> Multicast routes for the IP address.</p> <p><b>group-address</b> Multicast routes for the group address.</p> <p><b>hostname</b> (Optional) Multicast routes for the host name.</p> <p><b>source-address</b> (Optional) Multicast routes for the source address.</p>				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** The *group-address* variable specifies one of the following:

- Name of the multicast group as defined in the DNS hosts table or with the **ip host** command.
- IP address of the multicast group in four-part, dotted notation.

If you specify a group name or address, you can also enter the source argument to specify a name or address of a multicast source that is sending to the group. A source does not need to be a member of the group.

## Example

The following example shows how to delete all the entries from the IP multicast routing table:

```
Device# clear ip mroute *
```

The following example shows how to delete all the sources on the 228.3.0.0 subnet that are sending to the multicast group 224.2.205.42 from the IP multicast routing table. This example shows how to delete all sources on network 228.3, not individual sources:

```
Device# clear ip mroute 224.2.205.42 228.3.0.0
```

**ip igmp explicit-tracking**

# ip igmp explicit-tracking

To enable explicit tracking of hosts, groups, and channels for Internet Group Management Protocol Version 3 (IGMPv3), use the **ip igmp explicit-tracking** command in interface configuration mode. To disable this capability, use the **no** form of this command.

```
ip igmp explicit-tracking
no ip igmp explicit-tracking
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** Explicit tracking of hosts, groups and channels for IGMPv3 is disabled.

**Command Modes** Interface configuration (config-if)

Release	Modification
Cisco IOS XE Everest 16.6.1	This command was introduced.

**Usage Guidelines** This command enables explicit tracking on Layer 3 interfaces.

Use the **ip igmp explicit-tracking** command to enable a multicast device to explicitly track the membership of multicast hosts in a particular multiaccess network. This capability enables the device to track each individual host that is joined to a particular group or channel and to achieve minimal leave latencies when hosts leave a multicast group or channel.



**Note** Before configuring the **ip igmp explicit-tracking** command, IGMP must be enabled (IGMP is enabled by enabling PIM on an interface using the **ip pim** command). In addition, IGMPv3 should be configured on the interface. To configure IGMPv3, use the **ip igmp version 3** command in interface configuration mode.



**Note** When explicit tracking is enabled, the device uses more memory than if explicit tracking is disabled because the router must store the membership state of all hosts on the interface.

To monitor the IGMP membership of hosts, use the **show ip igmp membership** command.

## Examples

The following example shows how to enable explicit tracking. The example shows a basic configuration for enabling IP multicast with SSM, IGMPv3, and explicit tracking.

```
Device(config)# ip multicast-routing
Device(config)# interface gigabitethernet 1/0/2
Device(config-if)# ip address 10.1.0.1 255.255.255.0
Device(config-if)# ip pim sparse-dense-mode
Device(config-if)# ip igmp version 3
Device(config-if)# ip igmp explicit-tracking
Device(config-if)# end
```

Related Commands	Command	Description
	<b>ip igmp version</b>	Configures the version of IGMP that the device uses.
	<b>ip pim</b>	Enables PIM on an interface.
	<b>show ip igmp membership</b>	Displays the IGMP membership information for multicast groups and channels.

# ip igmp filter

To control whether or not all the hosts on a Layer 2 interface can join one or more IP multicast groups by applying an Internet Group Management Protocol (IGMP) profile to the interface, use the **ip igmp filter** interface configuration command on the device stack or on a standalone device. To remove the specified profile from the interface, use the **no** form of this command.

**ip igmp filter** *profile number*  
**no ip igmp filter**

<b>Syntax Description</b>	<i>profile number</i> IGMP profile number to be applied. The range is 1—4294967295.	
<b>Command Default</b>	No IGMP filters are applied.	
<b>Command Modes</b>	Interface configuration (config-if)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
<b>Usage Guidelines</b>	<p>You can apply IGMP filters only to Layer 2 physical interfaces; you cannot apply IGMP filters to routed ports, switch virtual interfaces (SVIs), or ports that belong to an EtherChannel group.</p> <p>An IGMP profile can be applied to one or more device port interfaces, but one port can have only one profile applied to it.</p>	

## Example

This example shows how to configure IGMP profile 40 to permit the specified range of IP multicast addresses, then shows how to apply that profile to a port as a filter:

```
Device(config)# ip igmp profile 40
Device(config-igmp-profile)# permit
Device(config-igmp-profile)# range 233.1.1.1 233.255.255.255
Device(config-igmp-profile)# exit
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# switchport
*Jan 3 18:04:17.007: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/1, changed state to down.
NOTE: If this message appears, this interface changes to layer 2, so that you can apply the
filter.
Device(config-if)# ip igmp filter 40
```

You can verify your setting by using the **show running-config** command in privileged EXEC mode and by specifying an interface.

# ip igmp max-groups

To set the maximum number of Internet Group Management Protocol (IGMP) groups that a Layer 2 interface can join or to configure the IGMP throttling action when the maximum number of entries is in the forwarding table, use the **ip igmp max-groups** interface configuration command on the device stack or on a standalone device. To set the maximum back to the default, which is to have no maximum limit, or to return to the default throttling action, which is to drop the report, use the **no** form of this command.

```
ip igmp max-groups {max number | action { deny | replace } }
no ip igmp max-groups {max number | action }
```

<b>Syntax Description</b>	
<i>max number</i>	Maximum number of IGMP groups that an interface can join. The range is 0—4294967294. The default is no limit.
<b>action deny</b>	Drops the next IGMP join report when the maximum number of entries is in the IGMP snooping forwarding table. This is the default action.
<b>action replace</b>	Replaces the existing group with the new group for which the IGMP report was received when the maximum number of entries is in the IGMP snooping forwarding table.

## Command Default

The default maximum number of groups is no limit.  
After the device learns the maximum number of IGMP group entries on an interface, the default throttling action is to drop the next IGMP report that the interface receives and to not add an entry for the IGMP group to the interface.

## Command Modes

Interface configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

You can use this command only on Layer 2 physical interfaces and on logical EtherChannel interfaces. You cannot set IGMP maximum groups for routed ports, switch virtual interfaces (SVIs), or ports that belong to an EtherChannel group.

Follow these guidelines when configuring the IGMP throttling action:

- If you configure the throttling action as deny, and set the maximum group limit, the entries that were previously in the forwarding table are not removed, but are aged out. After these entries are aged out, when the maximum number of entries is in the forwarding table, the device drops the next IGMP report received on the interface.
- If you configure the throttling action as replace, and set the maximum group limitation, the entries that were previously in the forwarding table are removed. When the maximum number of entries is in the forwarding table, the device replaces a randomly selected multicast entry with the received IGMP report.
- When the maximum group limitation is set to the default (no maximum), entering the **ip igmp max-groups {deny | replace}** command has no effect.

```
ip igmp max-groups
```

### Example

The following example shows how to limit the number of IGMP groups that a port can join to 25:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# ip igmp max-groups 25
```

The following example shows how to configure the device to replace the existing group with the new group for which the IGMP report was received when the maximum number of entries is in the forwarding table:

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# ip igmp max-groups action replace
```

You can verify your setting by using the **show running-config** privileged EXEC command and by specifying an interface.

# ip igmp profile

To create an Internet Group Management Protocol (IGMP) profile and enter IGMP profile configuration mode, use the **ip igmp profile** global configuration command on the device stack or on a standalone device. From this mode, you can specify the configuration of the IGMP profile to be used for filtering IGMP membership reports from a switch port. To delete the IGMP profile, use the **no** form of this command.

**ip igmp profile *profile number***  
**no ip igmp profile *profile number***

<b>Syntax Description</b>	<i>profile number</i> The IGMP profile number being configured. The range is 1—4294967295.				
<b>Command Default</b>	No IGMP profiles are defined. When configured, the default action for matching an IGMP profile is to deny matching addresses.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	When you are in IGMP profile configuration mode, you can create a profile by using these commands:
	<ul style="list-style-type: none"> <li>• <b>deny</b>—Specifies that matching addresses are denied; this is the default condition.</li> <li>• <b>exit</b>—Exits from igmp-profile configuration mode.</li> <li>• <b>no</b>—Negates a command or resets to its defaults.</li> <li>• <b>permit</b>—Specifies that matching addresses are permitted.</li> <li>• <b>range</b>—Specifies a range of IP addresses for the profile. This can be a single IP address or a range with a start and an end address.</li> </ul> <p>When entering a range, enter the low IP multicast address, a space, and the high IP multicast address.</p>

You can apply an IGMP profile to one or more Layer 2 interfaces, but each interface can have only one profile applied to it.

## Example

The following example shows how to configure IGMP profile 40, which permits the specified range of IP multicast addresses:

```
Device(config)# ip igmp profile 40
Device(config-igmp-profile)# permit
Device(config-igmp-profile)# range 233.1.1.1 233.255.255.255
```

You can verify your settings by using the **show ip igmp profile** command in privileged EXEC mode.

**ip igmp snooping**

# ip igmp snooping

To globally enable Internet Group Management Protocol (IGMP) snooping on the device or to enable it on a per-VLAN basis, use the **ip igmp snooping** global configuration command on the device stack or on a standalone device. To return to the default setting, use the **no** form of this command.

```
ip igmp snooping [vlan vlan-id]
no ip igmp snooping [vlan vlan-id]
```

<b>Syntax Description</b>	<b>vlan <i>vlan-id</i></b> (Optional) Enables IGMP snooping on the specified VLAN. Ranges are 1—1001 and 1006—4094.
---------------------------	---

<b>Command Default</b>	IGMP snooping is globally enabled on the device.
	IGMP snooping is enabled on VLAN interfaces.

<b>Command Modes</b>	Global configuration
----------------------	----------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	When IGMP snooping is enabled globally, it is enabled in all of the existing VLAN interfaces. When IGMP snooping is globally disabled, it is disabled on all of the existing VLAN interfaces.  VLAN IDs 1002 to 1005 are reserved for Token Ring and FDDI VLANs, and cannot be used in IGMP snooping.
-------------------------	---

## Example

The following example shows how to globally enable IGMP snooping:

```
Device(config)# ip igmp snooping
```

The following example shows how to enable IGMP snooping on VLAN 1:

```
Device(config)# ip igmp snooping vlan 1
```

You can verify your settings by entering the **show ip igmp snooping** command in privileged EXEC mode.

# ip igmp snooping vlan explicit-tracking

To enable the explicit tracking of hosts, groups, and channels for Internet Group Management Protocol (IGMP), use the **ip igmp snooping vlan explicit-tracking** command in global configuration mode. To disable IGMP explicit tracking, use the **no** form of this command.

```
ip igmp snooping vlan vlan-ID explicit-tracking
no ip igmp snooping vlan vlan-ID explicit-tracking
```

<b>Syntax Description</b>	<i>vlan-ID</i> VLAN ID; the range is 1 to 1001 and 1006 to 4094.
---------------------------	--

<b>Command Default</b>	Explicit tracking of hosts, groups and channels for IGMP is disabled.
------------------------	---

<b>Command Modes</b>	Global configuration (config)
----------------------	-------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.6.1	This command was introduced.

<b>Usage Guidelines</b>	Use the <b>ip igmp snooping vlan explicit-tracking</b> command to enable a multicast device to explicitly track the membership of multicast hosts in a particular multiaccess network. This capability enables the device to track each individual host that is joined to a particular group or channel and to achieve minimal leave latencies when hosts leave a multicast group or channel.
-------------------------	---



<b>Note</b>	When explicit tracking is enabled, the device uses more memory than if explicit tracking is disabled because the device must store the membership state of all hosts on the interface.
-------------	--

## Example

The following example shows how to enable explicit tracking.

```
Device# configure terminal
Device(config)# ip multicast-routing
Device(config)# ip igmp snooping vlan 1 explicit-tracking
Device(config)# exit
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>ip multicast-routing</b>	Enables IP multicast routing.

**ip igmp snooping last-member-query-count**

# ip igmp snooping last-member-query-count

To configure how often Internet Group Management Protocol (IGMP) snooping will send query messages in response to receiving an IGMP leave message, use the **ip igmp snooping last-member-query-count** command in global configuration mode. To set *count* to the default value, use the **no** form of this command.

```
ip igmp snooping [vlan vlan-id] last-member-query-count count
no ip igmp snooping [vlan vlan-id] last-member-query-count count
```

<b>Syntax Description</b>	<b>vlan <i>vlan-id</i></b> (Optional) Sets the count value on a specific VLAN ID. The range is from 1—1001. Do not enter leading zeroes. <b>count</b> Interval at which query messages are sent, in milliseconds. The range is from 1—7. The default is 2.				
<b>Command Default</b>	A query is sent every 2 milliseconds.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>When a multicast host leaves a group, the host sends an IGMP leave message. To check if this host is the last to leave the group, IGMP query messages are sent when the leave message is seen until the <b>last-member-query-interval</b> timeout period expires. If no response is received to the last-member queries before the timeout period expires, the group record is deleted.</p> <p>Use the <b>ip igmp snooping last-member-query-interval</b> command to configure the timeout period.</p> <p>When both IGMP snooping immediate-leave processing and the query count are configured, immediate-leave processing takes precedence.</p>				



**Note** Do not set the count to 1 because the loss of a single packet (the query packet from the device to the host or the report packet from the host to the device) may result in traffic forwarding being stopped even if the receiver is still there. Traffic continues to be forwarded after the next general query is sent by the device, but the interval during which a receiver may not receive the query could be as long as 1 minute (with the default query interval).

The leave latency in Cisco IOS software may increase by up to 1 last-member query interval (LMQI) value when the device is processing more than one leave within an LMQI. In such a scenario, the average leave latency is determined by the  $(\text{count} + 0.5) * \text{LMQI}$ . The result is that the default leave latency can range from 2.0 to 3.0 seconds with an average of 2.5 seconds under a higher load of IGMP leave processing. The leave latency under load for the minimum LMQI value of 100 milliseconds and a count of 1 is from 100 to 200 milliseconds, with an average of 150 milliseconds. This is done to limit the impact of higher rates of IGMP leave messages.

### Example

The following example shows how to set the last member query count to 5:

```
Device(config)# ip igmp snooping last-member-query-count 5
```

**ip igmp snooping querier**

# ip igmp snooping querier

To globally enable the Internet Group Management Protocol (IGMP) querier function in Layer 2 networks, use the **ip igmp snooping querier** global configuration command. Use the command with keywords to enable and configure the IGMP querier feature on a VLAN interface. To return to the default settings, use the **no** form of this command.

```
ip igmp snooping [vlan vlan-id] querier [address ip-address | max-response-time response-time | query-interval interval-count | tcn query {count count | interval interval} | timer expiry expiry-time | version version]
no ip igmp snooping [vlan vlan-id] querier [address | max-response-time | query-interval | tcn query {count | interval} | timer expiry | version]
```

Syntax Description					
<b>vlan <i>vlan-id</i></b>	(Optional) Enables IGMP snooping and the IGMP querier function on the specified VLAN. Ranges are 1—1001 and 1006—4094.				
<b>address <i>ip-address</i></b>	(Optional) Specifies a source IP address. If you do not specify an IP address, the querier tries to use the global IP address configured for the IGMP querier.				
<b>max-response-time <i>response-time</i></b>	(Optional) Sets the maximum time to wait for an IGMP querier report. The range is 1—25 seconds.				
<b>query-interval <i>interval-count</i></b>	(Optional) Sets the interval between IGMP queriers. The range is 1—18000 seconds.				
<b>tcn query</b>	(Optional) Sets parameters related to Topology Change Notifications (TCNs).				
<b>count <i>count</i></b>	Sets the number of TCN queries to be executed during the TCN interval time. The range is 1—10.				
<b>interval <i>interval</i></b>	Sets the TCN query interval time. The range is 1—255.				
<b>timer expiry <i>expiry-time</i></b>	(Optional) Sets the length of time until the IGMP querier expires. The range is 60—300 seconds.				
<b>version <i>version</i></b>	(Optional) Selects the IGMP version number that the querier feature uses. Select either 1 or 2.				
<b>Command Default</b>	The IGMP snooping querier feature is globally disabled on the device. When enabled, the IGMP snooping querier disables itself if it detects IGMP traffic from a multicast router.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

## Usage Guidelines

Use this command to enable IGMP snooping to detect the IGMP version and IP address of a device that sends IGMP query messages, which is also called a querier.

By default, the IGMP snooping querier is configured to detect devices that use IGMP Version 2 (IGMPv2), but does not detect clients that are using IGMP Version 1 (IGMPv1). You can manually configure the **max-response-time** value when devices use IGMPv2. You cannot configure the max-response-time when devices use IGMPv1. (The value cannot be configured, and is set to zero).

Non-RFC-compliant devices running IGMPv1 might reject IGMP general query messages that have a non-zero value as the **max-response-time** value. If you want the devices to accept the IGMP general query messages, configure the IGMP snooping querier to run IGMPv1.

VLAN IDs 1002—1005 are reserved for Token Ring and FDDI VLANs, and cannot be used in IGMP snooping.

## Example

The following example shows how to globally enable the IGMP snooping querier feature:

```
Device(config)# ip igmp snooping querier
```

The following example shows how to set the IGMP snooping querier maximum response time to 25 seconds:

```
Device(config)# ip igmp snooping querier max-response-time 25
```

The following example shows how to set the IGMP snooping querier interval time to 60 seconds:

```
Device(config)# ip igmp snooping querier query-interval 60
```

The following example shows how to set the IGMP snooping querier TCN query count to 25:

```
Device(config)# ip igmp snooping querier tcn count 25
```

The following example shows how to set the IGMP snooping querier timeout value to 60 seconds:

```
Device(config)# ip igmp snooping querier timer expiry 60
```

The following example shows how to set the IGMP snooping querier feature to Version 2:

```
Device(config)# ip igmp snooping querier version 2
```

You can verify your settings by entering the **show ip igmp snooping** privileged EXEC command.

**ip igmp snooping report-suppression**

# ip igmp snooping report-suppression

To enable Internet Group Management Protocol (IGMP) report suppression, use the **ip igmp snooping report-suppression** global configuration command on the device stack or on a standalone device. To disable IGMP report suppression, and to forward all IGMP reports to multicast routers, use the **no** form of this command.

**ip igmp snooping report-suppression**  
**no ip igmp snooping report-suppression**

**Syntax Description** This command has no arguments or keywords.

**Command Default** IGMP report suppression is enabled.

**Command Modes** Global configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** IGMP report suppression is supported only when the multicast query has IGMPv1 and IGMPv2 reports. This feature is not supported when the query includes IGMPv3 reports.

The device uses IGMP report suppression to forward only one IGMP report per multicast router query to multicast devices. When IGMP report suppression is enabled (the default), the device sends the first IGMP report from all the hosts for a group to all the multicast routers. The device does not send the remaining IGMP reports for the group to the multicast routers. This feature prevents duplicate reports from being sent to the multicast devices.

If the multicast router query includes requests only for IGMPv1 and IGMPv2 reports, the device forwards only the first IGMPv1 or IGMPv2 report from all the hosts for a group to all of the multicast routers. If the multicast router query also includes requests for IGMPv3 reports, the device forwards all IGMPv1, IGMPv2, and IGMPv3 reports for a group to the multicast devices.

If you disable IGMP report suppression by entering the **no ip igmp snooping report-suppression** command, all IGMP reports are forwarded to all of the multicast routers.

## Example

The following example shows how to disable report suppression:

```
Device(config)# no ip igmp snooping report-suppression
```

You can verify your settings by entering the **show ip igmp snooping** command in privileged EXEC mode.

# ip igmp snooping vlan mrouter

To add a multicast router port, use the **ip igmp snooping mrouter** global configuration command on the device stack or on a standalone device. To return to the default settings, use the **no** form of this command.

```
ip igmp snooping vlan vlan-id mrouter {interface interface-id}
no ip igmp snooping vlan vlan-id mrouter {interface interface-id}
```

<b>Syntax Description</b>	<p><i>vlan-id</i> Enables IGMP snooping, and adds the port in the specified VLAN as the multicast router port. Ranges are 1—1001 and 1006—4094.</p>				
<b>interface <i>interface-id</i></b>	Specifies the next-hop interface to the multicast router. The arguments have these meanings: <ul style="list-style-type: none"> <li>• <i>gigabitethernet interface number</i>—A Gigabit Ethernet IEEE 802.3z interface.</li> <li>• <i>tengigabitethernet interface number</i>—A 10-Gigabit Ethernet IEEE 802.3z interface.</li> <li>• <i>port-channel interface number</i>—A channel interface. The range is 0—128.</li> </ul>				
<b>Command Default</b>	By default, there are no multicast router ports.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	VLAN IDs 1002—1005 are reserved for Token Ring and FDDI VLANs, and cannot be used in IGMP snooping. The configuration is saved in NVRAM.				

## Example

The following example shows how to configure a port as a multicast router port:

```
Device(config)# ip igmp snooping vlan 1 mrouter interface gigabitethernet1/0/2
```

You can verify your settings by entering the **show ip igmp snooping** privileged EXEC command.

**ip igmp snooping vlan static**

## ip igmp snooping vlan static

To enable Internet Group Management Protocol (IGMP) snooping and to statically add a Layer 2 port as a member of a multicast group, use the **ip igmp snooping vlan static** global configuration command on the device stack or on a standalone device. To remove the port specified as members of a static multicast group, use the **no** form of this command.

```
ip igmp snooping vlan vlan-id static ip-address interface interface-id
no ip igmp snooping vlan vlan-id static ip-address interface interface-id
```

<b>Syntax Description</b>	<p><i>vlan-id</i> Enables IGMP snooping on the specified VLAN. Ranges are 1—1001 and 1006—4094.</p> <p><i>ip-address</i> Adds a Layer 2 port as a member of a multicast group with the specified group IP address.</p> <p><b>interface <i>interface-id</i></b> Specifies the interface of the member port. The <i>interface-id</i> has these options:</p> <ul style="list-style-type: none"> <li>• <i>fastethernet interface number</i>—A Fast Ethernet IEEE 802.3 interface.</li> <li>• <i>gigabitethernet interface number</i>—A Gigabit Ethernet IEEE 802.3z interface.</li> <li>• <i>tengigabitethernet interface number</i>—A 10-Gigabit Ethernet IEEE 802.3z interface.</li> <li>• <i>port-channel interface number</i>—A channel interface. The range is 0—128.</li> </ul>				
<b>Command Default</b>	By default, no ports are statically configured as members of a multicast group.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>VLAN IDs 1002 to 1005 are reserved for Token Ring and FDDI VLANs, and cannot be used in IGMP snooping.</p> <p>The configuration is saved in NVRAM.</p>				

### Example

The following example shows how to statically configure a host on an interface:

```
Device(config)# ip igmp snooping vlan 1 static 224.2.4.12 interface
gigabitEthernet1/0/1
```

```
Configuring port gigabitethernet1/0/1 on group 224.2.4.12
```

You can verify your settings by entering the **show ip igmp snooping** command in privileged EXEC mode.

# ip igmp version

To configure the version of Internet Group Management Protocol (IGMP) on a device, use the **ip igmp version** command in interface configuration mode. To restore the default value, use the **no** form of this command.

```
ip igmp version {1 | 2 | 3}
no ip igmp version
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>1</b></td><td>IGMP Version 1.</td></tr> <tr> <td><b>2</b></td><td>IGMP Version 2. This is the default.</td></tr> <tr> <td><b>3</b></td><td>IGMP Version 3.</td></tr> </table>	<b>1</b>	IGMP Version 1.	<b>2</b>	IGMP Version 2. This is the default.	<b>3</b>	IGMP Version 3.
<b>1</b>	IGMP Version 1.						
<b>2</b>	IGMP Version 2. This is the default.						
<b>3</b>	IGMP Version 3.						
<b>Command Default</b>	Version 2						
<b>Command Modes</b>	Interface configuration (config-if)						
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.6.1</td><td>This command was introduced in a release prior to Cisco IOS XE Everest 16.6.1.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.6.1	This command was introduced in a release prior to Cisco IOS XE Everest 16.6.1.		
<b>Release</b>	<b>Modification</b>						
Cisco IOS XE Everest 16.6.1	This command was introduced in a release prior to Cisco IOS XE Everest 16.6.1.						
<b>Usage Guidelines</b>	All devices on the subnet must support the same version of IGMP. Hosts can have any IGMP version (1, 2, or 3) and the device will correctly detect their presence and query them appropriately.						
<b>Examples</b>	The following example shows how to configure IGMP Version 3 on a device:						
	<pre>Device(config-if)# ip igmp version 3</pre>						
<b>Related Commands</b>	<table border="1"> <thead> <tr> <th><b>Command</b></th><th><b>Description</b></th></tr> </thead> <tbody> <tr> <td><b>show ip igmp groups</b></td><td>Displays the multicast groups that are directly connected to the router and that were learned through IGMP.</td></tr> <tr> <td><b>show ip igmp interface</b></td><td>Displays multicast-related information about an interface.</td></tr> </tbody> </table>	<b>Command</b>	<b>Description</b>	<b>show ip igmp groups</b>	Displays the multicast groups that are directly connected to the router and that were learned through IGMP.	<b>show ip igmp interface</b>	Displays multicast-related information about an interface.
<b>Command</b>	<b>Description</b>						
<b>show ip igmp groups</b>	Displays the multicast groups that are directly connected to the router and that were learned through IGMP.						
<b>show ip igmp interface</b>	Displays multicast-related information about an interface.						

**ip multicast auto-enable**

# ip multicast auto-enable

To support authentication, authorization, and accounting (AAA) enabling of IP multicast, use the **ip multicast auto-enable** command. This command allows multicast routing to be enabled dynamically on dialup interfaces using AAA attributes from a RADIUS server. To disable IP multicast for AAA, use the **no** form of this command.

```
ip multicast auto-enable
no ip multicast auto-enable
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** None

## Example

The following example shows how to enable AAA on IP multicast:

```
Device(config)# ip multicast auto-enable
```

# ip pim accept-register

To configure a candidate rendezvous point (RP) switch to filter Protocol Independent Multicast (PIM) register messages, use the **ip pim accept-register** command in global configuration mode. To disable this function, use the **no** form of this command.

```
ip pim [vrf vrf-name] accept-register {list access-list}
no ip pim [vrf vrf-name] accept-register
```

<b>Syntax Description</b>	<p><b>vrf vrf-name</b> (Optional) Configures a PIM register filter on candidate RPs for (S, G) traffic associated with the multicast Virtual Private Network (VPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.</p> <p><b>list access-list</b> Specifies the <i>access-list</i> argument as a number or name that defines the (S, G) traffic in PIM register messages to be permitted or denied. The range is 100—199 and the expanded range is 2000—2699. An IP-named access list can also be used.</p>				
<b>Command Default</b>	No PIM register filters are configured.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** Use this command to prevent unauthorized sources from registering with the RP. If an unauthorized source sends a register message to the RP, the RP will immediately send back a register-stop message.

The access list provided for the **ip pim accept-register** command should only filters IP source addresses and IP destination addresses. Filtering on other fields (for example, IP protocol or UDP port number) will not be effective and may cause undesired traffic to be forwarded from the RP down the shared tree to multicast group members. If more complex filtering is required, use the **ip multicast boundary** command instead.

## Example

The following example shows how to permit register packets for a source address sending to any group range, with the exception of source address 172.16.10.1 sending to the SSM group range (232.0.0.0/8). These are denied. These statements should be configured on all candidate RPs because candidate RPs will receive PIM registers from first-hop routers or switches.

```
Device(config)# ip pim accept-register list ssm-range
Device(config)# ip access-list extended ssm-range
Device(config-ext-nacl)# deny ip any 232.0.0.0 0.255.255.255
Device(config-ext-nacl)# permit ip any any
```

**ip pim bidir-enable**

# ip pim bidir-enable

To enable bidirectional Protocol Independent Multicast (bidirectional PIM), use the **ip pim bidir-enable** command in global configuration mode. To disable bidirectional PIM, use the **no** form of this command.

**ip pim bidir-enable**

**no ip pim bidir-enable**

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.12.1	This command was introduced.

**Command Default** The command is enabled.

**Command Modes** Global configuration (config)

**Usage Guidelines** When bidirectional PIM is disabled, the router will behave similarly to a router without bidirectional PIM support. The following conditions will apply:

- PIM hello messages sent by the router will not contain the bidirectional mode option.
- The router will not send designated forwarder (DF) election messages and will ignore DF election messages it receives.
- The **ip pim rp-address**, **ip pim send-rp-announce**, and **ip pim rp-candidate** global configuration commands will be treated as follows:
  - If these commands are configured when bidirectional PIM is disabled, bidirectional mode will not be a configuration option.
  - If these commands are configured with the bidirectional mode option when bidirectional PIM is enabled and then bidirectional PIM is disabled, these commands will be removed from the command-line interface (CLI). In this situation, these commands must be configured again with the bidirectional mode option when bidirectional PIM is reenabled.
- The **df** keyword for the **show ip pim interface** user EXEC or privileged EXEC command and **debug ip pim** privileged EXEC command is not supported.

The following example shows how to enable bidirectional PIM:

```
Device# enable
Device# configure terminal
Device(config)# ip pim bidir-enable
```

# ip pim bsr-candidate

To configure the Device to be a candidate BSR, use the **ip pim bsr-candidate** command in global configuration mode. To remove the switch as a candidate BSR, use the **no** form of this command.

```
ip pim [vrf vrf-name] bsr-candidate interface-id [hash-mask-length] [priority]
no ip pim [vrf vrf-name] bsr-candidate
```

<b>Syntax Description</b>	<p><b>vrf vrf-name</b> (Optional) Configures the Device to be a candidate BSR for the Multicast Virtual Private Network (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.</p>
<i>interface-id</i>	ID of the interface on the Device from which the BSR address is derived to make it a candidate. This interface must be enabled for Protocol Independent Multicast (PIM) using the <b>ip pim</b> command. Valid interfaces include physical ports, port channels, and VLANs.
<i>hash-mask-length</i>	(Optional) Length of a mask (32 bits maximum) that is to be ANDed with the group address before the PIMv2 hash function is called. All groups with the same seed hash correspond to the same rendezvous point (RP). For example, if this value is 24, only the first 24 bits of the group addresses matter. The hash mask length allows one RP to be used for multiple groups. The default hash mask length is 0.
<i>priority</i>	(Optional) Priority of the candidate BSR (C-BSR). The range is from 0 to 255. The default priority is 0. The C-BSR with the highest priority value is preferred.

**Command Default** The Device is not configured to announce itself as a candidate BSR.

**Command Modes** Global configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The interface specified for this command must be enabled for Protocol Independent Multicast (PIM) using the **ip pim** command.

This command configures the Device to send BSR messages to all of its PIM neighbors, with the address of the designated interface as the BSR address.

This command should be configured on backbone Devices that have good connectivity to all parts of the PIM domain.

The BSR mechanism is specified in RFC 2362. Candidate RP (C-RP) switches unicast C-RP advertisement packets to the BSR. The BSR then aggregates these advertisements in BSR messages, which it regularly multicasts with a TTL of 1 to the ALL-PIM-ROUTERS group address, 224.0.0.13. The multicasting of these messages is handled by hop-by-hop RPF flooding; so, no pre-existing IP multicast routing setup is required (unlike with AutoRP). In addition, the BSR does not preselect the designated RP for a particular group range (unlike AutoRP); instead, each switch that receives BSR messages will elect RPs for group ranges based on the information in the BSR messages.

**ip pim bsr-candidate**

Cisco Device always accept and process BSR messages. There is no command to disable this function.

Cisco Device perform the following steps to determine which C-RP is used for a group:

- A long match lookup is performed on the group prefix that is announced by the BSR C-RPs.
- If more than one BSR-learned C-RP is found by the longest match lookup, the C-RP with the lowest priority (configured with the **ip pim rp-candidate** command) is preferred.
- If more than one BSR-learned C-RP has the same priority, the BSR hash function is used to select the RP for a group.
- If more than one BSR-learned C-RP returns the same hash value derived from the BSR hash function, the BSR C-RP with the highest IP address is preferred.

**Example**

The following example shows how to configure the IP address of theDevice on Gigabit Ethernet interface 1/0/0 to be a BSR C-RP with a hash mask length of 0 and a priority of 192:

```
Device(config)# ip pim bsr-candidate GigabitEthernet1/0/1 0 192
```

# ip pim rp-address

To statically configure the address of a Protocol Independent Multicast (PIM) rendezvous point (RP) for multicast groups, use the **ip pim rp-address** command in global configuration mode. To remove an RP address, use the **no** form of this command.

**ip pim [vrf vrf-name] rp-address rp-address [access-list] [override] [bidir]**

**no ip pim [vrf vrf-name] rp-address rp-address [access-list] [override] [bidir]**

Syntax Description	<b>vrf vrf-name</b>  <b>rp-address rp-address</b>  <b>access-list</b>  <b>override</b>  <b>bidir</b>	(Optional) Specifies that the static group-to-RP mapping be associated with the Multicast Virtual Private Network (MVPN) routing and forwarding (MVRF) instance specified for the vrf-name argument.  IP address of the RP to be used for the static group-to-RP mapping. This is a unicast IP address in four-part dotted-decimal notation.  (Optional) Number or name of a standard access list that defines the multicast groups to be statically mapped to the RP.  <b>Note</b> If no access list is defined, the RP will map to all multicast groups
		(Optional) Specifies that if dynamic and static group-to-RP mappings are used together and there is an RP address conflict, the RP address configured for a static group-to-RP mapping will take precedence.  <b>Note</b> If the <b>override</b> keyword is not specified and there is RP address conflict, dynamic group-to-RP mappings will take precedence over static group-to-RP mappings.
		(Optional) Specifies that the static group-to-RP mapping be applied to a bidirectional PIM RP.  If the command is configured without the <b>bidir</b> keyword, the groups will operate in sparse mode.  <b>Note</b> The <b>bidir</b> keyword is available as an optional keyword only if bidirectional PIM has been enabled using the <b>ip pim bidir-enable</b> command.

**ip pim rp-address**

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.12.1	This command was introduced.
Command Default	No PIM static group-to-RP mappings are configured.	
Command Modes	Global configuration (config)	
Usage Guidelines	<p>Under PIM, multicast groups in sparse mode (PIM-SM) or bidirectional mode (bidirectional PIM) use RPs to connect sources and receivers. All routers in a PIM domain need to have a consistent configuration for the mode and RP addresses of the multicast groups.</p> <p>The Cisco IOS software learns the mode and RP addresses of multicast groups through the following three mechanisms: static group-to-RP mapping configurations, Auto-RP, and bootstrap router (BSR).</p> <p>Use the <b>ip pim rp-address</b> command to statically define the RP address for PIM-SM or bidirectional PIM groups (an <b>ip pim rp-address</b> command configuration is referred to as a static group-to-RP mapping).</p> <p>You can configure a single RP for more than one group using an access list. If no access list is specified, the static RP will map to all multicast groups.</p> <p>You can configure multiple RPs, but only one RP per group range.</p> <p>If multiple <b>ip pim rp-address</b> commands are configured, the following rules apply:</p> <ul style="list-style-type: none"> <li>Highest RP IP address selected regardless of reachability: If a multicast group is matched by the access list of more than one configured <b>ip pim rp-address</b> command, then the RP for the group is determined by the RP with the highest RP address configured.</li> <li>One RP address per command: If multiple <b>ip pim rp-address</b> commands are configured, each static group-to-RP mapping must be configured with a unique RP address (if not, it will be overwritten). This restriction also means that only one RP address can be used to provide RP functions for either sparse mode or bidirectional mode groups. If you want to configure static group-to-RP mappings for both bidirectional and sparse mode, the RP addresses must be unique for each mode.</li> <li>One access list per command: If multiple <b>ip pim rp-address</b> commands are configured, only one access list can be configured per static group-to-RP mapping. An access list cannot be reused with other static group-to-RP mappings configured on a router.</li> </ul> <p>If dynamic and static group-to-RP mappings are used together, the following rule applies to a multicast group: Dynamic group-to-RP mappings take precedence over static group-to-RP mappings--unless the <b>override</b> keyword is used.</p> <p>The following example shows how to set the bidirectional PIM RP address to 172.16.0.2 for the multicast range 239/8:</p> <pre>Device(config)# access list 10 239.0.0.0 0.255.255.255 Device(config)# ip pim rp-address 172.16.0.2 10 bidir</pre>	

# ip pim rp-candidate

To configure the Device to advertise itself to the BSR as a Protocol Independent Multicast (PIM) Version 2 (PIMv2) candidate rendezvous point (C-RP), use the **ip pim rp-candidate** command in global configuration mode. To remove the Device as a C-RP, use the **no** form of this command.

```
ip pim [vrf vrf-name] rp-candidate interface-id [group-list access-list-number]
no ip pim [vrf vrf-name] rp-candidate interface-id [group-list access-list-number]
```

<b>Syntax Description</b>	<table border="0"> <tr> <td><b>vrf vrf-name</b></td><td>(Optional) Configures the switch to advertise itself to the BSR as PIMv2 C-RP for the Multicast Virtual Private Network (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.</td></tr> <tr> <td><i>interface-id</i></td><td>ID of the interface whose associated IP address is advertised as a candidate RP address. Valid interfaces include physical ports, port channels, and VLANs.</td></tr> <tr> <td><b>group-list</b> <i>access-list-number</i></td><td>(Optional) Specifies the standard IP access list number that defines the group prefixes that are advertised in association with the RP address.</td></tr> </table>	<b>vrf vrf-name</b>	(Optional) Configures the switch to advertise itself to the BSR as PIMv2 C-RP for the Multicast Virtual Private Network (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.	<i>interface-id</i>	ID of the interface whose associated IP address is advertised as a candidate RP address. Valid interfaces include physical ports, port channels, and VLANs.	<b>group-list</b> <i>access-list-number</i>	(Optional) Specifies the standard IP access list number that defines the group prefixes that are advertised in association with the RP address.
<b>vrf vrf-name</b>	(Optional) Configures the switch to advertise itself to the BSR as PIMv2 C-RP for the Multicast Virtual Private Network (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.						
<i>interface-id</i>	ID of the interface whose associated IP address is advertised as a candidate RP address. Valid interfaces include physical ports, port channels, and VLANs.						
<b>group-list</b> <i>access-list-number</i>	(Optional) Specifies the standard IP access list number that defines the group prefixes that are advertised in association with the RP address.						

**Command Default** The Device is not configured to announce itself to the BSR as a PIMv2 C-RP.

**Command Modes** Global configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Use this command to configure the Device to send PIMv2 messages so that it advertises itself as a candidate RP to the BSR.

This command should be configured on backbone Devices that have good connectivity to all parts of the PIM domain.

The IP address associated with the interface specified by *interface-id* will be advertised as the C-RP address.

The interface specified for this command must be enabled for Protocol Independent Multicast (PIM) using the **ip pim** command.

If the optional **group-list** keyword and *access-list-number* argument are configured, the group prefixes defined by the standard IP access list will also be advertised in association with the RP address.

## Example

The following example shows how to configure the switch to advertise itself as a C-RP to the BSR in its PIM domain. The standard access list number 4 specifies the group prefix associated with the RP that has the address identified by Gigabit Ethernet interface 1/0/1.

```
Device(config)# ip pim rp-candidate GigabitEthernet1/0/1 group-list 4
```

---

**ip pim send-rp-announce**

## ip pim send-rp-announce

To use Auto-RP to configure groups for which the Device will act as a rendezvous point (RP), use the **ip pim send-rp-announce** command in global configuration mode. To unconfigure the Device as an RP, use the **no** form of this command.

```
ip pim [vrf vrf-name] send-rp-announce interface-id scope ttl-value [group-list access-list-number]
[interval seconds] [bidir]
no ip pim [vrf vrf-name] send-rp-announce interface-id
```

Syntax Description	<b>vrf vrf-name</b> (Optional) Uses Auto-RP to configure groups for which the Device will act as a rendezvous point (RP) for the <i>vrf-name</i> argument.	
	<b>interface-id</b> Enter the interface ID of the interface that identifies the RP address. Valid interfaces include physical ports, port channels, and VLANs.	
	<b>scope ttl-value</b> Specifies the time-to-live (TTL) value in hops that limits the number of Auto-RP announcements. Enter a hop count that is high enough to ensure that the RP-announce messages reach all the mapping agents in the network. There is no default setting. The range is 1—255.	
	<b>group-list access-list-number</b> (Optional) Specifies the standard IP access list number that defines the group prefixes that are advertised in association with the RP address. Enter an IP standard access list number from 1—99. If no access list is configured, the RP is used for all groups.	
	<b>interval seconds</b> (Optional) Specifies the interval between RP announcements, in seconds. The total hold time of the RP announcements is automatically set to three times the value of the interval. The default interval is 60 seconds. The range is 1—16383.	
	<b>bidir</b> (Optional) Indicates that the multicast groups specified by the access-list argument are to operate in bidirectional mode. If the command is configured without this keyword, the groups specified will operate in Protocol Independent Multicast sparse mode (PIM-SM).	
Command Default	Auto-RP is disabled.	
Command Modes	Global configuration	
Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.
	Cisco IOS XE Gibraltar 16.12.1	This command was modified. The <b>bidir</b> keyword was added.
Usage Guidelines	Enter this command on the Device that you want to be an RP. When you are using Auto-RP to distribute group-to-RP mappings, this command causes the router to send an Auto-RP announcement message to the well-known group CISCO-RP-ANNOUNCE (224.0.1.39). This message announces the router as a candidate RP for the groups in the range described by the access list.	

### Example

The following example shows how to configure the Device to send RP announcements out all Protocol Independent Multicast (PIM)-enabled interfaces for a maximum of 31 hops. The IP address by which the switch wants to be identified as RP is the IP address associated with Gigabit Ethernet interface 1/0/1 at an interval of 120 seconds:

```
Device(config)# ip pim send-rp-announce GigabitEthernet1/0/1 scope 31 group-list 5 interval 120
```

**ip pim spt-threshold**

# ip pim spt-threshold

To specify the threshold that must be reached before moving to shortest-path tree (spt), use the **ip pim spt-threshold** command in global configuration mode. To remove the threshold, use the **no** form of this command.

```
ip pim {kbps | infinity} [group-list access-list]
no ip pim {kbps | infinity} [group-list access-list]
```

Syntax Description	<b>kbps</b> Threshold that must be reached before moving to shortest-path tree (spt). 0 is the only valid entry even though the range is 0 to 4294967. A 0 entry always switches to the source-tree. <b>infinity</b> Specifies that all the sources for the specified group use the shared tree, never switching to the source tree. <b>group-list access-list</b> (Optional) Specifies an access list number or a specific access list that you have created by name. If the value is 0 or if the <b>group-list access-list</b> option is not used, the threshold applies to all the groups.	
Command Default	Switches to the PIM shortest-path tree (spt).	
Command Modes	Global configuration	
Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

## Example

The following example shows how to make all the sources for access list 16 use the shared tree:

```
Device(config)# ip pim spt-threshold infinity group-list 16
```

# match message-type

To set a message type to match a service list, use the **match message-type** command.

**match message-type {announcement | any | query}**

<b>Syntax Description</b>	<b>announcement</b> Allows only service advertisements or announcements for the Device. <b>any</b> Allows any match type. <b>query</b> Allows only a query from the client for a certain Device in the network.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Service list configuration.				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.3SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.3SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.3SE	This command was introduced.				

**Usage Guidelines** Multiple service maps of the same name with different sequence numbers can be created, and the evaluation of the filters will be ordered on the sequence number. Service lists are an ordered sequence of individual statements, with each one having a permit or deny result. The evaluation of a service list consists of a list scan in a predetermined order, and an evaluation of the criteria of each statement that matches. A list scan is stopped once the first statement match is found and a permit/deny action associated with the statement match is performed. The default action after scanning through the entire list is to deny.



**Note** It is not possible to use the **match** command if you have used the **service-list mdns-sd service-list-name query** command. The **match** command can be used only for the **permit** or **deny** option.

## Example

The following example shows how to set the announcement message type to be matched:

```
Device(config-mdns-sd-sl)# match message-type announcement
```

**match service-type**

# match service-type

To set the value of the mDNS service type string to match, use the **match service-type** command.

**match service-type** *line*

<b>Syntax Description</b>	<i>line</i> Regular expression to match the service type in packets.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Service list configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.3SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.3SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.3SE	This command was introduced.				
<b>Usage Guidelines</b>	It is not possible to use the <b>match</b> command if you have used the <b>service-list mdns-sd <i>service-list-name</i> query</b> command. The <b>match</b> command can be used only for the <b>permit</b> or <b>deny</b> option.				

## Example

The following example shows how to set the value of the mDNS service type string to match:

```
Device(config-mdns-sd-s1)# match service-type _ipp._tcp
```

# match service-instance

To set a service instance to match a service list, use the **match service-instance** command.

**match service-instance** *line*

<b>Syntax Description</b>	<i>line</i> Regular expression to match the service instance in packets.
---------------------------	--

<b>Command Default</b>	None
------------------------	------

<b>Command Modes</b>	Service list configuration
----------------------	----------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.3SE	This command was introduced.

<b>Usage Guidelines</b>	It is not possible to use the <b>match</b> command if you have used the <b>service-list mdns-sd <i>service-list-name</i> query</b> command. The <b>match</b> command can be used only for the <b>permit</b> or <b>deny</b> option.
-------------------------	--

## Example

The following example shows how to set the service instance to match:

```
Device(config-mdns-sd-s1)# match service-instance servInst 1
```

# mrinfo

To query which neighboring multicast routers or multilayer switches are acting as peers, use the **mrinfo** command in user EXEC or privileged EXEC mode.

**mrinfo [vrf route-name] [hostname | address] [interface-id]**

<b>Syntax Description</b>	<p><b>vrf route-name</b> (Optional) Specifies the VPN routing or forwarding instance.</p> <p><b>hostname   address</b> (Optional) Domain Name System (DNS) name or IP address of the multicast router or multilayer switch to query. If omitted, the switch queries itself.</p> <p><b>interface-id</b> (Optional) Interface ID.</p>				
<b>Command Default</b>	The command is disabled.				
<b>Command Modes</b>	User EXEC Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** The **mrinfo** command is the original tool of the multicast backbone (MBONE) to determine which neighboring multicast routers or switches are peering with multicast routers or switches. Cisco routers supports **mrinfo** requests from Cisco IOS Release 10.2.

You can query a multicast router or multilayer switch using the **mrinfo** command. The output format is identical to the multicast routed version of the Distance Vector Multicast Routing Protocol (DVMRP). (The mrouted software is the UNIX software that implements DVMRP.)

## Example

The following is the sample output from the **mrinfo** command:

```
Device# mrinfo
vrf 192.0.1.0
192.31.7.37 (barnnet-gw.cisco.com) [version cisco 11.1] [flags: PMSA]:
  192.31.7.37 -> 192.31.7.34 (sj-wall-2.cisco.com) [1/0/pim]
  192.31.7.37 -> 192.31.7.47 (dirtylab-gw-2.cisco.com) [1/0/pim]
  192.31.7.37 -> 192.31.7.44 (dirtylab-gw-1.cisco.com) [1/0/pim]
```

**Note**

The flags indicate the following:

- P: prune-capable
- M: mtrace-capable
- S: Simple Network Management Protocol-capable
- A: Auto RP capable

**redistribute mdns-sd**

# redistribute mdns-sd

To redistribute services or service announcements across subnets, use the **redistribute mdns-sd** command. To disable redistribution of services or service announcements across subnets, use the **no** form of this command.

**redistribute mdns-sd**  
**no redistribute mdns-sd**

This command has no arguments or keywords.

**Command Default** The redistribution of services or service announcements across subnets is disabled.

**Command Modes** mDNS configuration

**Command History**

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** To redistribute service announcements across interfaces, use the **redistribute mdns-sd** command. This command sends out unsolicited announcements received on one interface to all of the other interfaces. The outgoing announcements are filtered as per the out-service policy defined for the interface, or, in absence of a per-interface service policy, based on the global out-service policy.

In the absence of a redistribute option, services can be discovered by querying in a Layer 3 domain that is not local to the service provider.

## Example

The following example shows how to redistribute services or service announcements across subnets:

```
Device (config-mdns) # redistribute mdns-sd
```



**Note** If redistribution is enabled globally, global configuration is given higher priority than interface configuration.

# service-list mdns-sd

To enter mDNS service discovery service-list mode on the device, use the **service-list mdns-sd** command. To exit mDNS service discovery service-list mode, use the **no** form of this command.

```
service-list mdns-sd service-list-name {permit | deny} sequence-number [query]
no service-list mdns-sd service-list-name {permit | deny} sequence-number [query]
```

## Syntax Description

<i>service-list-name</i>	Name of the service list.
<b>permit</b> <i>sequence number</i>	Permits a filter on the service list to be applied to the sequence number.
<b>deny</b> <i>sequence number</i>	Denies a filter on the service list to be applied to the sequence number.
<b>query</b>	Associates a query for the service list name.

## Command Default

Disabled.

## Command Modes

Global configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE	This command was introduced.
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## Usage Guidelines

Service filters are modeled around access lists and route maps.

Multiple service maps of the same name with different sequence numbers can be created and the evaluation of the filters ordered on the sequence number. Service lists are an ordered sequence of individual statements, with each having a permit or deny result. The evaluation of a service list consists of a list scan in a predetermined order, and an evaluation of the criteria of each statement that matches. A list scan is terminated once the first statement match is found, and an action, permit, or deny that is associated with the statement match is performed. The default action after scanning through the entire list will be to deny.

This command can be used to enter mDNS service discovery service-list mode.

In this mode you can:

- Create a service list and apply a filter on the service list according to the **permit** or **deny** option applied to the sequence number.

## Example

The following example shows how to create a service list and apply a filter on the service list according to the **permit** or **deny** option applied to a sequence number:

```
Device(config)# service-list mdns-sd s11 permit 3
```

# service-policy-query

To configure the service-list query periodicity, use the **service-policy-query** command. To delete the configuration, use the **no** form of this command.

```
service-policy-query [service-list-query-name service-list-query-periodicity]
no service-policy-query
```

## Syntax Description

*service-list-query-name service-list-query-periodicity* (Optional) Service-list query periodicity.

## Command Default

Disabled.

## Command Modes

mDNS configuration

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

Since there are devices that do not send unsolicited announcements and to force such devices the learning of services and to keep them refreshed in the cache, this command contains an active query feature that ensures that the services listed in the active query list are queried.

## Example

This example shows how to configure service list query periodicity:

```
Device(config-mdns)# service-policy-query sl-query1 100
```

# service-routing mdns-sd

To enable the mDNS gateway functionality for a device and enter multicast DNS configuration mode, use the **service-routing mdns-sd** command. To restore the default settings and return to global configuration mode, enter the **no** form of this command.

```
service-routing mdns-sd  
no service-routing mdns-sd
```

This command has no arguments or keywords.

**Command Default** Disabled.

**Command Modes** Global configuration

Command History	Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.	

**Usage Guidelines** The mDNS gateway functionality can only be enabled or disabled globally, not on a per-interface basis. The service-filter policy and redistribution can be configured globally as well as on a per-interface basis. Any interface-specific configuration overrides the global configuration.

## Example

The following example shows how to enable the mDNS gateway functionality for a device and enter multicast DNS configuration mode:

```
Device(config)# service-routing mdns-sd
```

**service-policy**

# service-policy

To apply a filter on incoming or outgoing service-discovery information on a service list, use the **service-policy** command. To remove the filter, use the **no** form of this command.

```
service-policy service-policy-name {IN | OUT}  
no service-policy service-policy-name {IN | OUT}
```

<b>Syntax Description</b>	<b>IN</b> Applies a filter on incoming service-discovery information. <b>OUT</b> Applies a filter on outgoing service-discovery information.				
<b>Command Default</b>	Disabled.				
<b>Command Modes</b>	mDNS configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

## Example

The following example shows how to apply a filter on incoming service-discovery information on a service list:

```
Device(config-mdns)# service-policy serv-pol1 IN
```

# show ip igmp filter

To display Internet Group Management Protocol (IGMP) filter information, use the **show ip igmp filter** command in privileged EXEC mode.

**show ip igmp [vrf *vrf-name*] filter**

<b>Syntax Description</b>	<b>vrf <i>vrf-name</i></b> (Optional) Supports the multicast VPN routing and forwarding (VRF) instance.
---------------------------	---

<b>Command Default</b>	IGMP filters are enabled by default.
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<b>Command Modes</b>	Privileged EXEC
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	The <b>show ip igmp filter</b> command displays information about all filters defined on the device.
-------------------------	--

## Example

The following example shows the sample output from the **show ip igmp filter** command:

```
Device# show ip igmp filter
IGMP filter enabled
```

**show ip igmp profile**

# show ip igmp profile

To display all the configured Internet Group Management Protocol (IGMP) profiles or a specified IGMP profile, use the **show ip igmp profile** command in privileged EXEC mode.

**show ip igmp [vrf *vrf-name*] profile [*profile number*]**

<b>Syntax Description</b>	<p><b>vrf <i>vrf-name</i></b> (Optional) Supports the multicast VPN routing and forwarding (VRF) instance.</p> <p><b>profile number</b> (Optional) IGMP profile number to be displayed. The range is 1 to 4294967295. If no profile number is entered, all the IGMP profiles are displayed.</p>				
<b>Command Default</b>	IGMP profiles are undefined by default.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	None				

## Examples

The following example shows the output of the **show ip igmp profile** command for profile number 40 on the device:

```
Device# show ip igmp profile 40
IGMP Profile 40
  permit
    range 233.1.1.1 233.255.255.255
```

The following example shows the output of the **show ip igmp profile** command for all the profiles configured on the device:

```
Device# show ip igmp profile

IGMP Profile 3
  range 230.9.9.0 230.9.9.0
IGMP Profile 4
  permit
    range 229.9.9.0 229.255.255.255
```

# show ip igmp membership

To display the Internet Group Management Protocol (IGMP) membership information for multicast groups and channels, use the **show ip igmp membership** command in user EXEC or privileged EXEC mode.

**show ip igmp membership [{group-address group-name}] [tracked] [all]**

<b>Syntax Description</b>	<table border="1"> <tr> <td><i>group-address</i></td><td>(Optional) The IP address of the multicast group for which to display IGMP membership information.</td></tr> <tr> <td><i>group-name</i></td><td>(Optional) The name of the multicast group, as defined in the Domain Name System (DNS) hosts table, for which to display IGMP membership information.</td></tr> <tr> <td><b>tracked</b></td><td>(Optional) Displays the multicast groups with the explicit tracking feature enabled.</td></tr> <tr> <td><b>all</b></td><td>(Optional) Displays detailed information about multicast groups with and without the explicit tracking feature enabled.</td></tr> </table>	<i>group-address</i>	(Optional) The IP address of the multicast group for which to display IGMP membership information.	<i>group-name</i>	(Optional) The name of the multicast group, as defined in the Domain Name System (DNS) hosts table, for which to display IGMP membership information.	<b>tracked</b>	(Optional) Displays the multicast groups with the explicit tracking feature enabled.	<b>all</b>	(Optional) Displays detailed information about multicast groups with and without the explicit tracking feature enabled.
<i>group-address</i>	(Optional) The IP address of the multicast group for which to display IGMP membership information.								
<i>group-name</i>	(Optional) The name of the multicast group, as defined in the Domain Name System (DNS) hosts table, for which to display IGMP membership information.								
<b>tracked</b>	(Optional) Displays the multicast groups with the explicit tracking feature enabled.								
<b>all</b>	(Optional) Displays detailed information about multicast groups with and without the explicit tracking feature enabled.								

**Command Modes** User EXEC (>)

Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.6.1	This command was introduced.

**Usage Guidelines** Use this command to display IGMP membership information for multicast groups and channels. This command allows you to display detailed information about multicast group and channel membership and explicit tracking.

**Examples** The following is sample output from the **show ip igmp membership tracked** command:

```
Device> show ip igmp membership tracked

Flags:A - aggregate, T - tracked
      L - Local, S - static, V - virtual, R - Reported through v3
      I - v3lite, D - Urd, M - SSM (S,G) channel
      1,2,3 - The version of IGMP, the group is in
Channel/Group-Flags:
      / - Filtering entry (Exclude mode (S,G), Include mode (*,G))
Reporter:
      <ip-address> - last reporter if group is not explicitly tracked
      <n>/<m> - <n> reporter in include mode,<m> reporter in exclude
Channel/Group          Reporter        Uptime   Exp. Flags  Interface
*,203.0.113.10        1/0           00:20:46 stop 3AT   Gi1/0/24
192.168.0.2,203.0.113.10 10.34.34.2  00:20:46 02:59 T    Gi1/0/24
*,203.0.113.11        1/0           00:20:46 stop 3AT   Gi1/0/24
192.168.0.2,203.0.113.11 10.34.34.2  00:20:46 02:59 T    Gi1/0/24
*,203.0.113.14        1/0           00:20:46 stop 3AT   Gi1/0/24
192.168.0.2,203.0.113.14 10.34.34.2  00:20:46 02:59 T    Gi1/0/24
*,203.0.113.15        1/0           00:20:46 stop 3AT   Gi1/0/24
192.168.0.2,203.0.113.15 10.34.34.2  00:20:46 02:59 T    Gi1/0/24
*,203.0.113.12        1/0           00:20:46 stop 3AT   Gi1/0/24
192.168.0.2,203.0.113.12 10.34.34.2  00:20:46 02:59 T    Gi1/0/24
```

show ip igmp membership

*,203.0.113.13	1/0	00:20:46 stop 3AT	Gi1/0/24
192.168.0.2,203.0.113.13	10.34.34.2	00:20:46 02:59 T	Gi1/0/24
*,203.0.113.19	1/0	00:20:46 stop 3AT	Gi1/0/24
192.168.0.2,203.0.113.19	10.34.34.2	00:20:46 02:59 T	Gi1/0/24
*,203.0.113.18	1/0	00:20:46 stop 3AT	Gi1/0/24
192.168.0.2,203.0.113.18	10.34.34.2	00:20:46 02:59 T	Gi1/0/24
*,203.0.113.17	1/0	00:20:46 stop 3AT	Gi1/0/24
192.168.0.2,203.0.113.17	10.34.34.2	00:20:46 02:59 T	Gi1/0/24
*,203.0.113.16	1/0	00:20:46 stop 3AT	Gi1/0/24
192.168.0.2,203.0.113.16	10.34.34.2	00:20:46 02:59 T	Gi1/0/24
*,203.0.113.40	0/1	00:20:48 02:16 3LAT	Gi1/0/24
*,209.165.201.1	10.34.34.1	00:20:48 02:16 3LT	Gi1/0/24

The table below describes the significant fields shown in the displays.

**Table 23: show ip igmp membership Field Descriptions**

Field	Description
Channel/Group	(S, G) channel or multicast group filtering entry.
Reporter	Displays information about the hosts reporting membership with the (S, G) channel or multicast group entry.
Uptime	The Uptime timer is how long (in hours, minutes, and seconds) the entry has been known.
Exp.	The Exp. timer is how long (in minutes and seconds) until the entry expires.

Field	Description
Flags	<p>Provides information about the entry:</p> <ul style="list-style-type: none"> <li>• A—aggregate. Indicates that the aggregate information for the (S, G) channel or multicast group is being displayed.</li> <li>• T—tracked. Indicates that the multicast group is configured with the explicit tracking feature.</li> <li>• L—local. Indicates that the router itself is interested in receiving the traffic for this multicast group or channel. In order for the application to receive this traffic, the packets are sent to the process level of the router. When the <b>ip igmp join-group</b> command is configured for a multicast group, the L flag is set.</li> <li>• S—static. Indicates that the multicast group or channel is forwarded on the interface. When the <b>ip igmp static-group</b> command is configured on the interface, the S flag is set.</li> <li>• V—virtual. Indicates that service such as Hoot and Holler is running on the router requesting the traffic for the multicast group or channel. These services can process IP multicast traffic in the fast switching path. The L flag will not be set by these applications.</li> <li>• R—reported through v3. Indicates that an IGMP Version 3 (IGMPv3) report was received for this entry.</li> <li>• I—v3lite. Indicates that an IGMP Version 3 lite (IGMP v3lite) report was received for this entry.</li> <li>• D—URD. Indicates that a URL Rendezvous Directory (URD) report was received for this entry.</li> <li>• M—SSM (S, G) channel. Indicates that the multicast group address is in the Source Specific Multicast (SSM) range.</li> <li>• 1, 2, 3—The version of IGMP. The version of IGMP that the multicast group is running.</li> </ul>
Interface	Interface type and number.

Related Commands	Command	Description
	<b>ip igmp explicit-tracking</b>	Enables explicit tracking of hosts, groups, and channels for IGMP Version 3.
	<b>ip igmp version</b>	Configures the version of IGMP that the router uses.
	<b>show ip igmp groups</b>	Displays the multicast groups with receivers that are directly connected to the router and that were learned through IGMP.

**show ip igmp snooping**

# show ip igmp snooping

To display the Internet Group Management Protocol (IGMP) snooping configuration of the device or the VLAN, use the **show ip igmp snooping** command in user EXEC or privileged EXEC mode.

**show ip igmp snooping [groups | mrouter | querier] [vlan *vlan-id*] [detail]**

<b>Syntax Description</b>	<b>groups</b> (Optional) Displays the IGMP snooping multicast table. <b>mrouter</b> (Optional) Displays the IGMP snooping multicast router ports. <b>querier</b> (Optional) Displays the configuration and operation information for the IGMP querier. <b>vlan <i>vlan-id</i></b> (Optional) Specifies a VLAN; the range is 1 to 1001 and 1006 to 4094. <b>detail</b> (Optional) Displays operational state information.				
<b>Command Default</b>	None				
<b>Command Modes</b>	User EXEC Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	VLAN IDs 1002—1005 are reserved for Token Ring and FDDI VLANs, and cannot be used in IGMP snooping. Expressions are case sensitive. For example, if you enter   <b>exclude output</b> , the lines that contain "output" do not appear, but the lines that contain "Output" appear.				

## Examples

The following is a sample output from the **show ip igmp snooping vlan 1** command. It shows snooping characteristics for a specific VLAN:

```
Device# show ip igmp snooping vlan 1

Global IGMP Snooping configuration:
-----
IGMP snooping          : Enabled
IGMPv3 snooping (minimal) : Enabled
Report suppression      : Enabled
TCN solicit query       : Disabled
TCN flood query count   : 2
Robustness variable     : 2
Last member query count : 2
Last member query interval : 1000

Vlan 1:
-----
IGMP snooping          : Enabled
```

```
IGMPv2 immediate leave          : Disabled
Multicast router learning mode : pim-dvmrp
CGMP interoperability mode    : IGMP_ONLY
Robustness variable           : 2
Last member query count       : 2
Last member query interval    : 1000
```

The following is a sample output from the **show ip igmp snooping** command. It displays snooping characteristics for all the VLANs on the device:

```
Device# show ip igmp snooping

Global IGMP Snooping configuration:
-----
IGMP snooping          : Enabled
IGMPv3 snooping (minimal) : Enabled
Report suppression      : Enabled
TCN solicit query       : Disabled
TCN flood query count   : 2
Robustness variable     : 2
Last member query count : 2
Last member query interval : 1000

Vlan 1:
-----
IGMP snooping          : Enabled
IGMPv2 immediate leave  : Disabled
Multicast router learning mode : pim-dvmrp
CGMP interoperability mode : IGMP_ONLY
Robustness variable     : 2
Last member query count : 2
Last member query interval : 1000

Vlan 2:
-----
IGMP snooping          : Enabled
IGMPv2 immediate leave  : Disabled
Multicast router learning mode : pim-dvmrp
CGMP interoperability mode : IGMP_ONLY
Robustness variable     : 2
Last member query count : 2
Last member query interval : 1000

-
.
.
```

show ip igmp snooping groups

# show ip igmp snooping groups

To display the Internet Group Management Protocol (IGMP) snooping multicast table for the device or the multicast information, use the **show ip igmp snooping groups** command in privileged EXEC mode.

**show ip igmp snooping groups [vlan *vlan-id*] [[count] | *ip\_address*]**

<b>Syntax Description</b>	<b>vlan <i>vlan-id</i></b> (Optional) Specifies a VLAN; the range is 1 to 1001 and 1006 to 4094. Use this option to display the multicast table for a specified multicast VLAN or specific multicast information. <b>count</b> (Optional) Displays the total number of entries for the specified command options instead of the actual entries. <b><i>ip_address</i></b> (Optional) Characteristics of the multicast group with the specified group IP address.	
<b>Command Modes</b>	Privileged EXEC  User EXEC	
<b>Command History</b>	<b>Release</b> Cisco IOS XE 3.2SE	<b>Modification</b> This command was introduced.
<b>Usage Guidelines</b>	Expressions are case sensitive. For example, if you enter   <b>exclude output</b> , the lines that contain "output" do not appear, but the lines that contain "Output" appear.	

## Examples

The following is a sample output from the **show ip igmp snooping groups** command without any keywords. It displays the multicast table for the device.

```
Device# show ip igmp snooping groups
Vlan      Group        Type       Version      Port List
-----+-----+-----+-----+-----+
 1        224.1.4.4   igmp
 1        224.1.4.5   igmp
 2        224.0.1.40   igmp      v2
 104      224.1.4.2   igmp      v2
 104      224.1.4.3   igmp      v2
                                         Gi1/0/11
                                         Gi1/0/11
                                         Gi1/0/15
                                         Gi2/0/1, Gi2/0/2
                                         Gi2/0/1, Gi2/0/2
```

The following is a sample output from the **show ip igmp snooping groups count** command. It displays the total number of multicast groups on the device.

```
Device# show ip igmp snooping groups count
```

```
Total number of multicast groups: 2
```

The following is a sample output from the **show ip igmp snooping groups vlan *vlan-id* *ip-address*** command. It shows the entries for the group with the specified IP address:

```
Device# show ip igmp snooping groups vlan 104 224.1.4.2
```

Vlan	Group	Type	Version	Port List
------	-------	------	---------	-----------

```
-----  
104      224.1.4.2      igmp      v2      Gi2/0/1, Gi1/0/15
```

**show ip igmp snooping membership**

# show ip igmp snooping membership

To display Internet Group Management Protocol Version 3 (IGMPv3) host membership information, use the **show ip igmp snooping membership** command in user EXEC or privileged EXEC mode.

```
show ip igmp snooping membership [{interface type number}] [{reporter reporter-ip-address}]
[ {source source-ip-address group group-ip-address}] [{vlan vlan-ID}]
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>interface</b> <i>type number</i></td><td>(Optional) Displays entries for the specified interface.</td></tr> <tr> <td><b>reporter</b> <i>reporter-ip-address</i></td><td>(Optional) Displays entries matching the multicast reporter IP address.</td></tr> <tr> <td><b>source</b> <i>source-ip-address</i></td><td>(Optional) Displays entries matching the multicast source IP address.</td></tr> <tr> <td><b>group</b> <i>group-ip-address</i></td><td>(Optional) Displays entries matching the multicast group IP address.</td></tr> <tr> <td><b>vlan</b> <i>vlan-ID</i></td><td>(Optional) Displays entries for the specified VLAN.</td></tr> </table>	<b>interface</b> <i>type number</i>	(Optional) Displays entries for the specified interface.	<b>reporter</b> <i>reporter-ip-address</i>	(Optional) Displays entries matching the multicast reporter IP address.	<b>source</b> <i>source-ip-address</i>	(Optional) Displays entries matching the multicast source IP address.	<b>group</b> <i>group-ip-address</i>	(Optional) Displays entries matching the multicast group IP address.	<b>vlan</b> <i>vlan-ID</i>	(Optional) Displays entries for the specified VLAN.
<b>interface</b> <i>type number</i>	(Optional) Displays entries for the specified interface.										
<b>reporter</b> <i>reporter-ip-address</i>	(Optional) Displays entries matching the multicast reporter IP address.										
<b>source</b> <i>source-ip-address</i>	(Optional) Displays entries matching the multicast source IP address.										
<b>group</b> <i>group-ip-address</i>	(Optional) Displays entries matching the multicast group IP address.										
<b>vlan</b> <i>vlan-ID</i>	(Optional) Displays entries for the specified VLAN.										

**Command Modes** User EXEC (>)

Privileged EXEC (#)

Command History	Release	Modification
Cisco IOS XE Everest 16.6.1		This command was introduced.

**Usage Guidelines** If you omit the optional arguments, the **show ip igmp snooping membership** command displays membership information about all hosts.

**Examples** The following is sample output from the **show ip igmp snooping membership vlan** command:

```
Device# show ip igmp snooping membership vlan 70
Snooping Membership Summary for Vlan 70
-----
Total number of channels: 10000
Total number of hosts : 2

Source/Group           Interface Reporter      Uptime   Last-Join   Last-Leave
-----
10.60.60.10/209.165.201.1    Gi2/0/36  192.0.2.2      00:00:45 00:00:45      -
10.60.60.10/209.165.201.1    Gi2/0/36  192.0.2.10     00:00:59 00:19:54      00:18:54
10.60.60.10/209.165.201.2    Gi2/0/36  192.0.2.2      00:00:45 00:00:45      -
```

Related Commands	Command	Description
	<b>ip igmp snooping vlan explicit-tracking</b>	Enables explicit tracking of hosts, groups, and channels for IGMP.

**show ip igmp snooping mrouter**

## show ip igmp snooping mrouter

To display the Internet Group Management Protocol (IGMP) snooping dynamically learned and manually configured multicast router ports for the device or for the specified multicast VLAN, use the **show ip igmp snooping mrouter** command in privileged EXEC mode.

**show ip igmp snooping mrouter [vlan *vlan-id*]**

<b>Syntax Description</b>	<b>vlan <i>vlan-id</i></b> (Optional) Specifies a VLAN; Ranges are from 1—1001 and 1006—4094.
---------------------------	---

<b>Command Modes</b>	User EXEC
----------------------	-----------

	Privileged EXEC
--	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
------------------------	----------------	---------------------

Cisco IOS XE 3.2SE	This command was introduced.
--------------------	------------------------------

<b>Usage Guidelines</b>	VLAN IDs 1002—1005 are reserved for Token Ring and FDDI VLANs, and cannot be used in IGMP snooping.
-------------------------	---

	When multicast VLAN registration (MVR) is enabled, the <b>show ip igmp snooping mrouter</b> command displays MVR multicast router information and IGMP snooping information.
--	--

	Expressions are case sensitive, for example, if you enter   exclude output, the lines that contain "output" do not appear, but the lines that contain "Output" appear.
--	--

### Example

The following is a sample output from the **show ip igmp snooping mrouter** command. It shows how to display multicast router ports on the device:

```
Device# show ip igmp snooping mrouter
Vlan      ports
----      -----
1        Gi2/0/1 (dynamic)
```

# show ip igmp snooping querier

To display the configuration and operation information for the IGMP querier that is configured on a device, use the **show ip igmp snooping querier** command in user EXEC mode.

**show ip igmp snooping querier [vlan *vlan-id*] [detail]**

## Syntax Description

**vlan *vlan-id*** (Optional) Specifies a VLAN; Ranges are from 1—1001 and 1006—4094.

**detail** (Optional) Displays detailed IGMP querier information.

## Command Modes

User EXEC

Privileged EXEC

## Command History

### Release Modification

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

Use the **show ip igmp snooping querier** command to display the IGMP version and the IP address of a detected device, also called a querier, that sends IGMP query messages. A subnet can have multiple multicast routers but only one IGMP querier. In a subnet running IGMPv2, one of the multicast routers is elected as the querier. The querier can be a Layer 3 device.

The **show ip igmp snooping querier** command output also shows the VLAN and the interface on which the querier was detected. If the querier is the device, the output shows the Port field as Router. If the querier is a router, the output shows the port number on which the querier was detected in the Port field.

The **show ip igmp snooping querier detail** user EXEC command is similar to the **show ip igmp snooping querier** command. However, the **show ip igmp snooping querier** command displays only the device IP address most recently detected by the device querier.

The **show ip igmp snooping querier detail** command displays the device IP address most recently detected by the device querier and this additional information:

- The elected IGMP querier in the VLAN
- The configuration and operational information pertaining to the device querier (if any) that is configured in the VLAN

Expressions are case sensitive, for example, if you enter | **exclude output**, the lines that contain "output" do not appear, but the lines that contain "Output" appear.

## Examples

The following is a sample output from the **show ip igmp snooping querier** command:

```
Device> show ip igmp snooping querier
Vlan      IP Address     IGMP Version      Port
-----  -----
1          172.20.50.11    v3                  Gi1/0/1
2          172.20.40.20    v2                  Router
```

**show ip igmp snooping querier**

The following is a sample output from the **show ip igmp snooping querier detail** command:

```
Device> show ip igmp snooping querier detail

Vlan      IP Address     IGMP Version   Port
-----
1         10.0.0.10      v2             Fa8/0/1
Global IGMP device querier status

-----
admin state          : Enabled
admin version        : 2
source IP address   : 0.0.0.0
query-interval (sec) : 60
max-response-time (sec) : 10
querier-timeout (sec) : 120
tcn query count     : 2
tcn query interval (sec) : 10
Vlan 1:   IGMP device querier status
-----
elected querier is 10.0.0.10      on port Fa8/0/1
-----
admin state          : Enabled
admin version        : 2
source IP address   : 10.1.1.65
query-interval (sec) : 60
max-response-time (sec) : 10
querier-timeout (sec) : 120
tcn query count     : 2
tcn query interval (sec) : 10
operational state   : Non-Querier
operational version  : 2
tcn query pending count : 0
```

# show ip igmp snooping vlan

To display snooping information in a Catalyst VLAN, use the **show ip igmp snooping vlan** command in user EXEC or privileged EXEC mode.

**show ip igmp snooping vlan *vlan-ID***

<b>Syntax Description</b>	<i>vlan-ID</i> VLAN ID; the range is from 1 to 1001 and 1006 to 4094.
---------------------------	---

**Command Modes** User EXEC (>)

Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.6.1	This command was introduced.

## Examples

The following is sample output from the **show ip igmp snooping vlan** command:

```
Device# show ip igmp snooping vlan 77

Global IGMP Snooping configuration:
-----
IGMP snooping      : Enabled
IGMPv3 snooping   : Enabled
Report suppression : Enabled
TCN solicit query  : Disabled
TCN flood query count : 2
Robustness variable : 2
Last member query count : 2
Last member query interval : 1000

Vlan 77:
-----
IGMP snooping      : Enabled
IGMPv2 immediate leave : Disabled
Explicit host tracking : Enabled
Multicast router learning mode : pim-dvmrp
CGMP interoperability mode : IGMP_ONLY
Robustness variable : 2
Last member query count : 2
Last member query interval : 1000

Device#
```

The information in the output display is self-explanatory.

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>ip igmp snooping vlan explicit-tracking</b>	Enables explicit tracking of hosts, groups, and channels for IGMP.

**show ip pim autorp**

## show ip pim autorp

To display global information about auto-rp, use the **show ip pim autorp** command in privileged EXEC mode.

**show ip pim autorp**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Auto RP is enabled by default.

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** This command displays whether auto-rp is enabled or disabled.

### Example

The following command output shows that Auto RP is enabled:

```
Device# show ip pim autorp

AutoRP Information:
  AutoRP is enabled.
  RP Discovery packet MTU is 0.
  224.0.1.40 is joined on GigabitEthernet1/0/1.

PIM AutoRP Statistics: Sent/Received
  RP Announce: 0/0, RP Discovery: 0/0
```

# show ip pim bsr-router

To display information related to Protocol Independent Multicast (PIM) bootstrap router (BSR) protocol processing, use the **show ip pim bsr-router** command in user EXEC or privileged EXEC mode.

**show ip pim bsr-router**

<b>Syntax Description</b>	This command has no arguments or keywords.				
<b>Command Default</b>	None				
<b>Command Modes</b>	User EXEC Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** In addition to Auto RP, the BSR RP method can be configured. After the BSR RP method is configured, this command displays the BSR router information.

The following is sample output from the **show ip pim bsr-router** command:

```
Device# show ip pim bsr-router

PIMv2 Bootstrap information
This system is the Bootstrap Router (BSR)
  BSR address: 172.16.143.28
  Uptime: 04:37:59, BSR Priority: 4, Hash mask length: 30
  Next bootstrap message in 00:00:03 seconds

Next Cand_RP_advertisement in 00:00:03 seconds.
  RP: 172.16.143.28(Ethernet0), Group acl: 6
```

**show ip pim bsr**

## show ip pim bsr

To display information related to Protocol Independent Multicast (PIM) bootstrap router (BSR) protocol processing, use the **show ip pim bsr** command in user EXEC or privileged EXEC mode.

**show ip pim bsr**

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** User EXEC

Privileged EXEC

**Command History**

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

The following is sample output from the **show ip pim bsr** command:

```
Device# show ip pim bsr

PIMv2 Bootstrap information
This system is the Bootstrap Router (BSR)
  BSR address: 172.16.143.28
  Uptime: 04:37:59, BSR Priority: 4, Hash mask length: 30
  Next bootstrap message in 00:00:03 seconds

Next Cand_RP_advertisement in 00:00:03 seconds.
  RP: 172.16.143.28(Ethernet0), Group acl: 6
```

# show ip pim interface df

To display information about the elected designated forwarder (DF) for each rendezvous point (RP) on an interface configured for Bidirectional Protocol Independent Multicast (PIM), use the **show ip pim interface df** command in user EXEC or privileged EXEC mode.

**show ip pim [vrf *vrf-name*] interface [*interface-type* | *interface-name*] df [rp-address]**

<b>vrf <i>vrf-name</i></b>	(Optional) Specifies the multicast VPN routing and forwarding (VRF) instance.
<b>interface [<i>interface-type</i>   <i>interface-name</i>]</b>	Specifies the interface type or the interface number.
<b>rp-address</b>	(Optional) Specifies the RP IP address.

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.12.1	This command was introduced.

**Command Default** If no interface is specified, all interfaces are displayed.

**Command Modes** User EXEC (>  
Privileged EXEC (#)

The following is sample output from the **show ip pim interface df** command:

```
Device# show ip pim interface df
Interface          RP                DF Winner        Metric      Uptime
Ethernet3/3        10.10.0.2       10.4.0.2        0           00:03:49
                  10.10.0.3       10.4.0.3        0           00:01:49
                  10.10.0.5       10.4.0.4        409600     00:01:49
Ethernet3/4        10.10.0.2       10.5.0.2        0           00:03:49
                  10.10.0.3       10.5.0.2        409600     00:02:32
                  10.10.0.5       10.5.0.2        435200     00:02:16
Loopback0          10.10.0.2       10.10.0.2        0           00:03:49
                  10.10.0.3       10.10.0.2        409600     00:02:32
                  10.10.0.5       10.10.0.2        435200     00:02:16
```

The following is sample output from the **show ip pim interface df** command when an interface is specified:

```
Device# show ip pim interface Ethernet3/3 df 10.10.0.3
Designated Forwarder election for Ethernet3/3, 10.4.0.2, RP 10.10.0.3
  State                           Non-DF
  Offer count is                 0
  Current DF ip address          10.4.0.3
  DF winner up time              00:02:33
  Last winner metric preference  0
  Last winner metric             0
```

The following table gives the output field descriptions for the **show ip pim interface df** command:

**show ip pim interface df**

Field	Description
RP	IP address of the RP.
DF Winner	IP address of the elected DF.
Metric	Unicast routing metric to the RP announced by the DF.
Uptime	Length of time the RP has been up, in days and hours. If less than 1 day, time is shown in hours:minutes:seconds.
State	Indicates whether the specified interface is an elected DF.
Offer count is	Number of PIM DF election offer messages that the router has sent out the interface during the current election interval.
Current DF IP address	IP address of the current DF.
DF winner uptime	Length of time the current DF has been up, in days and hours. If less than 1 day, time is shown in hours:minutes:seconds.
Last winner metric preference	The preference value used for selecting the unicast routing metric to the RP announced by the DF.
Last winner metric	Unicast routing metric to the RP announced by the DF.

# show ip pim rp

To display active rendezvous points ( RPs) that are cached with associated multicast routing entries, use the **show ip pim rp** command in user EXEC or privileged EXEC mode.

```
show ip pim [vrf vrf-name] rp [mapping [ elected | in-use ] | metric] [rp-address]
```

<b>Syntax Description</b>	<b>vrf vrf-name</b>  <b>mapping [ elected   in-use ]</b>  <b>metric</b>  <b>rp-address</b>	(Optional) Specifies the multicast VPN routing and forwarding (VRF) instance.  (Optional) Displays all group-to-RP mappings of which the router is aware. (either configured or learned from Auto-RP) <ul style="list-style-type: none"> <li>• <b>elected</b>- Displays elected Auto RPs.</li> <li>• <b>in-use</b>- Displays learned RPs in-use.</li> </ul> (Optional) Displays the unicast routing metric to the RPs configured statically or learned via Auto-RP or the bootstrap router (BSR).
<b>Command History</b>	<b>Release</b>  Cisco IOS XE Gibraltar 16.12.1	<b>Modification</b>  This command was introduced.

**Command Default** If no RP is specified, all active RPs are displayed.

**Command Modes** User EXEC (>  
Privileged EXEC (#)

**Usage Guidelines** The Protocol Independent Multicast (PIM) version known for an RP influences the type of PIM register messages (Version 1 or Version 2) that the router sends when acting as the designated router (DR) for an active source. If an RP is statically configured, the PIM version of the RP is not set and the router, if required to send register packets, tries to send PIM Version 2 register packets. If sending PIM Version 2 packets fails, the router sends PIM Version 1 register packets.

The version of the RP displayed in the **show ip pim rp** command output can change according to the operations of the router. When the group is created, the version shown is for the RP in the RP mapping cache. Later, the version displayed by this command may change. If this router is acting as a DR for an active source, the router sends PIM register messages. The PIM register messages are answered by the RP with PIM register stop messages. The router learns from these PIM register stop messages the actual PIM version of the RP. Once the actual PIM version of the RP is learned, this command displays only this version. If the router is not acting as a DR for active sources on this group, then the version shown for the RP of the group does not change. In this case, the PIM version of the RP is irrelevant to the router because the version of the RP influences only the PIM register messages that this router must send.

**show ip pim rp**

When you enter the **show ip pim rp mapping** command, the version of the RP displayed in the output is determined only by the method through which an RP is learned. If the RP is learned from Auto-RP then the RP displayed is either “v1” or “v2, v1.” If the RP is learned from a static RP definition, the RP version is undetermined and no RP version is displayed in the output. If the RP is learned from the BSR, the RP version displayed is “v2.”

The following is sample output from the **show ip pim rp** command:

```
Device# show ip pim rp
Group:227.7.7.7, RP:10.10.0.2, v2, v1, next RP-reachable in 00:00:48
```

The following is sample output from the **show ip pim rp** command when the **mapping** keyword is specified:

```
Device# show ip pim rp mapping
PIM Group-to-RP Mappings
This system is an RP (Auto-RP)
This system is an RP-mapping agent
Group(s) 227.0.0.0/8
    RP 10.10.0.2 (?), v2v1, bidir
        Info source:10.10.0.2 (?), via Auto-RP
        Uptime:00:01:42, expires:00:00:32
Group(s) 228.0.0.0/8
    RP 10.10.0.3 (?), v2v1, bidir
        Info source:10.10.0.3 (?), via Auto-RP
        Uptime:00:01:26, expires:00:00:34
Group(s) 229.0.0.0/8
    RP 10.10.0.5 (mcast1.cisco.com), v2v1, bidir
        Info source:10.10.0.5 (mcast1.cisco.com), via Auto-RP
        Uptime:00:00:52, expires:00:00:37
Group(s) (-)230.0.0.0/8
    RP 10.10.0.5 (mcast1.cisco.com), v2v1, bidir
        Info source:10.10.0.5 (mcast1.cisco.com), via Auto-RP
        Uptime:00:00:52, expires:00:00:37
```

The following is sample output from the **show ip pim rp** command when the **metric** keyword is specified:

RP Address	Metric	Pref	Metric	Flags	RPF Type	Interface
10.10.0.2	0		0	L	unicast	Loopback0
10.10.0.3	90		409600	L	unicast	Ethernet3/3
10.10.0.5	90		435200	L	unicast	Ethernet3/3

# show ip pim tunnel

To display information about the Protocol Independent Multicast (PIM) register encapsulation and decapsulation tunnels on an interface, use the **show ip pim tunnel** command.

```
show ip pim [vrf vrf-name] tunnel [Tunnel interface-number | verbose]
```

<b>Syntax Description</b>	<b>vrf vrf-name</b> (Optional) Specifies a virtual routing and forwarding (VRF) configuration. <b>Tunnel interface-number</b> (Optional) Specifies the tunnel interface number. <b>verbose</b> (Optional) Provides additional information, such as the MAC encapsulation header and platform-specific information.
<b>Command Default</b>	None
<b>Command Modes</b>	Privileged EXEC
<b>Command History</b>	<b>Release</b> <b>Modification</b> Cisco IOS XE 3.2SE This command was introduced.

**Usage Guidelines** Use the **show ip pim tunnel** to display information about PIM tunnel interfaces.

PIM tunnel interfaces are used by the IPv4 Multicast Forwarding Information Base (MFIB) for the PIM sparse mode (PIM-SM) registration process. Two types of PIM tunnel interfaces are used by the the IPv4 MFIB:

- A PIM encapsulation tunnel (PIM Encap Tunnel)
- A PIM decapsulation tunnel (PIM Decap Tunnel)

The PIM Encap Tunnel is dynamically created whenever a group-to-rendezvous point (RP) mapping is learned (through auto-RP, bootstrap router (BSR), or static RP configuration). The PIM Encap Tunnel is used to encapsulate multicast packets sent by first-hop designated routers (DRs) that have directly connected sources.

Similar to the PIM Encap Tunnel, the PIM Decap Tunnel interface is dynamically created—but it is created only on the RP whenever a group-to-RP mapping is learned. The PIM Decap Tunnel interface is used by the RP to decapsulate PIM register messages.



**Note** PIM tunnels will not appear in the running configuration.

The following syslog message appears when a PIM tunnel interface is created:

```
* %LINEPROTO-5-UPDOWN: Line protocol on Interface Tunnel<interface_number>, changed state to up
```

The following is sample output from the **show ip pim tunnel** taken from an RP. The output is used to verify the PIM Encap and Decap Tunnel on the RP:

**show ip pim tunnel**

```
Device# show ip pim tunnel

Tunnel0
  Type    : PIM Encap
  RP      : 70.70.70.1*
  Source: 70.70.70.1
Tunnel1*
  Type    : PIM Decap
  RP      : 70.70.70.1*
  Source: -R2#
```



**Note** The asterisk (\*) indicates that the router is the RP. The RP will always have a PIM Encap and Decap Tunnel interface.

# show mdns cache

To display mDNS cache information for the device, use the **show mdns cache** command in privileged EXEC mode.

```
show mdns cache [interface type number | name record-name [type record-type] | type record-type]
```

<b>Syntax Description</b>	<b>interface type-number</b> (Optional) Specifies a particular interface type and number for which mDNS cache information is to be displayed.				
	<b>name record-name</b> (Optional) Specifies a particular name for which mDNS cache information is to be displayed.				
	<b>type record-type</b> (Optional) Specifies a particular type for which mDNS cache information is to be displayed.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC User EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** Expressions are case sensitive. For example, if you enter **| exclude output**, the lines that contain output do not appear, but the lines that contain output appear.

## Example

The following is an example of output from the **show mdns cache** command without any keywords:

```
Device# show mdns cache
```

[<NAME>] Address] [<RR Record Data>]	[<TYPE>] [<CLASS>] [<TTL>/Remaining] [Accessed] [If-name] [Mac Address]
airplay. tcp.local b878.2e33.c7c5 CAMPUS APPLE TV1._airplay._tcp.local	PTR IN 4500/4455 0 Vl121
CAMPUS APPLE TV1._airplay._tcp.local SRV b878.2e33.c7c5 CAMPUS-APPLE-TV1.local	IN 120/75 2 Vl121
CAMPUS-APPLE-TV1.local b878.2e33.c7c5 121.1.0.254	A IN 120/75 2 Vl121
CAMPUS APPLE TV1._airplay._tcp.local TXT b878.2e33.c7c5 (162) 'deviceid=B8:78:2E:33:C7:C6'	IN 4500/4455 2 Vl121

show mdns cache

```

'features=0x5a7ffff7''flags=0x4'

'model=AppleT~'~

_ipp._tcp.local PTR IN 4500/4465 2 v12
2894.0fed.447f EPSON XP-400 Series._ipp._tcp.local

EPSON XP-400 Series._ipp._tcp.local SRV IN 120/85 2 v12
2894.0fed.447f EPSONC053AA.local

EPSONC053AA.local A IN 120/85 2 v12
2894.0fed.447f 121.1.0.251

EPSON XP-400 Series._ipp._tcp.local TXT IN 4500/4465 2 v12
2894.0fed.447f (384)'txtvers=1' N XP-400 Series'

'usbFG=EPSON''usb_MDL=XP~'~

_smb._tcp.local PTR IN 4500/4465 2 v12
2894.0fed.447f EPSON XP-400 Series._smb._tcp.local

EPSON XP-400 Series._smb._tcp.local SRV IN 120/85 2 v12
2894.0fed.447f EPSONC053AA.local

EPSON XP-400 Series._smb._tcp.local TXT IN 4500/4465 2 v12
2894.0fed.447f (1)'' R2-Access1#

```

# show mdns requests

To display information for outstanding mDNS requests, including record name and record type information, for the device, use the **show mdns requests** command in privileged EXEC mode.

**show mdns requests [detail | name record-name | type record-type [ name record-name ] ]**

<b>Syntax Description</b>	<b>detail</b> Displays detailed mDNS request information. <b>name record-name</b> Displays detailed mDNS request information based on name. <b>type record-type</b> Displays detailed mDNS request information based on type.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC User EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** Expressions are case sensitive. For example, if you enter | exclude output, the lines that contain output do not appear, but the lines that contain output appear.

## Example

This is an example of output from the **show mdns requests** command without any keywords:

```
Device# show mdns requests
MDNS Outstanding Requests
=====
Request name : _airplay._tcp.local
Request type : PTR
Request class : IN
-----
Request name : *.* 
Request type : PTR
Request class : IN
```

**show mdns statistics**

## show mdns statistics

To display mDNS statistics for the device, use the **show mdns statistics** command in privileged EXEC mode.

```
show mdns statistics {all | service-list list-name | service-policy {all | interface type-number}}
```

<b>Syntax Description</b>	<b>all</b> Displays the service policy, service list, and interface information. <b>service-list</b> <i>list-name</i> Displays the service list information. <b>service-policy</b> Displays the service policy information. <b>interface</b> <i>type number</i> Displays interface information.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC User EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** Expressions are case sensitive, for example, if you enter | **exclude output**, the lines that contain "output" do not appear, but the lines that contain "Output" appear.

### Example

The following is a sample output from the **show mdns statistics all** command:

```
Device# show mdns statistics all

mDNS Statistics
mDNS packets sent      : 0
mDNS packets received   : 0
mDNS packets dropped    : 0
mDNS cache memory in use: 64224 (bytes)
```

# show platform software fed switch ip multicast groups

To display platform-dependent IP multicast groups information, use the **show platform software fed switch ip multicast groups** command in privileged EXEC mode.

```
show platform software fed switch {switch-number | active | standby} ip multicast groups [vrf-id vrf-id | vrf-name vrf-name] [group-address [source source-address] [detail] | count | summary]
```

## Syntax Description

<b>switch</b> { <i>switch_num</i>   <b>active</b>   <b>standby</b> }	The device for which you want to display information. <ul style="list-style-type: none"> <li>• <i>switch_num</i>—Enter the switch ID. Displays information for the specified switch.</li> <li>• <b>active</b>—Displays information for the active switch.</li> <li>• <b>standby</b>—Displays information for the standby switch, if available.</li> </ul>
<b>vrf</b> <i>vrf-id</i>	(Optional) Specifies the multicast Virtual Routing and Forwarding (VRF) ID.
<b>vrf</b> <i>vrf-name</i>	(Optional) Specifies the multicast Virtual Routing and Forwarding (VRF) name.
<i>group-address</i>	(Optional) Specifies the IP Multicast Group Address.
<b>source</b> <i>source-address</i>	(Optional) Specifies the IP Multicast Source Address
<b>detail</b>	(Optional) Specifies the IP Multicast group detail.
<b>count</b>	(Optional) Specifies the IP Multicast group count.
<b>summary</b>	(Optional) Specifies the Multicast group summary.

## Command History

Release	Modification
Cisco IOS XE Everest 16.5.1a	This command was introduced

## Command Modes

Privileged EXEC (#)

## Usage Guidelines

Use this command only when you are working directly with a technical support representative while troubleshooting a problem. Do not use this command unless a technical support representative asks you to do so.

show platform software fed switch ip multicast

# show platform software fed switch ip multicast

To display platform-dependent IP multicast tables and other information, use the **show platform software fed switch ip multicast** command in privileged EXEC mode.

**show platform software fed switch{switch-number | active | standby}ip multicast{groups | hardware[ {detail}] | interfaces | retry}**

<b>Syntax Description</b>	<b>switch {switch_num   active   standby }</b> The device for which you want to display information. <ul style="list-style-type: none"> <li>• <i>switch_num</i>—Enter the switch ID. Displays information for the specified switch.</li> <li>• <b>active</b>—Displays information for the active switch.</li> <li>• <b>standby</b>—Displays information for the standby switch, if available.</li> </ul>
<b>groups</b>	Displays the IP multicast routes per group.
<b>hardware [detail]</b>	Displays the IP multicast routes loaded into hardware. The optional <b>detail</b> keyword is used to show the port members in the destination index and route index.
<b>interfaces</b>	Displays the IP multicast interfaces.
<b>retry</b>	Displays the IP multicast routes in the retry queue.

<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				

<b>Usage Guidelines</b>	Use this command only when you are working directly with a technical support representative while troubleshooting a problem. Do not use this command unless a technical support representative asks you to do so.
	This command is not supported on switches running the LAN Base feature set.

## Example

The following example shows how to display platform IP multicast routes per group:

```
Device# show platform software fed active ip multicast groups
Total Number of entries:3
MROUTE ENTRY vrf 0 (*, 224.0.0.0)
Token: 0x0000001f6 flags: C
No RPF interface.
Number of OIF: 0
Flags: 0x10 Pkts : 0
```



```
show platform software fed switch ip multicast
```

```
=====
<output truncated>
```

# show platform software fed switch ip multicast df

To display information about platform-dependent IP multicast designated forwarders (DF), use the **show platform software fed switch ip multicast df** command in privileged EXEC mode.

```
show platform software fed switch{switch-number | active | standby} ip multicast df[ {vrf-id vrf-id | vrf-name vrf-name} ][{df-index}]
```

<b>Syntax Description</b>	<b>switch</b> { <i>switch_num</i>   <b>active</b>   <b>standby</b> } The device for which you want to display information.
	<ul style="list-style-type: none"> <li>• <i>switch_num</i>—Enter the switch ID. Displays information for the specified switch.</li> <li>• <b>active</b>—Displays information for the active switch.</li> <li>• <b>standby</b>—Displays information for the standby switch, if available.</li> </ul>
<b>vrf-id vrf-id</b>	(Optional) Specifies the multicast Virtual Routing and Forwarding (VRF) ID.
<b>vrf vrf-name</b>	(Optional) Specifies the multicast Virtual Routing and Forwarding (VRF) name.
<b>df-index</b>	(Optional) Specifies the DF index.

<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.12.1	This command was introduced.

**Usage Guidelines** Use this command only when you are working directly with a technical support representative while troubleshooting a problem. Do not use this command unless a technical support representative asks you to do so.

The following is sample output from the **show platform software fed switch ip multicast df** command:

```
Device# show platform software fed switch active ip multicast df
VRF-ID  DF-Index      Ref-Count      DF Set
=====
2       1             1              Vlan254
                                Vlan186
                                Vlan305
                                Vlan135
                                Tunnel14
                                Null0
```

```
show platform software fed switch ip multicast df
```



PART **V**

## **IPv6**

- [IPv6 Commands, on page 357](#)





## IPv6 Commands

---

- [ipv6 dhcp server vrf enable](#), on page 358
- [ipv6 flow monitor](#) , on page 359
- [show ipv6 dhcp binding](#), on page 360

**ipv6 dhcp server vrf enable**

## ipv6 dhcp server vrf enable

To enable the DHCP for IPv6 server VRF-aware feature, use the **ipv6 dhcp server vrf enable** command in global configuration mode. To disable the feature, use the **no** form of this command.

**ipv6 dhcp server vrf enable**  
**no ipv6 dhcp server vrf enable**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The DHCPv6 server VRF-aware feature is not enabled.

**Command Modes** Global configuration (config)

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The **ipv6 dhcp server option vpn** command allows the DHCPv6 server VRF-aware feature to be enabled globally on a device.

**Examples** The following example enables the DHCPv6 server VRF-aware feature globally on a device:

```
Device(config)# ipv6 dhcp server option vpn
```

# ipv6 flow monitor

This command activates a previously created flow monitor by assigning it to the interface to analyze incoming or outgoing traffic.

To activate a previously created flow monitor, use the **ipv6 flow monitor** command. To de-activate a flow monitor, use the **no** form of the command.

```
ipv6 flow monitor ipv6-monitor-name [sampler ipv6-sampler-name] {input | output}  
no ipv6 flow monitor ipv6-monitor-name [sampler ipv6-sampler-name] {input | output}
```

<b>Syntax Description</b>	<p><i>ipv6-monitor-name</i> Activates a previously created flow monitor by assigning it to the interface to analyze incoming or outgoing traffic.</p> <p><b>sampler</b> <i>ipv6-sampler-name</i> Applies the flow monitor sampler.</p> <p><b>input</b> Applies the flow monitor on input traffic.</p> <p><b>output</b> Applies the flow monitor on output traffic.</p>
---------------------------	--

**Command Default** IPv6 flow monitor is not activated until it is assigned to an interface.

**Command Modes** Interface configuration (config-if)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** You cannot attach a NetFlow monitor to a port channel interface. If both service module interfaces are part of an EtherChannel, you should attach the monitor to both physical interfaces.

This example shows how to apply a flow monitor to an interface:

```
Device(config)# interface gigabitethernet 1/1/2  
Device(config-if)# ip flow monitor FLOW-MONITOR-1 input  
Device(config-if)# ip flow monitor FLOW-MONITOR-2 output  
Device(config-if)# end
```

**show ipv6 dhcp binding**

# show ipv6 dhcp binding

To display automatic client bindings from the Dynamic Host Configuration Protocol (DHCP) for IPv6 server binding table, use the **show ipv6 dhcp binding** command in user EXEC or privileged EXEC mode.

**show ipv6 dhcp binding [ipv6-address] [vrf vrf-name]**

<b>Syntax Description</b>	<i>ipv6-address</i> (Optional) The address of a DHCP for IPv6 client.
	<b>vrf vrf-name</b> (Optional) Specifies a virtual routing and forwarding (VRF) configuration.

**Command Modes** User EXEC (>)

Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The **show ipv6 dhcp binding** command displays all automatic client bindings from the DHCP for IPv6 server binding table if the *ipv6-address* argument is not specified. When the *ipv6-address* argument is specified, only the binding for the specified client is displayed.

If the **vrf vrf-name** keyword and argument combination is specified, all bindings that belong to the specified VRF are displayed.



**Note** The **ipv6 dhcp server vrf enable** command must be enabled for the configured VRF to work. If the command is not configured, the output of the **show ipv6 dhcp binding** command will not display the configured VRF; it will only display the default VRF details.

## Examples

The following sample output displays all automatic client bindings from the DHCP for IPv6 server binding table:

```
Device# show ipv6 dhcp binding

Client: FE80::A8BB:CCFF:FE00:300
        DUID: 00030001AABBCC000300
        Username : client_1
        Interface: Virtual-Access2.1
        IA PD: IA ID 0x000C0001, T1 75, T2 135
        Prefix: 2001:380:E00::/64
                  preferred lifetime 150, valid lifetime 300
                  expires at Dec 06 2007 12:57 PM (262 seconds)
Client: FE80::A8BB:CCFF:FE00:300 (Virtual-Access2.2)
        DUID: 00030001AABBCC000300
        IA PD: IA ID 0x000D0001, T1 75, T2 135
        Prefix: 2001:0DB8:E00:1::/64
```

```
preferred lifetime 150, valid lifetime 300
expires at Dec 06 2007 12:58 PM (288 seconds)
```

The table below describes the significant fields shown in the display.

**Table 24: show ipv6 dhcp binding Field Descriptions**

Field	Description
Client	Address of a specified client.
DUID	DHCP unique identifier (DUID).
Virtual-Access2.1	First virtual client. When an IPv6 DHCP client requests two prefixes with the same DUID but a different identity association for prefix delegation (IAPD) on two different interfaces, these prefixes are considered to be for two different clients, and interface information is maintained for both.
Username : client_1	The username associated with the binding.
IA PD	Collection of prefixes assigned to a client.
IA ID	Identifier for this IAPD.
Prefix	Prefixes delegated to the indicated IAPD on the specified client.
preferred lifetime, valid lifetime	The preferred lifetime and valid lifetime settings, in seconds, for the specified client.
Expires at	Date and time at which the valid lifetime expires.
Virtual-Access2.2	Second virtual client. When an IPv6 DHCP client requests two prefixes with the same DUID but different IAIDs on two different interfaces, these prefixes are considered to be for two different clients, and interface information is maintained for both.

When the DHCPv6 pool on the Cisco IOS DHCPv6 server is configured to obtain prefixes for delegation from an authentication, authorization, and accounting (AAA) server, it sends the PPP username from the incoming PPP session to the AAA server for obtaining the prefixes. The PPP username is associated with the binding is displayed in output from the **show ipv6 dhcp binding** command. If there is no PPP username associated with the binding, this field value is displayed as "unassigned."

The following example shows that the PPP username associated with the binding is "client\_1":

```
Device# show ipv6 dhcp binding

Client: FE80::2AA:FF:FEBB:CC
        DUID: 0003000100AA00BB00CC
        Username : client_1
        Interface : Virtual-Access2
        IA PD: IA ID 0x00130001, T1 75, T2 135
        Prefix: 2001:0DB8:1:3::/80
                  preferred lifetime 150, valid lifetime 300
                  expires at Aug 07 2008 05:19 AM (225 seconds)
```

The following example shows that the PPP username associated with the binding is unassigned:

**show ipv6 dhcp binding**

```
Device# show ipv6 dhcp binding

Client: FE80::2AA:FF:FEBB:CC
DUID: 0003000100AA00BB00CC
Username : unassigned
Interface : Virtual-Access2
IA PD: IA ID 0x00130001, T1 150, T2 240
Prefix: 2001:0DB8:1:1::/80
preferred lifetime 300, valid lifetime 300
expires at Aug 11 2008 06:23 AM (233 seconds)
```

Related Commands	Command	Description
	<b>ipv6 dhcp server vrf enable</b>	Enables the DHCPv6 server VRF-aware feature.
	<b>clear ipv6 dhcp binding</b>	Deletes automatic client bindings from the DHCP for IPv6 binding table.

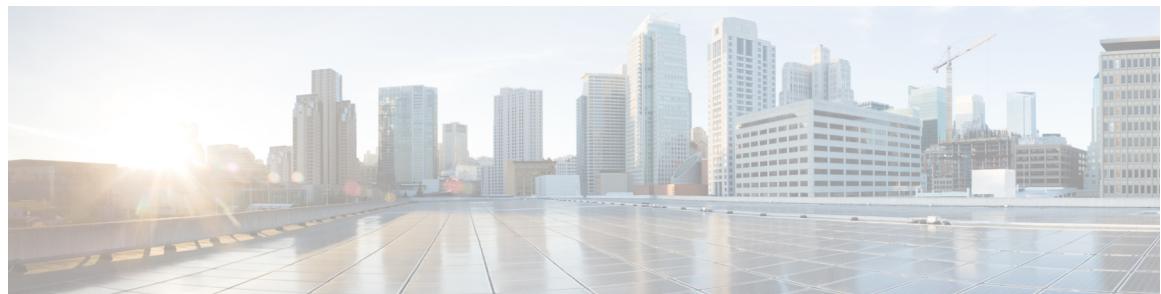


PART VI

## Layer 2/3

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## Layer 2/3 Commands

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# channel-group

To assign an Ethernet port to an EtherChannel group, or to enable an EtherChannel mode, or both, use the **channel-group** command in interface configuration mode. To remove an Ethernet port from an EtherChannel group, use the **no** form of this command.

```
channel-group { auto | channel-group-number mode {active | auto [non-silent] | desirable
[non-silent] | on | passive} }
no channel-group
```

Syntax Description		
	<b>auto</b>	Enables auto-LAG feature on individual port interface.  By default, the auto-LAG feature is enabled on the port.
	<i>channel-group-number</i>	Channel group number. The range is 1 to 128.
	<b>mode</b>	Specifies the EtherChannel mode.
	<b>active</b>	Unconditionally enables Link Aggregation Control Protocol (LACP).
	<b>auto</b>	Enables the Port Aggregation Protocol (PAgP) only if a PAgP device is detected.
	<b>non-silent</b>	(Optional) Configures the interface for nonsilent operation when connected to a partner that is PAgP-capable. Use in PAgP mode with the <b>auto</b> or <b>desirable</b> keyword when traffic is expected from the other device.
	<b>desirable</b>	Unconditionally enables PAgP.
	<b>on</b>	Enables the on mode.
	<b>passive</b>	Enables LACP only if a LACP device is detected.
<b>Command Default</b>	No channel groups are assigned. No mode is configured.	
<b>Command Modes</b>	Interface configuration	

**channel-group**

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.
Usage Guidelines	<p>For Layer 2 EtherChannels, the <b>channel-group</b> command automatically creates the port-channel interface when the channel group gets its first physical port. You do not have to use the <b>interface port-channel</b> command in global configuration mode to manually create a port-channel interface. If you create the port-channel interface first, the <i>channel-group-number</i> can be the same as the <i>port-channel-number</i>, or you can use a new number. If you use a new number, the <b>channel-group</b> command dynamically creates a new port channel.</p> <p>After you configure an EtherChannel, configuration changes that you make on the port-channel interface apply to all the physical ports assigned to the port-channel interface. Configuration changes applied to the physical port affect only the port where you apply the configuration. To change the parameters of all ports in an EtherChannel, apply configuration commands to the port-channel interface, for example, spanning-tree commands or commands to configure a Layer 2 EtherChannel as a trunk.</p> <p>Active mode places a port into a negotiating state in which the port initiates negotiations with other ports by sending LACP packets. A channel is formed with another port group in either the active or passive mode.</p> <p>Auto mode places a port into a passive negotiating state in which the port responds to PAgP packets it receives but does not start PAgP packet negotiation. A channel is formed only with another port group in desirable mode. When auto is enabled, silent operation is the default.</p> <p>Desirable mode places a port into an active negotiating state in which the port starts negotiations with other ports by sending PAgP packets. An EtherChannel is formed with another port group that is in the desirable or auto mode. When desirable is enabled, silent operation is the default.</p> <p>If you do not specify non-silent with the auto or desirable mode, silent is assumed. The silent mode is used when the device is connected to a device that is not PAgP-capable and rarely, if ever, sends packets. An example of a silent partner is a file server or a packet analyzer that is not generating traffic. In this case, running PAgP on a physical port prevents that port from ever becoming operational. However, it allows PAgP to operate, to attach the port to a channel group, and to use the port for transmission. Both ends of the link cannot be set to silent.</p> <p>In on mode, a usable EtherChannel exists only when both connected port groups are in the on mode.</p> <p><b>Caution</b> Use care when using the on mode. This is a manual configuration, and ports on both ends of the EtherChannel must have the same configuration. If the group is misconfigured, packet loss or spanning-tree loops can occur.</p> <p>Passive mode places a port into a negotiating state in which the port responds to received LACP packets but does not initiate LACP packet negotiation. A channel is formed only with another port group in active mode.</p> <p>Do not configure an EtherChannel in both the PAgP and LACP modes. EtherChannel groups running PAgP and LACP can coexist on the same device or on different devices in the stack (but not in a cross-stack configuration). Individual EtherChannel groups can run either PAgP or LACP, but they cannot interoperate.</p> <p>If you set the protocol by using the <b>channel-protocol</b> interface configuration command, the setting is not overridden by the <b>channel-group</b> interface configuration command.</p> <p>Do not configure a port that is an active or a not-yet-active member of an EtherChannel as an IEEE 802.1x port. If you try to enable IEEE 802.1x authentication on an EtherChannel port, an error message appears, and IEEE 802.1x authentication is not enabled.</p> <p>Do not configure a secure port as part of an EtherChannel or configure an EtherChannel port as a secure port.</p>	

For a complete list of configuration guidelines, see the “Configuring EtherChannels” chapter in the software configuration guide for this release.



**Caution** Do not assign bridge groups on the physical EtherChannel ports because it creates loops.

This example shows how to configure an EtherChannel on a single device in the stack. It assigns two static-access ports in VLAN 10 to channel 5 with the PAgP mode desirable:

```
Device# configure terminal
Device(config)# interface range GigabitEthernet 2/0/1 - 2
Device(config-if-range)# switchport mode access
Device(config-if-range)# switchport access vlan 10
Device(config-if-range)# channel-group 5 mode desirable
Device(config-if-range)# end
```

This example shows how to configure an EtherChannel on a single device in the stack. It assigns two static-access ports in VLAN 10 to channel 5 with the LACP mode active:

```
Device# configure terminal
Device(config)# interface range GigabitEthernet 2/0/1 - 2
Device(config-if-range)# switchport mode access
Device(config-if-range)# switchport access vlan 10
Device(config-if-range)# channel-group 5 mode active
Device(config-if-range)# end
```

This example shows how to configure a cross-stack EtherChannel in a device stack. It uses LACP passive mode and assigns two ports on stack member 2 and one port on stack member 3 as static-access ports in VLAN 10 to channel 5:

```
Device# configure terminal
Device(config)# interface range GigabitEthernet 2/0/4 - 5
Device(config-if-range)# switchport mode access
Device(config-if-range)# switchport access vlan 10
Device(config-if-range)# channel-group 5 mode passive
Device(config-if-range)# exit
Device(config)# interface GigabitEthernet 3/0/3
Device(config-if)# switchport mode access
Device(config-if)# switchport access vlan 10
Device(config-if)# channel-group 5 mode passive
Device(config-if)# exit
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

# channel-protocol

To restrict the protocol used on a port to manage channeling, use the **channel-protocol** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

```
channel-protocol {lacp | pagp}
no channel-protocol
```

## Syntax Description

**lacp** Configures an EtherChannel with the Link Aggregation Control Protocol (LACP).

**pagp** Configures an EtherChannel with the Port Aggregation Protocol (PAgP).

## Command Default

No protocol is assigned to the EtherChannel.

## Command Modes

Interface configuration

## Command History

### Release

### Modification

Cisco IOS XE 3.2SE

This command was introduced.

## Usage Guidelines

Use the **channel-protocol** command only to restrict a channel to LACP or PAgP. If you set the protocol by using the **channel-protocol** command, the setting is not overridden by the **channel-group** interface configuration command.

You must use the **channel-group** interface configuration command to configure the EtherChannel parameters. The **channel-group** command also can set the mode for the EtherChannel.

You cannot enable both the PAgP and LACP modes on an EtherChannel group.

PAgP and LACP are not compatible; both ends of a channel must use the same protocol.

You cannot configure PAgP on cross-stack configurations.

This example shows how to specify LACP as the protocol that manages the EtherChannel:

```
Device(config-if)# channel-protocol lacp
```

You can verify your settings by entering the **show etherchannel [channel-group-number] protocol** privileged EXEC command.

# clear lacp

To clear Link Aggregation Control Protocol (LACP) channel-group counters, use the **clear lacp** command in privileged EXEC mode.

**clear lacp [channel-group-number] counters**

---

## Syntax Description

*channel-group-number* (Optional) Channel group number. The range is 1 to 128.

**counters** Clears traffic counters.

---

## Command Default

None

## Command Modes

Privileged EXEC

---

## Command History

### Release

### Modification

Cisco IOS XE 3.2SE

This command was introduced.

---



---

## Usage Guidelines

You can clear all counters by using the **clear lacp counters** command, or you can clear only the counters for the specified channel group by using the **clear lacp channel-group-number counters** command.

This example shows how to clear all channel-group information:

```
Device# clear lacp counters
```

This example shows how to clear LACP traffic counters for group 4:

```
Device# clear lacp 4 counters
```

You can verify that the information was deleted by entering the **show lacp counters** or the **show lacp channel-group-number counters** privileged EXEC command.

**clear pagp**

# clear pagp

To clear the Port Aggregation Protocol (PAgP) channel-group information, use the **clear pagp** command in privileged EXEC mode.

**clear pagp [channel-group-number] counters**

<b>Syntax Description</b>	<i>channel-group-number</i> (Optional) Channel group number. The range is 1 to 128.				
	<b>counters</b> Clears traffic counters.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** You can clear all counters by using the **clear pagp counters** command, or you can clear only the counters for the specified channel group by using the **clear pagp channel-group-number counters** command.

This example shows how to clear all channel-group information:

```
Device# clear pagp counters
```

This example shows how to clear PAgP traffic counters for group 10:

```
Device# clear pagp 10 counters
```

You can verify that the information was deleted by entering the **show pagp** privileged EXEC command.

# clear spanning-tree counters

To clear the spanning-tree counters, use the **clear spanning-tree counters** command in privileged EXEC mode.

**clear spanning-tree counters [interface *interface-id*]**

<b>Syntax Description</b>	<b>interface <i>interface-id</i></b>	(Optional) Clears all spanning-tree counters on the specified interface. This includes physical ports, VLANs, and port channels. The VLAN range is 1 to 4094. The port-channel range is 1 to 128.
<b>Command Default</b>	None	
<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** If the *interface-id* value is not specified, spanning-tree counters are cleared for all interfaces.

This example shows how to clear spanning-tree counters for all interfaces:

```
Device# clear spanning-tree counters
```

**clear spanning-tree detected-protocols**

# clear spanning-tree detected-protocols

To restart the protocol migration process and force renegotiation with neighboring devices on the interface, use the **clear spanning-tree detected-protocols** command in privileged EXEC mode.

**clear spanning-tree detected-protocols [interface *interface-id*]**

<b>Syntax Description</b>	<b>interface <i>interface-id</i></b>	(Optional) Restarts the protocol migration process on the specified interfaces.  The VLAN range is 1 to 4094.  The port-channel range is 1 to 128.
<b>Command Default</b>	None	
<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
<b>Usage Guidelines</b>	<p>A device running the rapid per-VLAN spanning-tree plus (rapid-PVST+) protocol or the Multiple Spanning Tree Protocol (MSTP) supports a built-in protocol migration method that enables it to interoperate with legacy IEEE 802.1D devices. If a rapid-PVST+ or an MSTP device receives a legacy IEEE 802.1D configuration bridge protocol data unit (BPDU) with the protocol version set to 0, the device sends only IEEE 802.1D BPDUs on that port. A multiple spanning-tree (MST) device can also detect that a port is at the boundary of a region when it receives a legacy BPDU, an MST BPDU (Version 3) associated with a different region, or a rapid spanning-tree (RST) BPDU (Version 2).</p> <p>The device does not automatically revert to the rapid-PVST+ or the MSTP mode if it no longer receives IEEE 802.1D BPDUs because it cannot learn whether the legacy switch has been removed from the link unless the legacy switch is the designated switch. Use the <b>clear spanning-tree detected-protocols</b> command in this situation.</p>	
	<p>This example shows how to restart the protocol migration process on a port:</p>	

```
Device# clear spanning-tree detected-protocols interface gigabitethernet2/0/1
```

# debug etherchannel

To enable debugging of EtherChannels, use the **debug etherchannel** command in privileged EXEC mode. To disable debugging, use the **no** form of the command.

```
debug etherchannel [{all | detail | error | event | idb}]
no debug etherchannel [{all | detail | error | event | idb}]
```

## Syntax Description

<b>all</b>	(Optional) Displays all EtherChannel debug messages.
<b>detail</b>	(Optional) Displays detailed EtherChannel debug messages.
<b>error</b>	(Optional) Displays EtherChannel error debug messages.
<b>event</b>	(Optional) Displays EtherChannel event messages.
<b>idb</b>	(Optional) Displays PAgP interface descriptor block debug messages.

## Command Default

Debugging is disabled.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

The **undebbug etherchannel** command is the same as the **no debug etherchannel** command.



**Note** Although the **linecard** keyword is displayed in the command-line help, it is not supported.

When you enable debugging on a stack, it is enabled only on the active switch. To enable debugging on the standby switch, start a session from the active switch by using the **session switch-number** command in privileged EXEC mode. Enter the **debug** command at the command-line prompt of the standby switch.

To enable debugging on the standby switch without first starting a session on the active switch, use the **remote command switch-number LINE** command in privileged EXEC mode.

This example shows how to display all EtherChannel debug messages:

```
Device# debug etherchannel all
```

This example shows how to display debug messages related to EtherChannel events:

```
Device# debug etherchannel event
```

**debug lacp**

# debug lacp

To enable debugging of Link Aggregation Control Protocol (LACP) activity, use the **debug lacp** command in privileged EXEC mode. To disable LACP debugging, use the **no** form of this command.

```
debug lacp [{all | event | fsm | misc | packet}]
no debug lacp [{all | event | fsm | misc | packet}]
```

---

## Syntax Description

<b>all</b>	(Optional) Displays all LACP debug messages.
<b>event</b>	(Optional) Displays LACP event debug messages.
<b>fsm</b>	(Optional) Displays messages about changes within the LACP finite state machine.
<b>misc</b>	(Optional) Displays miscellaneous LACP debug messages.
<b>packet</b>	(Optional) Displays the receiving and transmitting LACP control packets.

---



---

## Command Default

Debugging is disabled.

---

## Command Modes

Privileged EXEC

---

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

---



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## Usage Guidelines

The **undebug etherchannel** command is the same as the **no debug etherchannel** command.

When you enable debugging on a stack, it is enabled only on the active switch. To enable debugging on the standby switch, start a session from the active switch by using the **session switch-number** command in privileged EXEC mode. Enter the **debug** command at the command-line prompt of the standby switch.

To enable debugging on the standby switch without first starting a session on the active switch, use the **remote command** *switch-number LINE* command in privileged EXEC mode.

This example shows how to display all LACP debug messages:

```
Device# debug LACP all
```

This example shows how to display debug messages related to LACP events:

```
Device# debug LACP event
```

# debug pagp

To enable debugging of Port Aggregation Protocol (PAgP) activity, use the **debug pagp** command in privileged EXEC mode. To disable PAgP debugging, use the **no** form of this command.

```
debug pagp [{all | dual-active | event | fsm | misc | packet}]
no debug pagp [{all | dual-active | event | fsm | misc | packet}]
```

## Syntax Description

<b>all</b>	(Optional) Displays all PAgP debug messages.
<b>dual-active</b>	(Optional) Displays dual-active detection messages.
<b>event</b>	(Optional) Displays PAgP event debug messages.
<b>fsm</b>	(Optional) Displays messages about changes within the PAgP finite state machine.
<b>misc</b>	(Optional) Displays miscellaneous PAgP debug messages.
<b>packet</b>	(Optional) Displays the receiving and transmitting PAgP control packets.

## Command Default

Debugging is disabled.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

The **undebug pagp** command is the same as the **no debug pagp** command.

When you enable debugging on a stack, it is enabled only on the active switch. To enable debugging on the standby switch, start a session from the active switch by using the **session switch-number** command in privileged EXEC mode. Enter the **debug** command at the command-line prompt of the standby switch.

To enable debugging on the standby switch without first starting a session on the active switch, use the **remote command switch-number LINE** command in privileged EXEC mode.

This example shows how to display all PAgP debug messages:

```
Device# debug pagp all
```

This example shows how to display debug messages related to PAgP events:

```
Device# debug pagp event
```

# debug platform pm

To enable debugging of the platform-dependent port manager software module, use the **debug platform pm** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

<b>Syntax Description</b>	
<b>all</b>	Displays all port manager debug messages.
<b>counters</b>	Displays counters for remote procedure call (RPC) debug messages.
<b>errdisable</b>	Displays error-disabled-related events debug messages.
<b>if-numbers</b>	Displays interface-number translation event debug messages.
<b>link-status</b>	Displays interface link-detection event debug messages.
<b>platform</b>	Displays port manager function event debug messages.
<b>pm-vectors</b>	Displays port manager vector-related event debug messages.
<b>detail</b>	(Optional) Displays vector-function details.
<b>vlans</b>	Displays VLAN creation and deletion event debug messages.

**Command Default** Debugging is disabled.

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The **undebug platform pm** command is the same as the **no debug platform pm** command.

When you enable debugging on a stack, it is enabled only on the active switch. To enable debugging on the standby switch , start a session from the active switch by using the **session switch-number** command in privileged EXEC mode. Enter the **debug** command at the command-line prompt of the standby switch.

To enable debugging on the standby switch without first starting a session on the active switch, use the **remote command switch-number LINE** command in privileged EXEC mode.

This example shows how to display debug messages related to the creation and deletion of VLANs:

```
Device# debug platform pm vlans
```

# debug platform udld

To enable debugging of the platform-dependent UniDirectional Link Detection (UDLD) software, use the **debug platform udld** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

<b>Syntax Description</b>	<b>error</b> (Optional) Displays error condition debug messages.				
<b>Command Default</b>	Debugging is disabled.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	The <b>undebug platform udld</b> command is the same as the <b>no debug platform udld</b> command.				

# debug spanning-tree

To enable debugging of spanning-tree activities, use the **debug spanning-tree** command in EXEC mode. To disable debugging, use the **no** form of this command.

```
debug spanning-tree {all | backbonefast | bpdu | bpdu-opt | config | etherchannel | events | exceptions | general | ha | mstp | pvst+ | root | snmp | synchronization | switch | uplinkfast}
no debug spanning-tree {all | backbonefast | bpdu | bpdu-opt | config | etherchannel | events | exceptions | general | mstp | pvst+ | root | snmp | synchronization | switch | uplinkfast}
```

Syntax Description		
	<b>all</b>	Displays all spanning-tree debug messages.
	<b>backbonefast</b>	Displays BackboneFast-event debug messages.
	<b>bpdu</b>	Displays spanning-tree bridge protocol data unit (BPDU) debug messages.
	<b>bpdu-opt</b>	Displays optimized BPDU handling debug messages.
	<b>config</b>	Displays spanning-tree configuration change debug messages.
	<b>etherchannel</b>	Displays EtherChannel-support debug messages.
	<b>events</b>	Displays spanning-tree topology event debug messages.
	<b>exceptions</b>	Displays spanning-tree exception debug messages.
	<b>general</b>	Displays general spanning-tree activity debug messages.
	<b>ha</b>	Displays high-availability spanning-tree debug messages.
	<b>mstp</b>	Debugs Multiple Spanning Tree Protocol (MSTP) events.
	<b>pvst+</b>	Displays per-VLAN spanning-tree plus (PVST+) event debug messages.
	<b>root</b>	Displays spanning-tree root-event debug messages.
	<b>snmp</b>	Displays spanning-tree Simple Network Management Protocol (SNMP) handling debug messages.
	<b>switch</b>	Displays device shim command debug messages. This shim is the software module that is the interface between the generic Spanning Tree Protocol (STP) code and the platform-specific code of various device platforms.
	<b>synchronization</b>	Displays the spanning-tree synchronization event debug messages.
	<b>uplinkfast</b>	Displays UplinkFast-event debug messages.

<b>Command Default</b>	Debugging is disabled.
<b>Command Modes</b>	Privileged EXEC
<b>Command History</b>	<b>Release</b> Cisco IOS XE 3.2SE <b>Modification</b> This command was introduced.

**Usage Guidelines**

The **undebug spanning-tree** command is the same as the **no debug spanning-tree** command. When you enable debugging on a stack, it is enabled only on the active switch. To enable debugging on the standby switch , start a session from the active switch by using the **session switch-number** command in privileged EXEC mode. Enter the **debug** command at the command-line prompt of the standby switch.

To enable debugging on the standby switch without first starting a session on the active switch, use the **remote command switch-number LINE** command in privileged EXEC mode.

This example shows how to display all spanning-tree debug messages:

```
Device# debug spanning-tree all
```

# interface port-channel

To access or create a port channel, use the **interface port-channel** command in global configuration mode. Use the **no** form of this command to remove the port channel.

**interface port-channel** *port-channel-number*  
**no interface port-channel**

<b>Syntax Description</b>	<i>port-channel-number</i> Channel group number. The range is 1 to 128.				
<b>Command Default</b>	No port channel logical interfaces are defined.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	For Layer 2 EtherChannels, you do not have to create a port-channel interface before assigning physical ports to a channel group. Instead, you can use the <b>channel-group</b> interface configuration command, which automatically creates the port-channel interface when the channel group obtains its first physical port. If you create the port-channel interface first, the <i>channel-group-number</i> can be the same as the <i>port-channel-number</i> , or you can use a new number. If you use a new number, the <b>channel-group</b> command dynamically creates a new port channel.
	Only one port channel in a channel group is allowed.

Follow these guidelines when you use the **interface port-channel** command:

- If you want to use the Cisco Discovery Protocol (CDP), you must configure it on the physical port and not on the port channel interface.
- Do not configure a port that is an active member of an EtherChannel as an IEEE 802.1x port. If IEEE 802.1x is enabled on a not-yet active port of an EtherChannel, the port does not join the EtherChannel.

For a complete list of configuration guidelines, see the “Configuring EtherChannels” chapter in the software configuration guide for this release.

This example shows how to create a port channel interface with a port channel number of 5:

```
Device(config)# interface port-channel 5
```

You can verify your setting by entering the **show running-config** privileged EXEC or **show etherchannel** *channel-group-number* **detail** privileged EXEC command.

# lacp max-bundle

To define the maximum number of active LACP ports allowed in a port channel, use the **lacp max-bundle** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

**lacp max-bundle *max\_bundle\_number***  
**no lacp max-bundle**

<b>Syntax Description</b>	<i>max_bundle_number</i> The maximum number of active LACP ports in the port channel. The range is 1 to 8. The default is 8.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.3SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.3SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.3SE	This command was introduced.				

**Usage Guidelines** An LACP channel group can have up to 16 Ethernet ports of the same type. Up to eight ports can be active, and up to eight ports can be in hot-standby mode. When there are more than eight ports in an LACP channel group, the device on the controlling end of the link uses port priorities to determine which ports are bundled into the channel and which ports are put in hot-standby mode. Port priorities on the other device (the noncontrolling end of the link) are ignored.

The **lacp max-bundle** command must specify a number greater than the number specified by the **port-channel min-links** command.

Use the **show etherchannel summary** privileged EXEC command to see which ports are in the hot-standby mode (denoted with an H port-state flag in the output display).

This example shows how to specify a maximum of five active LACP ports in port channel 2:

```
Device(config)# interface port-channel 2
Device(config-if)# lacp max-bundle 5
```

# lacp port-priority

To configure the port priority for the Link Aggregation Control Protocol (LACP), use the **lacp port-priority** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

**lacp port-priority *priority***  
**no lacp port-priority**

<b>Syntax Description</b>	<i>priority</i> Port priority for LACP. The range is 1 to 65535.
---------------------------	--

<b>Command Default</b>	The default is 32768.
------------------------	-----------------------

<b>Command Modes</b>	Interface configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	The <b>lacp port-priority</b> interface configuration command determines which ports are bundled and which ports are put in hot-standby mode when there are more than eight ports in an LACP channel group.
-------------------------	---

An LACP channel group can have up to 16 Ethernet ports of the same type. Up to eight ports can be active, and up to eight ports can be in standby mode.

In port-priority comparisons, a numerically lower value has a higher priority: When there are more than eight ports in an LACP channel group, the eight ports with the numerically lowest values (highest priority values) for LACP port priority are bundled into the channel group, and the lower-priority ports are put in hot-standby mode. If two or more ports have the same LACP port priority (for example, they are configured with the default setting of 65535), then an internal value for the port number determines the priority.



<b>Note</b>	The LACP port priorities are only effective if the ports are on the device that controls the LACP link. See the <b>lacp system-priority</b> global configuration command for determining which device controls the link.
-------------	--

Use the **show lacp internal** privileged EXEC command to display LACP port priorities and internal port number values.

For information about configuring LACP on physical ports, see the configuration guide for this release.

This example shows how to configure the LACP port priority on a port:

```
Device# interface gigabitethernet2/0/1
Device(config-if)# lacp port-priority 1000
```

You can verify your settings by entering the **show lacp [channel-group-number] internal** privileged EXEC command.

# lacp rate

To set the rate at which Link Aggregation Control Protocol (LACP) control packets are ingressed to an LACP-supported interface, use the **lacp rate** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

```
lacp rate {normal | fast}
no lacp rate
```

## Syntax Description

<b>normal</b>	Specifies that LACP control packets are ingressed at the normal rate, every 30 seconds after the link is bundled.
<b>fast</b>	Specifies that LACP control packets are ingressed at the fast rate, once every 1 second.

## Command Default

The default ingress rate for control packets is 30 seconds after the link is bundled.

## Command Modes

Interface configuration (config-if)

## Command History

Release	Modification
Cisco IOS XE Denali 16.2.1	This command was introduced.

## Usage Guidelines

Use this command to modify the duration of LACP timeout. The LACP timeout value on Cisco switch is three times the LACP rate configured on the interface. Using the **lacp rate** command, you can select the LACP timeout value for a switch to be either 90 seconds or 3 seconds.

This command is supported only on LACP-enabled interfaces.

This example shows how to specify the fast (1 second) ingress rate on interface GigabitEthernet 0/0:

```
Device(config)# interface gigabitEthernet 0/0
Device(config-if)# lacp rate fast
```

**lacp system-priority**

# lacp system-priority

To configure the system priority for the Link Aggregation Control Protocol (LACP), use the **lacp system-priority** command in global configuration mode on the device. To return to the default setting, use the **no** form of this command.

```
lacp system-priority priority
no lacp system-priority
```

<b>Syntax Description</b>	<i>priority</i> System priority for LACP. The range is 1 to 65535.				
<b>Command Default</b>	The default is 32768.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	<p>The <b>lacp system-priority</b> command determines which device in an LACP link controls port priorities. An LACP channel group can have up to 16 Ethernet ports of the same type. Up to eight ports can be active, and up to eight ports can be in standby mode. When there are more than eight ports in an LACP channel group, the device on the controlling end of the link uses port priorities to determine which ports are bundled into the channel and which ports are put in hot-standby mode. Port priorities on the other device (the noncontrolling end of the link) are ignored.</p> <p>In priority comparisons, numerically lower values have a higher priority. Therefore, the system with the numerically lower value (higher priority value) for LACP system priority becomes the controlling system. If both devices have the same LACP system priority (for example, they are both configured with the default setting of 32768), the LACP system ID (the device MAC address) determines which device is in control.</p> <p>The <b>lacp system-priority</b> command applies to all LACP EtherChannels on the device.</p> <p>Use the <b>show etherchannel summary</b> privileged EXEC command to see which ports are in the hot-standby mode (denoted with an H port-state flag in the output display).</p>
-------------------------	---

This example shows how to set the LACP system priority:

```
Device(config)# lacp system-priority 20000
```

You can verify your settings by entering the **show lacp sys-id** privileged EXEC command.

# pagp learn-method

To learn the source address of incoming packets received from an EtherChannel port, use the **pagp learn-method** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

```
pagp learn-method {aggregation-port | physical-port}
no pagp learn-method
```

<b>Syntax Description</b>	<b>aggregation-port</b> Specifies address learning on the logical port channel. The device sends packets to the source using any port in the EtherChannel. This setting is the default. With aggregation-port learning, it is not important on which physical port the packet arrives.  <b>physical-port</b> Specifies address learning on the physical port within the EtherChannel. The device sends packets to the source using the same port in the EtherChannel from which it learned the source address. The other end of the channel uses the same port in the channel for a particular destination MAC or IP address.				
<b>Command Default</b>	The default is aggregation-port (logical port channel).				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	The learn method must be configured the same at both ends of the link.  The device supports address learning only on aggregate ports even though the <b>physical-port</b> keyword is provided in the command-line interface (CLI). The <b>pagp learn-method</b> and the <b>pagp port-priority</b> interface configuration commands have no effect on the device hardware, but they are required for PAgP interoperability with devices that only support address learning by physical ports.  When the link partner to the device is a physical learner, we recommend that you configure the device as a physical-port learner by using the <b>pagp learn-method physical-port</b> interface configuration command. We also recommend that you set the load-distribution method based on the source MAC address by using the <b>port-channel load-balance src-mac</b> global configuration command. Use the <b>pagp learn-method</b> interface configuration command only in this situation.
-------------------------	--

This example shows how to set the learning method to learn the address on the physical port within the EtherChannel:

```
Device(config-if)# pagp learn-method physical-port
```

This example shows how to set the learning method to learn the address on the port channel within the EtherChannel:

```
Device(config-if)# pagp learn-method aggregation-port
```

**pagp learn-method**

You can verify your settings by entering the **show running-config** privileged EXEC command or the **show pagp *channel-group-number* internal** privileged EXEC command.

# pagp port-priority

To select a port over which all Port Aggregation Protocol (PAgP) traffic through the EtherChannel is sent, use the **pagp port-priority** command in interface configuration mode. If all unused ports in the EtherChannel are in hot-standby mode, they can be placed into operation if the currently selected port and link fails. To return to the default setting, use the **no** form of this command.

**pagp port-priority** *priority*  
**no pagp port-priority**

<b>Syntax Description</b>	<i>priority</i> Priority number. The range is from 0 to 255.	
<b>Command Default</b>	The default is 128.	
<b>Command Modes</b>	Interface configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
<b>Usage Guidelines</b>	<p>The physical port with the highest priority that is operational and has membership in the same EtherChannel is the one selected for PAgP transmission.</p> <p>The device supports address learning only on aggregate ports even though the <b>physical-port</b> keyword is provided in the command-line interface (CLI). The <b>pagp learn-method</b> and the <b>pagp port-priority</b> interface configuration commands have no effect on the device hardware, but they are required for PAgP interoperability with devices that only support address learning by physical ports, such as the Catalyst 1900 switch.</p> <p>When the link partner to the device is a physical learner, we recommend that you configure the device as a physical-port learner by using the <b>pagp learn-method physical-port</b> interface configuration command. We also recommend that you set the load-distribution method based on the source MAC address by using the <b>port-channel load-balance src-mac</b> global configuration command. Use the <b>pagp learn-method</b> interface configuration command only in this situation.</p>	

This example shows how to set the port priority to 200:

```
Device(config-if)# pagp port-priority 200
```

You can verify your setting by entering the **show running-config** privileged EXEC command or the **show pagp channel-group-number internal** privileged EXEC command.

**port-channel**

# port-channel

To convert the auto created EtherChannel into a manual channel and adding configuration on the EtherChannel, use the **port-channel** command in privileged EXEC mode.

**port-channel {channel-group-number persistent | persistent}**

<b>Syntax Description</b>	<i>channel-group-number</i> Channel group number. The range is 1 to 128.				
	<b>persistent</b> Converts the auto created EtherChannel into a manual channel and allows you to add configuration on the EtherChannel.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.7.2E</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.7.2E	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.7.2E	This command was introduced.				

**Usage Guidelines** You can use the **show etherchannel summary** privileged EXEC command to display the EtherChannel information.

**Examples** This example shows how to convert the auto created EtherChannel into a manual channel:

```
Device# port-channel 1 persistent
```

# port-channel auto

To enable the auto-LAG feature on a switch globally, use the **port-channel auto** command in global configuration mode. To disable the auto-LAG feature on the switch globally, use **no** form of this command.

**port-channel auto**  
**no port-channel auto**

**Syntax Description** This command has no arguments or keywords.

**Command Default** By default, the auto-LAG feature is disabled globally and is enabled on all port interfaces.

**Command Modes** Global configuration

Command History	Release	Modification
	Cisco IOS XE 3.7.2E	This command was introduced.

**Usage Guidelines** You can use the **show etherchannel auto** privileged EXEC command to verify if the EtherChannel was created automatically.

**Examples** This example shows how to enable the auto-LAG feature on the switch:

```
Device(config)# port-channel auto
```

**port-channel load-balance**

# port-channel load-balance

To set the load-distribution method among the ports in the EtherChannel, use the **port-channel load-balance** command in global configuration mode. To reset the load-balancing mechanism to the default setting, use the **no** form of this command.

```
port-channel load-balance {dst-ip | dst-mac | dst-mixed-ip-port | dst-port | extended | src-dst-ip | src-dst-mac | src-dst-mixed-ip-port | src-dst-port | src-ip | src-mac | src-mixed-ip-port | src-port}
no port-channel load-balance
```

Syntax Description	<b>dst-ip</b> Specifies load distribution based on the destination host IP address.
<b>dst-mac</b>	Specifies load distribution based on the destination host MAC address. Packets to the same destination are sent on the same port, but packets to different destinations are sent on different ports in the channel.
<b>dst-mixed-ip-port</b>	Specifies load distribution based on the destination IPv4 or IPv6 address and the TCP/UDP (Layer 4) port number.
<b>dst-port</b>	Specifies load distribution based on the destination TCP/UDP (Layer 4) port number for both IPv4 and IPv6.
<b>extended</b>	Sets extended load balance methods among the ports in the EtherChannel. See the <b>port-channel load-balance extended</b> command.
<b>src-dst-ip</b>	Specifies load distribution based on the source and destination host IP address.
<b>src-dst-mac</b>	Specifies load distribution based on the source and destination host MAC address.
<b>src-dst-mixed-ip-port</b>	Specifies load distribution based on the source and destination host IP address and TCP/UDP (layer 4) port number.
<b>src-dst-port</b>	Specifies load distribution based on the source and destination TCP/UDP (Layer 4) port number.
<b>src-ip</b>	Specifies load distribution based on the source host IP address.
<b>src-mac</b>	Specifies load distribution based on the source MAC address. Packets from different hosts use different ports in the channel, but packets from the same host use the same port.
<b>src-mixed-ip-port</b>	Specifies load distribution based on the source host IP address and TCP/UDP (Layer 4) port number.
<b>src-port</b>	Specifies load distribution based on the TCP/UDP (Layer 4) port number.

**Command Default** The default is **src-mac**.

**Command Modes** Global configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.
Usage Guidelines	You can verify your setting by entering the <b>show running-config</b> privileged EXEC command or the <b>show etherchannel load-balance</b> privileged EXEC command.	
Examples	This example shows how to set the load-distribution method to dst-mac:	

```
Device(config)# port-channel load-balance dst-mac
```

**port-channel load-balance extended**

# port-channel load-balance extended

To set combinations of load-distribution methods among the ports in the EtherChannel, use the **port-channel load-balance extended** command in global configuration mode. To reset the extended load-balancing mechanism to the default setting, use the **no** form of this command.

```
port-channel load-balance extended[ {dst-ip | dst-mac | dst-port | ipv6-label | l3-proto | src-ip | src-mac | src-port}]
no port-channel load-balance extended
```

<b>Syntax Description</b>	<p><b>dst-ip</b> (Optional) Specifies load distribution based on the destination host IP address.</p> <p><b>dst-mac</b> (Optional) Specifies load distribution based on the destination host MAC address. Packets to the same destination are sent on the same port, but packets to different destinations are sent on different ports in the channel.</p> <p><b>dst-port</b> (Optional) Specifies load distribution based on the destination TCP/UDP (Layer 4) port number for both IPv4 and IPv6.</p> <p><b>ipv6-label</b> (Optional) Specifies load distribution based on the source MAC address and IPv6 flow label.</p> <p><b>l3-proto</b> (Optional) Specifies load distribution based on the source MAC address and Layer 3 protocols.</p> <p><b>src-ip</b> (Optional) Specifies load distribution based on the source host IP address.</p> <p><b>src-mac</b> (Optional) Specifies load distribution based on the source MAC address. Packets from different hosts use different ports in the channel, but packets from the same host use the same port.</p> <p><b>src-port</b> (Optional) Specifies load distribution based on the TCP/UDP (Layer 4) port number.</p>				
<b>Command Default</b>	The default is <b>src-mac</b> .				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	For information about when to use these forwarding methods, see the <i>Layer 2/3 Configuration Guide (Catalyst 3850 Switches)</i> for this release.
	You can verify your setting by entering the <b>show running-config</b> privileged EXEC command or the <b>show etherchannel load-balance</b> privileged EXEC command.

<b>Examples</b>	This example shows how to set the extended load-distribution method:
	<pre>Device(config)# <b>port-channel load-balance extended dst-ip dst-mac src-ip</b></pre>

# port-channel min-links

To define the minimum number of LACP ports that must be bundled in the link-up state and bundled in the EtherChannel in order that a port channel becomes active, use the **port-channel min-links** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

**port-channel min-links *min\_links\_number***  
**no port-channel min-links**

<b>Syntax Description</b>	<i>min_links_number</i> The minimum number of active LACP ports in the port channel. The range is 2 to 8. The default is 1.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.3SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.3SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.3SE	This command was introduced.				

**Usage Guidelines** An LACP channel group can have up to 16 Ethernet ports of the same type. Up to eight ports can be active, and up to eight ports can be in hot-standby mode. When there are more than eight ports in an LACP channel group, the device on the controlling end of the link uses port priorities to determine which ports are bundled into the channel and which ports are put in hot-standby mode. Port priorities on the other device (the noncontrolling end of the link) are ignored.

The **port-channel min-links** command must specify a number less than the number specified by the **lacp max-bundle** command.

Use the **show etherchannel summary** privileged EXEC command to see which ports are in the hot-standby mode (denoted with an H port-state flag in the output display).

This example shows how to specify a minimum of three active LACP ports before port channel 2 becomes active:

```
Device(config)# interface port-channel 2
Device(config-if)# port-channel min-links 3
```

## rep admin vlan

To configure a Resilient Ethernet Protocol (REP) administrative VLAN for the REP to transmit hardware flood layer (HFL) messages, use the **rep admin vlan** command in global configuration mode. To return to the default configuration with VLAN 1 as the administrative VLAN, use the **no** form of this command.

```
rep admin vlan vlan-id
no rep admin vlan
```

<b>Syntax Description</b>	<i>vlan-id</i> 48-bit static MAC address.
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<b>Command Default</b>	None.
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<b>Command Modes</b>	Global configuration (config)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.2.2	This command was introduced.

<b>Usage Guidelines</b>	The range of the REP administrative VLAN is from 1 to 4094. There can be only one administrative VLAN on a device and on a segment. Verify your settings by entering the <b>show interfaces rep detail</b> command in privileged EXEC mode.
-------------------------	---

<b>Examples</b>	The following example shows how to configure VLAN 100 as the REP administrative VLAN:  Device(config)# <b>rep admin vlan 100</b>
-----------------	--

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>show interfaces rep detail</b>	Displays detailed REP configuration and status for all the interfaces or the specified interface, including the administrative VLAN.

# rep block port

To configure Resilient Ethernet Protocol (REP) VLAN load balancing on a REP primary edge port, use the **rep block port** command in interface configuration mode. To return to the default configuration with VLAN 1 as the administrative VLAN, use the **no** form of this command.

```
rep block port {id port-id | neighbor-offset | preferred} vlan {vlan-list | all}
no rep block port {id port-id | neighbor-offset | preferred}
```

<b>Syntax Description</b>	<p><b>id port-id</b> Specifies the VLAN blocking alternate port by entering the unique port ID, which is automatically generated when REP is enabled. The REP port ID is a 16-character hexadecimal value.</p> <p><b>neighbor-offset</b> VLAN blocking alternate port by entering the offset number of a neighbor. The range is from -256 to +256. A value of 0 is invalid.</p> <p><b>preferred</b> Selects the regular segment port previously identified as the preferred alternate port for VLAN load balancing.</p> <p><b>vlan</b> Identifies the VLANs to be blocked.</p> <p><b>vlan-list</b> VLAN ID or range of VLAN IDs to be displayed. Enter a VLAN ID from 1 to 4094, or a range or sequence of VLANs (such as 1-3, 22, and 41-44) to be blocked.</p> <p><b>all</b> Blocks all the VLANs.</p>
---------------------------	--

**Command Default** The default behavior after you enter the **rep preempt segment** command in privileged EXEC (for manual preemption) is to block all the VLANs at the primary edge port. This behavior remains until you configure the **rep block port** command.

If the primary edge port cannot determine which port is to be the alternate port, the default action is no preemption and no VLAN load balancing.

**Command Modes** Interface configuration (config-if)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.2.2	This command was introduced.

**Usage Guidelines** When you select an alternate port by entering an offset number, this number identifies the downstream neighbor port of an edge port. The primary edge port has an offset number of 1; positive numbers above 1 identify downstream neighbors of the primary edge port. Negative numbers identify the secondary edge port (offset number -1) and its downstream neighbors.



**Note** Do not enter an offset value of 1 because that is the offset number of the primary edge port itself.

If you have configured a preempt delay time by entering the **rep preempt delay seconds** command in interface configuration mode and a link failure and recovery occurs, VLAN load balancing begins after the configured

**rep block port**

preemption time period elapses without another link failure. The alternate port specified in the load-balancing configuration blocks the configured VLANs and unblocks all the other segment ports. If the primary edge port cannot determine the alternate port for VLAN balancing, the default action is no preemption.

Each port in a segment has a unique port ID. To determine the port ID of a port, enter the **show interfaces interface-id rep detail** command in privileged EXEC mode.

**Examples**

The following example shows how to configure REP VLAN load balancing:

```
Device(config)# interface TenGigabitEthernet 4/1
Device(config-if)# rep block port id 0009001818D68700 vlan 1-100
```

Related Commands	Command	Description
	<b>show interfaces rep detail</b>	Displays detailed REP configuration and status for all the interfaces or the specified interface, including the administrative VLAN.

# rep lsl-age-timer

To configure the Resilient Ethernet Protocol (REP) link status layer (LSL) age-out timer value, use the **rep lsl-age-timer** command in interface configuration mode. To restore the default age-out timer value, use the **no** form of this command.

```
rep lsl-age-timer milliseconds
no rep lsl-age-timer milliseconds
```

<b>Syntax Description</b>	<i>milliseconds</i> REP LSL age-out timer value, in milliseconds (ms). The range is from 120 to 10000 in multiples of 40.							
<b>Command Default</b>	The default LSL age-out timer value is 5 ms.							
<b>Command Modes</b>	Interface configuration (config-if)							
<b>Command History</b>	<b>Release</b>	<b>Modification</b>						
	Cisco IOS XE Denali 16.2.2	This command was introduced.						
<b>Usage Guidelines</b>	While configuring REP configurable timers, we recommend that you configure the REP LSL number of retries first and then configure the REP LSL age-out timer value.							
<b>Examples</b>	The following example shows how to configure a REP LSL age-out timer value:							
	<pre>Device(config)# interface TenGigabitEthernet 4/1 Device(config-if)# rep segment 1 edge primary Device(config-if)# rep lsl-age-timer 2000</pre>							
<b>Related Commands</b>	<table border="1"> <thead> <tr> <th>Command</th><th>Description</th></tr> </thead> <tbody> <tr> <td><b>interface interface-type interface-name</b></td><td>Specifies a physical interface or port channel to receive STCNs.</td></tr> <tr> <td><b>rep segment</b></td><td>Enables REP on an interface and assigns a segment ID.</td></tr> </tbody> </table>		Command	Description	<b>interface interface-type interface-name</b>	Specifies a physical interface or port channel to receive STCNs.	<b>rep segment</b>	Enables REP on an interface and assigns a segment ID.
Command	Description							
<b>interface interface-type interface-name</b>	Specifies a physical interface or port channel to receive STCNs.							
<b>rep segment</b>	Enables REP on an interface and assigns a segment ID.							

**rep Isl-retries**

## rep Isl-retries

To configure the REP link status layer (LSL) number of retries, use the **rep Isl-retries** command in interface configuration mode. To restore the default number of retries, use the **no** form of this command.

```
rep Isl-retries number-of-retries
no rep Isl-retries number-of-retries
```

### Syntax Description

*number-of-retries* Number of LSL retries. The range of retries is from 3 to 10.

### Command Default

The default number of LSL retries is 5.

### Command Modes

Interface configuration (config-if)

### Command History

#### Release

#### Modification

Cisco IOS XE Denali 16.2.2

This command was introduced

### Usage Guidelines

The **rep Isl-retries** command is used to configure the number of retries before the REP link is disabled. While configuring REP configurable timers, we recommend that you configure the REP LSL number of retries first and then configure the REP LSL age-out timer value.

The following example shows how to configure REP LSL retries.

```
Device(config)# interface TenGigabitEthernet 4/1
Device(config-if)# rep segment 2 edge primary
```

# rep preempt delay

To configure a waiting period after a segment port failure and recovery before Resilient Ethernet Protocol (REP) VLAN load balancing is triggered, use the **rep preempt delay** command in interface configuration mode. To remove the configured delay, use the **no** form of this command.

```
rep preempt delay seconds
no rep preempt delay
```

<b>Syntax Description</b>	<i>seconds</i> Number of seconds to delay REP preemption. The range is from 15 to 300 seconds. The default is manual preemption without delay.							
<b>Command Default</b>	REP preemption delay is not set. The default is manual preemption without delay.							
<b>Command Modes</b>	Interface configuration (config-if)							
<b>Command History</b>	<b>Release</b>	<b>Modification</b>						
	Cisco IOS XE Denali 16.2.2	This command was introduced.						
<b>Usage Guidelines</b>	<p>Enter this command on the REP primary edge port.</p> <p>Enter this command and configure a preempt time delay for VLAN load balancing to be automatically triggered after a link failure and recovery.</p> <p>If VLAN load balancing is configured after a segment port failure and recovery, the REP primary edge port starts a delay timer before VLAN load balancing occurs. Note that the timer restarts after each link failure. When the timer expires, the REP primary edge port alerts the alternate port to perform VLAN load balancing (configured by using the <b>rep block port</b> interface configuration command) and prepares the segment for the new topology. The configured VLAN list is blocked at the alternate port, and all other VLANs are blocked at the primary edge port.</p> <p>You can verify your settings by entering the <b>show interfaces rep</b> command.</p>							
<b>Examples</b>	<p>The following example shows how to configure a REP preemption time delay of 100 seconds on the primary edge port:</p> <pre>Device(config)# interface TenGigabitEthernet 4/1 Device(config-if)# rep preempt delay 100</pre>							
<b>Related Commands</b>	<table border="1"> <thead> <tr> <th>Command</th><th>Description</th></tr> </thead> <tbody> <tr> <td><b>rep block port</b></td><td>Configures VLAN load balancing.</td></tr> <tr> <td><b>show interfaces rep detail</b></td><td>Displays detailed REP configuration and status for all the interfaces or the specified interface, including the administrative VLAN.</td></tr> </tbody> </table>		Command	Description	<b>rep block port</b>	Configures VLAN load balancing.	<b>show interfaces rep detail</b>	Displays detailed REP configuration and status for all the interfaces or the specified interface, including the administrative VLAN.
Command	Description							
<b>rep block port</b>	Configures VLAN load balancing.							
<b>show interfaces rep detail</b>	Displays detailed REP configuration and status for all the interfaces or the specified interface, including the administrative VLAN.							

**rep preempt segment**

# rep preempt segment

To manually start Resilient Ethernet Protocol (REP) VLAN load balancing on a segment, use the **rep preempt segment** command in privileged EXEC mode.

**rep preempt segment *segment-id***

<b>Syntax Description</b>	<i>segment-id</i> ID of the REP segment. The range is from 1 to 1024.
---------------------------	---

<b>Command Default</b>	Manual preemption is the default behavior.
------------------------	--

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.2.2	This command was introduced.

<b>Usage Guidelines</b>	<p>Enter this command on the segment, which has the primary edge port on the device. Ensure that all the other segment configurations are completed before setting preemption for VLAN load balancing. When you enter the <b>rep preempt segment <i>segment-id</i></b> command, a confirmation message appears before the command is executed because preemption for VLAN load balancing can disrupt the network.</p> <p>If you do not enter the <b>rep preempt delay <i>seconds</i></b> command in interface configuration mode on the primary edge port to configure a preemption time delay, the default configuration is to manually trigger VLAN load balancing on the segment.</p> <p>Enter the <b>show rep topology</b> command in privileged EXEC mode to see which port in the segment is the primary edge port.</p> <p>If you do not configure VLAN load balancing, entering the <b>rep preempt segment <i>segment-id</i></b> command results in the default behavior, that is, the primary edge port blocks all the VLANs.</p> <p>You can configure VLAN load balancing by entering the <b>rep block port</b> command in interface configuration mode on the REP primary edge port before you manually start preemption.</p>
-------------------------	---

## Examples

The following example shows how to manually trigger REP preemption on segment 100:

```
Device# rep preempt segment 100
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>rep block port</b>	Configures VLAN load balancing.
	<b>rep preempt delay</b>	Configures a waiting period after a segment port failure and recovery before REP VLAN load balancing is triggered.
	<b>show rep topology</b>	Displays REP topology information for a segment or for all the segments.

# rep segment

To enable Resilient Ethernet Protocol (REP) on an interface and to assign a segment ID to the interface, use the **rep segment** command in interface configuration mode. To disable REP on the interface, use the **no** form of this command.

```
rep segment segment-id [edge [no-neighbor] [primary] ] [preferred]
no rep segment
```

Syntax Description	<p><b>segment-id</b> Segment for which REP is enabled. Assign a segment ID to the interface. The range is from 1 to 1024.</p> <p><b>edge</b> (Optional) Configures the port as an edge port. Each segment has only two edge ports.</p> <p><b>no-neighbor</b> (Optional) Specifies the segment edge as one with no external REP neighbor.</p> <p><b>primary</b> (Optional) Specifies that the port is the primary edge port where you can configure VLAN load balancing. A segment has only one primary edge port.</p> <p><b>preferred</b> (Optional) Specifies that the port is the preferred alternate port or the preferred port for VLAN load balancing.</p> <p><b>Note</b> Configuring a port as a preferred port does not guarantee that it becomes the alternate port; it merely gives it a slight edge among equal contenders. The alternate port is usually a previously failed port.</p>	
Command Default	REP is disabled on the interface.	
Command Modes	Interface configuration (config-if)	
Command History	Release	Modification
	Cisco IOS XE Denali 16.2.2	This command was introduced.
Usage Guidelines	<p>REP ports must be a Layer 2 IEEE 802.1Q port or a 802.1AD port. You must configure two edge ports on each REP segment, a primary edge port and a secondary edge port.</p> <p>If REP is enabled on two ports on a device, both the ports must be either regular segment ports or edge ports. REP ports follow these rules:</p> <ul style="list-style-type: none"> <li>• If only one port on a device is configured in a segment, that port should be an edge port.</li> <li>• If two ports on a device belong to the same segment, both the ports must be regular segment ports.</li> <li>• If two ports on a device belong to the same segment, and one is configured as an edge port and one as a regular segment port (a misconfiguration), the edge port is treated as a regular segment port.</li> </ul>	
 <b>Caution</b> REP interfaces come up in a blocked state and remain in a blocked state until notified that it is safe to unblock. Be aware of this to avoid sudden connection losses.		

**rep segment**

When REP is enabled on an interface, the default is for that port to be a regular segment port.

**Examples**

The following example shows how to enable REP on a regular (nonedge) segment port:

```
Device(config)# interface TenGigabitEthernet 4/1
Device(config-if)# rep segment 100
```

The following example shows how to enable REP on a port and identify the port as the REP primary edge port:

```
Device(config)# interface TenGigabitEthernet 4/1
Device(config-if)# rep segment 100 edge primary
```

The following example shows how to enable REP on a port and identify the port as the REP secondary edge port:

```
Device(config)# interface TenGigabitEthernet 4/1
Device(config-if)# rep segment 100 edge
```

The following example shows how to enable REP as an edge no-neighbor port:

```
Device(config)# interface TenGigabitEthernet 4/1
Device(config-if)# rep segment 1 edge no-neighbor primary
```

## rep stcn

To configure a Resilient Ethernet Protocol (REP) edge port to send segment topology change notifications (STCNs) to another interface or to other segments, use the **rep stcn** command in interface configuration mode. To disable the task of sending STCNs to the interface or to the segment, use the **no** form of this command.

```
rep stcn {interface interface-id | segment segment-id-list}
no rep stcn {interface | segment}
```

### Syntax Description

**interface interface-id** Specifies a physical interface or port channel to receive STCNs.

**segment segment-id-list** Specifies one REP segment or a list of REP segments to receive STCNs. The segment range is from 1 to 1024. You can also configure a sequence of segments, for example, 3 to 5, 77, 100.

### Command Default

Transmission of STCNs to other interfaces or segments is disabled.

### Command Modes

Interface configuration (config-if)

### Command History

#### Release

#### Modification

Cisco IOS XE Denali 16.2.2

This command was introduced.

### Usage Guidelines

You can verify your settings by entering the **show interfaces rep detail** command in privileged EXEC mode.

### Examples

The following example shows how to configure a REP edge port to send STCNs to segments 25 to 50:

```
Device(config)# interface TenGigabitEthernet 4/1
Device(config-if)# rep stcn segment 25-50
```

**show etherchannel**

# show etherchannel

To display EtherChannel information for a channel, use the **show etherchannel** command in user EXEC mode.

```
show etherchannel [{channel-group-number | {detail | port | port-channel | protocol | summary}}]
| [{auto | detail | load-balance | port | port-channel | protocol | summary}]
```

Syntax Description	<i>channel-group-number</i>	(Optional) Channel group number. The range is 1 to 128.
<b>auto</b>		(Optional) Displays that Etherchannel is created automatically.
<b>detail</b>		(Optional) Displays detailed EtherChannel information.
<b>load-balance</b>		(Optional) Displays the load-balance or frame-distribution scheme among ports in the port channel.
<b>port</b>		(Optional) Displays EtherChannel port information.
<b>port-channel</b>		(Optional) Displays port-channel information.
<b>protocol</b>		(Optional) Displays the protocol that is being used in the channel.
<b>summary</b>		(Optional) Displays a one-line summary per channel group.
Command Default	None	
Command Modes	User EXEC	
Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** If you do not specify a channel group number, all channel groups are displayed.

This is an example of output from the **show etherchannel auto** command:

```
device# show etherchannel auto
Flags: D - down      P - bundled in port-channel
       I - stand-alone S - suspended
       H - Hot-standby (LACP only)
       R - Layer3      S - Layer2
       U - in use      f - failed to allocate aggregator
       M - not in use, minimum links not met
       u - unsuitable for bundling
       w - waiting to be aggregated
       d - default port
       A - formed by Auto LAG

Number of channel-groups in use: 1
Number of aggregators: 1
```

Group	Port-channel	Protocol	Ports
1	Po1 (SUA)	LACP	Gi1/0/45(P) Gi2/0/21(P) Gi3/0/21(P)

This is an example of output from the **show etherchannel channel-group-number detail** command:

```
Device> show etherchannel 1 detail
Group state = L2
Ports: 2 Maxports = 16
Port-channels: 1 Max Port-channels = 16
Protocol: LACP
          Ports in the group:
-----
Port: Gi1/0/1
-----
Port state = Up Mstr In-Bndl
Channel group = 1 Mode = Active Gcchange = -
Port-channel = Po1GC = - Pseudo port-channel = Po1
Port index = 0Load = 0x00 Protocol = LACP

Flags: S - Device is sending Slow LACPDU F - Device is sending fast LACPDU
      A - Device is in active mode. P - Device is in passive mode.

Local information:
          LACP port Admin Oper Port Port
Port   Flags State Priority Key Key Number State
Gi1/0/1 SA bndl 32768 0x1 0x1 0x101 0x3D
Gi1/0/2 A bndl 32768 0x0 0x1 0x0 0x3D

Age of the port in the current state: 01d:20h:06m:04s

          Port-channels in the group:
-----
Port-channel: Po1 (Primary Aggregator)

Age of the Port-channel = 01d:20h:20m:26s
Logical slot/port = 10/1 Number of ports = 2
HotStandBy port = null
Port state = Port-channel Ag-Inuse
Protocol = LACP

Ports in the Port-channel:
Index Load Port EC state No of bits
-----+-----+-----+-----+
0     00   Gi1/0/1 Active 0
0     00   Gi1/0/2 Active 0

Time since last port bundled: 01d:20h:24m:44s Gi1/0/2
```

This is an example of output from the **show etherchannel channel-group-number summary** command:

```
Device> show etherchannel 1 summary
Flags: D - down P - in port-channel
      I - stand-alone s - suspended
      H - Hot-standby (LACP only)
      R - Layer3 S - Layer2
      u - unsuitable for bundling
      U - in use f - failed to allocate aggregator
      d - default port
```

**show etherchannel**

```
Number of channel-groups in use: 1
Number of aggregators: 1

Group  Port-channel  Protocol      Ports
-----+-----+-----+
  1    Po1 (SU)       LACP        Gi1/0/1(P) Gi1/0/2(P)
```

This is an example of output from the **show etherchannel channel-group-number port-channel** command:

```
Device> show etherchannel 1 port-channel
Port-channels in the group:
-----
Port-channel: Po1 (Primary Aggregator)
-----
Age of the Port-channel = 01d:20h:24m:50s
Logical slot/port = 10/1 Number of ports = 2
Logical slot/port = 10/1 Number of ports = 2
Port state = Port-channel Ag-Inuse
Protocol = LACP

Ports in the Port-channel:
Index  Load   Port   EC state      No of bits
-----+-----+-----+-----+
  0     00    Gi1/0/1 Active      0
  0     00    Gi1/0/2 Active      0

Time since last port bundled: 01d:20h:24m:44s Gi1/0/2
```

This is an example of output from **show etherchannel protocol** command:

```
Device# show etherchannel protocol
Channel-group listing:
-----
Group: 1
-----
Protocol: LACP
Group: 2
-----
Protocol: PAgP
```

# show interfaces rep detail

To display detailed Resilient Ethernet Protocol (REP) configuration and status for all interfaces or a specified interface, including the administrative VLAN, use the **show interfaces rep detail** command in privileged EXEC mode.

**show interfaces [interface-id] rep detail**

<b>Syntax Description</b>	<i>interface-id</i> (Optional) Physical interface used to display the port ID.	
<b>Command Default</b>	None.	
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.2.2	This command was introduced.
<b>Usage Guidelines</b>	<p>Enter this command on a segment edge port to send STCNs to one or more segments or to an interface.</p> <p>You can verify your settings by entering the <b>show interfaces rep detail</b> command in privileged EXEC mode.</p>	
<b>Examples</b>	<p>The following example shows how to display the REP configuration and status for a specified interface;</p> <pre>Device# show interfaces TenGigabitEthernet4/1 rep detail</pre> <pre>TenGigabitEthernet4/1 REP enabled Segment-id: 3 (Primary Edge) PortID: 03010015FA66FF80 Preferred flag: No Operational Link Status: TWO_WAY Current Key: 02040015FA66FF804050 Port Role: Open Blocked VLAN: &lt;empty&gt; Admin-vlan: 1 Preempt Delay Timer: disabled Configured Load-balancing Block Port: none Configured Load-balancing Block VLAN: none STCN Propagate to: none LSL PDU rx: 999, tx: 652 HFL PDU rx: 0, tx: 0 BPA TLV rx: 500, tx: 4 BPA (STCN, LSL) TLV rx: 0, tx: 0 BPA (STCN, HFL) TLV rx: 0, tx: 0 EPA-ELECTION TLV rx: 6, tx: 5 EPA-COMMAND TLV rx: 0, tx: 0 EPA-INFO TLV rx: 135, tx: 136</pre>	
<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>rep admin vlan</b>	Configures a REP administrative VLAN for the REP to transmit HFL messages.

show lacp

# show lacp

To display Link Aggregation Control Protocol (LACP) channel-group information, use the **show lacp** command in user EXEC mode.

**show lacp [channel-group-number] {counters | internal | neighbor | sys-id}**

<b>Syntax Description</b>	<p><i>channel-group-number</i> (Optional) Channel group number. The range is 1 to 128.</p> <p><b>counters</b> Displays traffic information.</p> <p><b>internal</b> Displays internal information.</p> <p><b>neighbor</b> Displays neighbor information.</p> <p><b>sys-id</b> Displays the system identifier that is being used by LACP. The system identifier consists of the LACP system priority and the device MAC address.</p>				
<b>Command Default</b>	None				
<b>Command Modes</b>	User EXEC				
<b>Command History</b>	<table border="0"> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>You can enter any <b>show lacp</b> command to display the active channel-group information. To display specific channel information, enter the <b>show lacp</b> command with a channel-group number.</p> <p>If you do not specify a channel group, information for all channel groups appears.</p> <p>You can enter the <i>channel-group-number</i> to specify a channel group for all keywords except <b>sys-id</b>.</p> <p>This is an example of output from the <b>show lacp counters</b> user EXEC command. The table that follows describes the fields in the display.</p> <pre>Device&gt; show lacp counters       LACPDU Sent Marker Sent Response LACPDU Port      Recv   Recv   Sent   Recv   Pkts Err -----+ Channel group:1 Gi2/0/1    19     10     0     0      0     0 Gi2/0/2    14      6     0     0      0     0</pre>				
<b>Table 25: show lacp counters Field Descriptions</b>					
<b>Field</b>	<b>Description</b>				
LACPDU Sent and Recv	The number of LACP packets sent and received by a port.				

Field	Description
Marker Sent and Recv	The number of LACP marker packets sent and received by a port.
Marker Response Sent and Recv	The number of LACP marker response packets sent and received by a port.
LACPDUs Pkts and Err	The number of unknown and illegal packets received by LACP for a port.

This is an example of output from the **show lacp internal** command:

```
Device> show lacp 1 internal
Flags: S - Device is requesting Slow LACPDUs
          F - Device is requesting Fast LACPDUs
          A - Device is in Active mode      P - Device is in Passive mode

Channel group 1
          LACP port    Admin     Oper     Port     Port
Port   Flags   State   Priority   Key     Key   Number   State
Gi2/0/1  SA     bndl    32768     0x3    0x3    0x4    0x3D
Gi2/0/2  SA     bndl    32768     0x3    0x3    0x5    0x3D
```

The following table describes the fields in the display:

**Table 26: show lacp internal Field Descriptions**

Field	Description
State	<p>State of the specific port. These are the allowed values:</p> <ul style="list-style-type: none"> <li>—Port is in an unknown state.</li> <li><b>bndl</b>—Port is attached to an aggregator and bundled with other ports.</li> <li><b>susp</b>—Port is in a suspended state; it is not attached to any aggregator.</li> <li><b>hot-sby</b>—Port is in a hot-standby state.</li> <li><b>indiv</b>—Port is incapable of bundling with any other port.</li> <li><b>indep</b>—Port is in an independent state (not bundled but able to handle data traffic. In this case, LACP is not running on the partner port).</li> <li><b>down</b>—Port is down.</li> </ul>
LACP Port Priority	Port priority setting. LACP uses the port priority to put ports in standby mode when there is a hardware limitation that prevents all compatible ports from aggregating.

show lacp

Field	Description
Admin Key	Administrative key assigned to this port. LACP automatically generates an administrative key value as a hexadecimal number. The administrative key defines the ability of a port to aggregate with other ports. A port's ability to aggregate with other ports is determined by the port physical characteristics (for example, data rate and duplex capability) and configuration restrictions that you establish.
Oper Key	Runtime operational key that is being used by this port. LACP automatically generates this value as a hexadecimal number.
Port Number	Port number.
Port State	<p>State variables for the port, encoded as individual bits within a single octet with these meanings:</p> <ul style="list-style-type: none"> <li>• bit0: LACP_Activity</li> <li>• bit1: LACP_Timeout</li> <li>• bit2: Aggregation</li> <li>• bit3: Synchronization</li> <li>• bit4: Collecting</li> <li>• bit5: Distributing</li> <li>• bit6: Defaulted</li> <li>• bit7: Expired</li> </ul> <p><b>Note</b> In the list above, bit7 is the MSB and bit0 is the LSB.</p>

This is an example of output from the **show lacp neighbor** command:

```
Device> show lacp neighbor
Flags: S - Device is sending Slow LACPDUs F - Device is sending Fast LACPDUs
      A - Device is in Active mode          P - Device is in Passive mode
```

Channel group 3 neighbors

Partner's information:

Port	Partner System ID	Partner Port Number	Age	Partner Flags
Gi2/0/1	32768,0007.eb49.5e80	0xC	19s	SP

LACP Partner	Partner	Partner
Port Priority	Oper Key	Port State
32768	0x3	0x3C

Partner's information:

Port	Partner	Partner	Partner	
	System ID	Port Number	Age	Flags
Gi2/0/2	32768,0007.eb49.5e80	0xD	15s	SP
	LACP Partner	Partner	Partner	
	Port Priority	Oper Key	Port State	
	32768	0x3	0x3C	

This is an example of output from the **show lacp sys-id** command:

```
Device> show lacp sys-id  
32765,0002.4b29.3a00
```

The system identification is made up of the system priority and the system MAC address. The first two bytes are the system priority, and the last six bytes are the globally administered individual MAC address associated to the system.

# show pagp

To display Port Aggregation Protocol (PAgP) channel-group information, use the **show pagp** command in EXEC mode.

**show pagp [channel-group-number] {counters | dual-active | internal | neighbor}**

## Syntax Description

*channel-group-number* (Optional) Channel group number. The range is 1 to 128.

**counters** Displays traffic information.

**dual-active** Displays the dual-active status.

**internal** Displays internal information.

**neighbor** Displays neighbor information.

## Command Default

None

## Command Modes

User EXEC

Privileged EXEC

## Command History

### Release

### Modification

Cisco IOS XE 3.2SE

This command was introduced.

## Usage Guidelines

You can enter any **show pagp** command to display the active channel-group information. To display the nonactive information, enter the **show pagp** command with a channel-group number.

## Examples

This is an example of output from the **show pagp 1 counters** command:

```
Device> show pagp 1 counters
          Information           Flush
          Port      Sent     Recv      Sent     Recv
-----
Channel group: 1
  Gi1/0/1    45      42      0      0
  Gi1/0/2    45      41      0      0
```

This is an example of output from the **show pagp dual-active** command:

```
Device> show pagp dual-active
PAgP dual-active detection enabled: Yes
PAgP dual-active version: 1.1

Channel group 1
          Dual-Active      Partner          Partner      Partner
          Port    Detect Capable  Name        Port        Version
Gi1/0/1    No            Device       Gi3/0/3    N/A
Gi1/0/2    No            Device       Gi3/0/4    N/A

<output truncated>
```

This is an example of output from the **show pagp 1 internal** command:

```
Device> show pagp 1 internal
Flags: S - Device is sending Slow hello. C - Device is in Consistent state.
       A - Device is in Auto mode.
Timers: H - Hello timer is running.          Q - Quit timer is running.
       S - Switching timer is running.        I - Interface timer is running.

Channel group 1
Port      Flags State   Timers    Hello Interval Partner Count PAgP Priority Learning Method Ifindex
Gi1/0/1    SC    U6/S7   H         30s     1        128      Any      16
Gi1/0/2    SC    U6/S7   H         30s     1        128      Any      16
```

This is an example of output from the **show pagp 1 neighbor** command:

```
Device> show pagp 1 neighbor
Flags: S - Device is sending Slow hello. C - Device is in Consistent state.
       A - Device is in Auto mode.          P - Device learns on physical port.

Channel group 1 neighbors
Port      Partner Name           Partner Device ID          Partner Port   Partner Age   Partner Flags Group Cap.
Gi1/0/1    device-p2          0002.4b29.4600 Gi01//1          9s   SC      10001
Gi1/0/2    device-p2          0002.4b29.4600 Gi1/0/2          24s  SC      10001
```

**show platform software fed etherchannel**

# show platform software fed etherchannel

To display platform-dependent EtherChannel information, use the **show platform software fed etherchannel** command in privileged EXEC mode.

```
show platform software fed etherchannel [switch switch-number] channel-group-number
{group-mask | load-balance mac src-mac dst-mac [ip src-ip dst-ip [port src-port dst-port]]}
```

<b>Syntax Description</b>	<b>switch</b> (Optional) Specifies the stack member. <i>switch-number</i>				
	<i>channel-group-number</i> Channel group number. The range is 1 to 128.				
	<b>group-mask</b> Displays EtherChannel group mask.				
	<b>load-balance</b> Tests EtherChannel load-balance hash algorithm.				
	<b>mac <i>src-mac dst-mac</i></b> Specifies the source and destination MAC addresses.				
	<b>ip <i>src-ip dst-ip</i></b> (Optional) Specifies the source and destination IP addresses.				
	<b>port <i>src-port dst-port</i></b> (Optional) Specifies the source and destination layer port numbers.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="0"> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> <tr> <td>Cisco IOS XE Denali 16.1.1</td> <td>This command was introduced.</td> </tr> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.1.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Denali 16.1.1	This command was introduced.				
<b>Usage Guidelines</b>	<p>Use this command only when you are working directly with a technical support representative while troubleshooting a problem.</p> <p>Do not use this command unless a technical support representative asks you to do so.</p>				

# show platform pm

To display platform-dependent port manager information, use the **show platform pm** command in privileged EXEC mode.

<b>Command Default</b>	None
------------------------	------

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	Use this command only when you are working directly with your technical support representative while troubleshooting a problem.
-------------------------	---

Do not use this command unless your technical support representative asks you to do so.

**show rep topology**

# show rep topology

To display Resilient Ethernet Protocol (REP) topology information for a segment or for all the segments, including the primary and secondary edge ports in the segment, use the **show rep topology** command in privileged EXEC mode.

**show rep topology [segment *segment-id*] [archive] [detail]**

<b>Syntax Description</b>	<b>segment <i>segment-id</i></b> (Optional) Specifies the segment for which to display the REP topology information. The <i>segment-id</i> range is from 1 to 1024. <b>archive</b> (Optional) Displays the previous topology of the segment. This keyword is useful for troubleshooting a link failure. <b>detail</b> (Optional) Displays detailed REP topology information.
<b>Command Modes</b>	Privileged EXEC (#)
<b>Command History</b>	<b>Release</b> <b>Modification</b> Cisco IOS XE Denali 16.2.2      This command was introduced.
<b>Examples</b>	The following is a sample output from the <b>show rep topology</b> command:  <pre>Device# show rep topology  REP Segment 1 BridgeName      PortName   Edge Role -----  ----- 10.64.106.63    Te5/4     Pri  Open 10.64.106.228   Te3/4     Open 10.64.106.228   Te3/3     Open 10.64.106.67    Te4/3     Open 10.64.106.67    Te4/4     Alt 10.64.106.63    Te4/4     Sec  Open  REP Segment 3 BridgeName      PortName   Edge Role -----  ----- 10.64.106.63    Gi50/1    Pri  Open SVT_3400_2       Gi0/3     Open SVT_3400_2       Gi0/4     Open 10.64.106.68    Gi40/2    Open 10.64.106.68    Gi40/1    Open 10.64.106.63    Gi50/2    Sec  Alt</pre>

The following is a sample output from the **show rep topology detail** command:

**Device# show rep topology detail**

```
REP Segment 1
10.64.106.63, Te5/4 (Primary Edge)
  Open Port, all vlans forwarding
  Bridge MAC: 0005.9b2e.1700
```

```
Port Number: 010
Port Priority: 000
Neighbor Number: 1 / [-6]
10.64.106.228, Te3/4 (Intermediate)
Open Port, all vlans forwarding
Bridge MAC: 0005.9b1b.1f20
Port Number: 010
Port Priority: 000
Neighbor Number: 2 / [-5]
10.64.106.228, Te3/3 (Intermediate)
Open Port, all vlans forwarding
Bridge MAC: 0005.9b1b.1f20
Port Number: 00E
Port Priority: 000
Neighbor Number: 3 / [-4]
10.64.106.67, Te4/3 (Intermediate)
Open Port, all vlans forwarding
Bridge MAC: 0005.9b2e.1800
Port Number: 008
Port Priority: 000
Neighbor Number: 4 / [-3]
10.64.106.67, Te4/4 (Intermediate)
Alternate Port, some vlans blocked
Bridge MAC: 0005.9b2e.1800
Port Number: 00A
Port Priority: 000
Neighbor Number: 5 / [-2]
10.64.106.63, Te4/4 (Secondary Edge)
Open Port, all vlans forwarding
Bridge MAC: 0005.9b2e.1700
Port Number: 00A
Port Priority: 000
Neighbor Number: 6 / [-1]
```

**show udld**

## show udld

To display UniDirectional Link Detection (UDLD) administrative and operational status for all ports or the specified port, use the **show udld** command in user EXEC mode.

```
show udld [Auto-Template | Capwap | GigabitEthernet | GroupVI | InternalInterface | Loopback | Null | Port-channel | TenGigabitEthernet | Tunnel | Vlan] interface_number
show udld neighbors
```

<b>Syntax Description</b>	
<b>Auto-Template</b>	(Optional) Displays UDLD operational status of the auto-template interface. The range is from 1 to 999.
<b>Capwap</b>	(Optional) Displays UDLD operational status of the CAPWAP interface. The range is from 0 to 2147483647.
<b>GigabitEthernet</b>	(Optional) Displays UDLD operational status of the GigabitEthernet interface. The range is from 0 to 9.
<b>GroupVI</b>	(Optional) Displays UDLD operational status of the group virtual interface. The range is from 1 to 255.
<b>InternalInterface</b>	(Optional) Displays UDLD operational status of the internal interface. The range is from 0 to 9.
<b>Loopback</b>	(Optional) Displays UDLD operational status of the loopback interface. The range is from 0 to 2147483647.
<b>Null</b>	(Optional) Displays UDLD operational status of the null interface.
<b>Port-channel</b>	(Optional) Displays UDLD operational status of the Ethernet channel interfaces. The range is from 1 to 128.
<b>TenGigabitEthernet</b>	(Optional) Displays UDLD operational status of the Ten Gigabit Ethernet interface. The range is from 0 to 9.
<b>Tunnel</b>	(Optional) Displays UDLD operational status of the tunnel interface. The range is from 0 to 2147483647.
<b>Vlan</b>	(Optional) Displays UDLD operational status of the VLAN interface. The range is from 1 to 4095.
<i>interface-id</i>	(Optional) ID of the interface and port number. Valid interfaces include physical ports, VLANs, and port channels.
<b>neighbors</b>	(Optional) Displays neighbor information only.
<b>Command Default</b>	None
<b>Command Modes</b>	User EXEC

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

### Usage Guidelines

If you do not enter an interface ID, administrative and operational UDLD status for all interfaces appear. This is an example of output from the **show udld interface-id** command. For this display, UDLD is enabled on both ends of the link, and UDLD detects that the link is bidirectional. The table that follows describes the fields in this display.

```
Device> show udld gigabitethernet2/0/1
Interface gi2/0/1
---
Port enable administrative configuration setting: Follows device default
Port enable operational state: Enabled
Current bidirectional state: Bidirectional
Current operational state: Advertisement - Single Neighbor detected
Message interval: 60
Time out interval: 5
Entry 1
Expiration time: 146
Device ID: 1
Current neighbor state: Bidirectional
Device name: Switch-A
Port ID: Gi2/0/1
Neighbor echo 1 device: Switch-B
Neighbor echo 1 port: Gi2/0/2
Message interval: 5
CDP Device name: Switch-A
```

**Table 27: show udld Field Descriptions**

Field	Description
Interface	The interface on the local device configured for UDLD.
Port enable administrative configuration setting	How UDLD is configured on the port. If UDLD is enabled or disabled, the port enable configuration setting is the same as the operational enable state. Otherwise, the enable operational setting depends on the global enable setting.
Port enable operational state	Operational state that shows whether UDLD is actually running on this port.
Current bidirectional state	The bidirectional state of the link. An unknown state appears if the link is down or if it is connected to an UDLD-incapable device. A bidirectional state appears if the link is a normal two-way connection to a UDLD-capable device. All other values mean miswiring.

show udld

Field	Description
Current operational state	The current phase of the UDLD state machine. For a normal bidirectional link, the state machine is most often in the Advertisement phase.
Message interval	How often advertisement messages are sent from the local device. Measured in seconds.
Time out interval	The time period, in seconds, that UDLD waits for echoes from a neighbor device during the detection window.
Entry 1	Information from the first cache entry, which contains a copy of echo information received from the neighbor.
Expiration time	The amount of time in seconds remaining before this cache entry is aged out.
Device ID	The neighbor device identification.
Current neighbor state	The neighbor's current state. If both the local and neighbor devices are running UDLD normally, the neighbor state and local state should be bidirectional. If the link is down or the neighbor is not UDLD-capable, no cache entries appear.
Device name	The device name or the system serial number of the neighbor. The system serial number appears if the device name is not set or is set to the default (Switch).
Port ID	The neighbor port ID enabled for UDLD.
Neighbor echo 1 device	The device name of the neighbors' neighbor from which the echo originated.
Neighbor echo 1 port	The port number ID of the neighbor from which the echo originated.
Message interval	The rate, in seconds, at which the neighbor is sending advertisement messages.
CDP device name	The CDP device name or the system serial number. The system serial number appears if the device name is not set or is set to the default (Switch).

This is an example of output from the **show udld neighbors** command:

```
Device# show udld neighbors
Port      Device Name      Device ID  Port-ID  OperState
-----  -----
Gi2/0/1   Switch-A        1          Gi2/0/1  Bidirectional
Gi3/0/1   Switch-A        2          Gi3/0/1  Bidirectional
```

# switchport

To put an interface that is in Layer 3 mode into Layer 2 mode for Layer 2 configuration, use the **switchport** command in interface configuration mode. To put an interface in Layer 3 mode, use the **no** form of this command.

**switchport**  
**no switchport**

**Syntax Description** This command has no arguments or keywords.

**Command Default** By default, all interfaces are in Layer 2 mode.

**Command Modes** Interface configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Use the **no switchport** command (without parameters) to set the interface to the routed-interface status and to erase all Layer 2 configurations. You must use this command before assigning an IP address to a routed port.



**Note** This command is not supported on devices running the LAN Base feature set.

Entering the **no switchport** command shuts the port down and then reenables it, which might generate messages on the device to which the port is connected.

When you put an interface that is in Layer 2 mode into Layer 3 mode (or the reverse), the previous configuration information related to the affected interface might be lost, and the interface is returned to its default configuration.



**Note** If an interface is configured as a Layer 3 interface, you must first enter the **switchport** command to configure the interface as a Layer 2 port. Then you can enter the **switchport access vlan** and **switchport mode** commands.

The **switchport** command is not used on platforms that do not support Cisco-routed ports. All physical ports on such platforms are assumed to be Layer 2-switched interfaces.

You can verify the port status of an interface by entering the **show running-config** privileged EXEC command.

## Examples

This example shows how to cause an interface to cease operating as a Layer 2 port and become a Cisco-routed port:

```
Device(config-if)# no switchport
```

**switchport**

This example shows how to cause the port interface to cease operating as a Cisco-routed port and convert to a Layer 2 switched interface:

```
Device(config-if)# switchport
```

# switchport access vlan

To configure a port as a static-access port, use the **switchport access vlan** command in interface configuration mode. To reset the access mode to the default VLAN mode for the device, use the **no** form of this command.

```
switchport access vlan {vlan-id | name vlan_name}
no switchport access vlan
```

## Syntax Description

*vlan-id* VLAN ID of the access mode VLAN; the range is 1 to 4094.

## Command Default

The default access VLAN and trunk interface native VLAN is a default VLAN corresponding to the platform or interface hardware.

## Command Modes

Interface configuration

## Command History

	<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE		This command was introduced.
Cisco IOS XE Denali 16.2.1		The <b>name</b> <i>vlan_name</i> keyword was introduced.

## Usage Guidelines

The port must be in access mode before the **switchport access vlan** command can take effect.

If the switchport mode is set to **access vlan** *vlan-id*, the port operates as a member of the specified VLAN. An access port can be assigned to only one VLAN.

The **no switchport access** command resets the access mode VLAN to the appropriate default VLAN for the device.

## Examples

This example shows how to change a switched port interface that is operating in access mode to operate in VLAN 2 instead of the default VLAN:

```
Device(config-if)# switchport access vlan 2
```

## Examples

This example show how to first populate the VLAN database by associating a VLAN ID with a VLAN name, and then configure the VLAN (using the name) on an interface, in the access mode: You can also verify your configuration by entering the **show interfaces interface-id switchport** in privileged EXEC command and examining information in the Access Mode VLAN: row.

Part 1 - Making the entry in the VLAN database:

```
Device# configure terminal
Device(config)# vlan 33
Device(config-vlan)# name test
Device(config-vlan)# end
Device#
```

Part 2 - Checking the VLAN database

```
Device # show vlan id 33
VLAN Name Status Ports
-----
```

**switchport access vlan**

```

33    test    active

VLAN Type SAID      MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
33  enet  100033    1500   -     -     -     -     -     0     0

Remote SPAN VLAN
-----
Disabled

Primary Secondary Type          Ports
----- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

```

**Part 3 - Assigning VLAN to the interface by using the name of the VLAN**

```

Device # configure terminal
Device(config)# interface GigabitEthernet3/1/1
Device(config-if)# switchport mode access
Device(config-if)# switchport access vlan name test
Device(config-if)# end
Device#

```

**Part 4 - Verifying configuration**

```

Device # show running-config interface GigabitEthernet3/1/1
Building configuration...
Current configuration : 113 bytes
!
interface GigabitEthernet3/1/1
switchport access vlan 33
switchport mode access

```

**Part 5 - Verifying interface switchport**

```

Device # show interface GigabitEthernet3/1/1 switchport
Name: Gi3/1/1
Switchport: Enabled
Administrative Mode: static access
Operational Mode: static access
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: 33 (test)
Trunking Native Mode VLAN: 1 (default)
Administrative Native VLAN tagging: enabled
Voice VLAN: None
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Unknown unicast blocked: disabled
Unknown multicast blocked: disabled
Appliance trust: none

```

# switchport mode

To configure the VLAN membership mode of a port, use the **switchport mode** command in interface configuration mode. To reset the mode to the appropriate default for the device, use the **no** form of this command.

```
switchport mode {access | dynamic | {auto | desirable} | trunk}
noswitchport mode {access | dynamic | {auto | desirable} | trunk}
```

Syntax Description	<b>access</b>	Sets the port to access mode (either static-access or dynamic-access depending on the setting of the <b>switchport access vlan</b> interface configuration command). The port is set to access unconditionally and operates as a nontrunking, single VLAN interface that sends and receives nonencapsulated (non-tagged) frames. An access port can be assigned to only one VLAN.
	<b>dynamic auto</b>	Sets the port trunking mode dynamic parameter to auto to specify that the interface convert the link to a trunk link. This is the default switchport mode.
	<b>dynamic desirable</b>	Sets the port trunking mode dynamic parameter to desirable to specify that the interface actively attempt to convert the link to a trunk link.
	<b>trunk</b>	Sets the port to trunk unconditionally. The port is a trunking VLAN Layer 2 interface. The port sends and receives encapsulated (tagged) frames that identify the VLAN of origination. A trunk is a point-to-point link between two devices or between a device and a router.
Command Default	The default mode is <b>dynamic auto</b> .	
Command Modes	Interface configuration	
Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

Usage Guidelines	A configuration that uses the <b>access</b> , or <b>trunk</b> keywords takes effect only when you configure the port in the appropriate mode by using the <b>switchport mode</b> command. The static-access and trunk configuration are saved, but only one configuration is active at a time.  When you enter <b>access</b> mode, the interface changes to permanent nontrunking mode and negotiates to convert the link into a nontrunk link even if the neighboring interface does not agree to the change.  When you enter <b>trunk</b> mode, the interface changes to permanent trunking mode and negotiates to convert the link into a trunk link even if the interface connecting to it does not agree to the change.  When you enter <b>dynamic auto</b> mode, the interface converts the link to a trunk link if the neighboring interface is set to <b>trunk</b> or <b>desirable</b> mode.  When you enter <b>dynamic desirable</b> mode, the interface becomes a trunk interface if the neighboring interface is set to <b>trunk</b> , <b>desirable</b> , or <b>auto</b> mode.
------------------	---

**switchport mode**

To autonegotiate trunking, the interfaces must be in the same VLAN Trunking Protocol (VTP) domain. Trunk negotiation is managed by the Dynamic Trunking Protocol (DTP), which is a point-to-point protocol. However, some internetworking devices might forward DTP frames improperly, which could cause misconfigurations. To avoid this problem, configure interfaces connected to devices that do not support DTP to not forward DTP frames, which turns off DTP.

- If you do not intend to trunk across those links, use the **switchport mode access** interface configuration command to disable trunking.
- To enable trunking to a device that does not support DTP, use the **switchport mode trunk** and **switchport nonegotiate** interface configuration commands to cause the interface to become a trunk but to not generate DTP frames.

Access ports and trunk ports are mutually exclusive.

The IEEE 802.1x feature interacts with switchport modes in these ways:

- If you try to enable IEEE 802.1x on a trunk port, an error message appears, and IEEE 802.1x is not enabled. If you try to change the mode of an IEEE 802.1x-enabled port to trunk, the port mode is not changed.
- If you try to enable IEEE 802.1x on a port set to **dynamic auto** or **dynamic desirable**, an error message appears, and IEEE 802.1x is not enabled. If you try to change the mode of an IEEE 802.1x-enabled port to **dynamic auto** or **dynamic desirable**, the port mode is not changed.
- If you try to enable IEEE 802.1x on a dynamic-access (VLAN Query Protocol [VQP]) port, an error message appears, and IEEE 802.1x is not enabled. If you try to change an IEEE 802.1x-enabled port to dynamic VLAN assignment, an error message appears, and the VLAN configuration is not changed.

You can verify your settings by entering the **show interfaces interface-id switchport** privileged EXEC command and examining information in the *Administrative Mode* and *Operational Mode* rows.

**Examples**

This example shows how to configure a port for access mode:

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport mode access
```

This example shows how to set the port to dynamic desirable mode:

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport mode dynamic desirable
```

This example shows how to configure a port for trunk mode:

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport mode trunk
```

# switchport nonegotiate

To specify that Dynamic Trunking Protocol (DTP) negotiation packets are not sent on the Layer 2 interface, use the **switchport nonegotiate** command in interface configuration mode. Use the **no** form of this command to return to the default setting.

```
switchport nonegotiate
no switchport nonegotiate
```

## Syntax Description

This command has no arguments or keywords.

## Command Default

The default is to use DTP negotiation to learn the trunking status.

## Command Modes

Interface configuration

## Command History

<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

The **no switchport nonegotiate** command removes nonegotiate status.

This command is valid only when the interface switchport mode is access or trunk (configured by using the **switchport mode access** or the **switchport mode trunk** interface configuration command). This command returns an error if you attempt to execute it in dynamic (auto or desirable) mode.

Internetworking devices that do not support DTP might forward DTP frames improperly and cause misconfigurations. To avoid this problem, turn off DTP by using the **switchport nonegotiate** command to configure the interfaces connected to devices that do not support DTP to not forward DTP frames.

When you enter the **switchport nonegotiate** command, DTP negotiation packets are not sent on the interface. The device does or does not trunk according to the **mode** parameter: **access** or **trunk**.

- If you do not intend to trunk across those links, use the **switchport mode access** interface configuration command to disable trunking.
- To enable trunking on a device that does not support DTP, use the **switchport mode trunk** and **switchport nonegotiate** interface configuration commands to cause the interface to become a trunk but to not generate DTP frames.

This example shows how to cause a port to refrain from negotiating trunking mode and to act as a trunk or access port (depending on the mode set):

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport nonegotiate
```

You can verify your setting by entering the **show interfaces interface-id switchport** privileged EXEC command.

**switchport voice vlan**

# switchport voice vlan

To configure voice VLAN on the port, use the **switchport voice vlan** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

```
switchport voice vlan {vlan-id | dot1p | none | untagged | name vlan_name}
no switchport voice vlan
```

<b>Syntax Description</b>	<p><b>vlan-id</b> The VLAN to be used for voice traffic. The range is 1 to 4094. By default, the IP phone forwards the voice traffic with an IEEE 802.1Q priority of 5.</p> <p><b>dot1p</b> Configures the telephone to use IEEE 802.1p priority tagging and uses VLAN 0 (the native VLAN). By default, the Cisco IP phone forwards the voice traffic with an IEEE 802.1p priority of 5.</p> <p><b>none</b> Does not instruct the IP telephone about the voice VLAN. The telephone uses the configuration from the telephone key pad.</p> <p><b>untagged</b> Configures the telephone to send untagged voice traffic. This is the default for the telephone.</p> <p><b>name vlan_name</b> (Optional) Specifies the VLAN name to be used for voice traffic. You can enter up to 128 characters.</p>						
<b>Command Default</b>	The default is not to automatically configure the telephone ( <b>none</b> ). The telephone default is not to tag frames.						
<b>Command Modes</b>	Interface configuration						
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> <tr> <td>Cisco IOS XE Denali 16.2.1</td> <td>Option to specify a VLAN name for voice VLAN. The '<b>name</b>' keyword was added.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.	Cisco IOS XE Denali 16.2.1	Option to specify a VLAN name for voice VLAN. The ' <b>name</b> ' keyword was added.
<b>Release</b>	<b>Modification</b>						
Cisco IOS XE 3.2SE	This command was introduced.						
Cisco IOS XE Denali 16.2.1	Option to specify a VLAN name for voice VLAN. The ' <b>name</b> ' keyword was added.						
<b>Usage Guidelines</b>	<p>You should configure voice VLAN on Layer 2 access ports.</p> <p>You must enable Cisco Discovery Protocol (CDP) on the switch port connected to the Cisco IP phone for the device to send configuration information to the phone. CDP is enabled by default globally and on the interface.</p> <p>Before you enable voice VLAN, we recommend that you enable quality of service (QoS) on the interface by entering the <b>trust device cisco-phone</b> interface configuration command. If you use the auto QoS feature, these settings are automatically configured.</p> <p>When you enter a VLAN ID, the IP phone forwards voice traffic in IEEE 802.1Q frames, tagged with the specified VLAN ID. The device puts IEEE 802.1Q voice traffic in the voice VLAN.</p> <p>When you select <b>dot1p</b>, <b>none</b>, or <b>untagged</b>, the device puts the indicated voice traffic in the access VLAN.</p> <p>In all configurations, the voice traffic carries a Layer 2 IP precedence value. The default is 5 for voice traffic.</p>						

When you enable port security on an interface that is also configured with a voice VLAN, set the maximum allowed secure addresses on the port to 2. When the port is connected to a Cisco IP phone, the IP phone requires one MAC address. The Cisco IP phone address is learned on the voice VLAN, but not on the access VLAN. If you connect a single PC to the Cisco IP phone, no additional MAC addresses are required. If you connect more than one PC to the Cisco IP phone, you must configure enough secure addresses to allow one for each PC and one for the Cisco IP phone.

If any type of port security is enabled on the access VLAN, dynamic port security is automatically enabled on the voice VLAN.

You cannot configure static secure MAC addresses in the voice VLAN.

A voice-VLAN port cannot be a private-VLAN port.

The Port Fast feature is automatically enabled when voice VLAN is configured. When you disable voice VLAN, the Port Fast feature is not automatically disabled.

This example show how to first populate the VLAN database by associating a VLAN ID with a VLAN name, and then configure the VLAN (using the name) on an interface, in the access mode: You can also verify your configuration by entering the **show interfaces interface-id switchport** in privileged EXEC command and examining information in the Voice VLAN: row.

Part 1 - Making the entry in the VLAN database:

```
Device# configure terminal
Device(config)# vlan 55
Device(config-vlan)# name test
Device(config-vlan)# end
Device#
```

Part 2 - Checking the VLAN database:

```
Device# show vlan id 55
VLAN Name Status Ports
-----
55 test active
VLAN Type SAID MTU Parent RingNo BridgeNo Stp BrdgMode Trans1 Trans2
----- -----
55 enet 100055 1500 - - - - - 0 0
Remote SPAN VLAN
-----
Disabled
Primary Secondary Type Ports
-----
```

Part 3- Assigning VLAN to the interface by using the name of the VLAN:

```
Device# configure terminal
Device(config)# interface gigabitethernet3/1/1
Device(config-if)# switchport mode access
Device(config-if)# switchport voice vlan name test
Device(config-if)# end
Device#
```

Part 4 - Verifying configuration:

```
Device# show running-config
interface gigabitethernet3/1/1
Building configuration...
Current configuration : 113 bytes
!
interface GigabitEthernet3/1/1
```

**switchport voice vlan**

```
switchport voice vlan 55
switchport mode access
Switch#
```

Part 5 - Also can be verified in interface switchport:

```
Device# show interface GigabitEthernet3/1/1 switchport
Name: Gi3/1/1
Switchport: Enabled
Administrative Mode: static access
Operational Mode: static access
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Administrative Native VLAN tagging: enabled
Voice VLAN: 55 (test)
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Unknown unicast blocked: disabled
Unknown multicast blocked: disabled
Appliance trust: none
Device#
```

# udld

To enable aggressive or normal mode in the UniDirectional Link Detection (UDLD) and to set the configurable message timer time, use the **udld** command in global configuration mode. To disable aggressive or normal mode UDLD on all fiber-optic ports, use the **no** form of the command.

```
udld {aggressive | enable | message time message-timer-interval}
no udld {aggressive | enable | message}
```

Syntax Description	<b>aggressive</b> Enables UDLD in aggressive mode on all fiber-optic interfaces. <b>enable</b> Enables UDLD in normal mode on all fiber-optic interfaces. <b>message time</b> <i>message-timer-interval</i> Configures the period of time between UDLD probe messages on ports that are in the advertisement phase and are determined to be bidirectional. The range is 1 to 90 seconds. The default is 15 seconds.				
Command Default	UDLD is disabled on all interfaces.				
	The message timer is set at 15 seconds.				
Command Modes	Global configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				
Usage Guidelines	<p>UDLD supports two modes of operation: normal (the default) and aggressive. In normal mode, UDLD detects unidirectional links due to misconnected interfaces on fiber-optic connections. In aggressive mode, UDLD also detects unidirectional links due to one-way traffic on fiber-optic and twisted-pair links and due to misconnected interfaces on fiber-optic links. For information about normal and aggressive modes, see the <i>Catalyst 2960-X Switch Layer 2 Configuration Guide</i>, <i>Catalyst 2960-XR Switch Layer 2 Configuration Guide</i>, and <i>Layer 2/3 Configuration Guide (Catalyst 3850 Switches)</i>.</p> <p>If you change the message time between probe packets, you are making a compromise between the detection speed and the CPU load. By decreasing the time, you can make the detection-response faster but increase the load on the CPU.</p> <p>This command affects fiber-optic interfaces only. Use the <b>udld</b> interface configuration command to enable UDLD on other interface types.</p> <p>You can use these commands to reset an interface shut down by UDLD:</p> <ul style="list-style-type: none"> <li>• The <b>udld reset</b> privileged EXEC command to reset all interfaces shut down by UDLD.</li> <li>• The <b>shutdown</b> and <b>no shutdown</b> interface configuration commands.</li> <li>• The <b>no udld enable</b> global configuration command followed by the <b>udld {aggressive   enable}</b> global configuration command to reenable UDLD globally.</li> <li>• The <b>no udld port</b> interface configuration command followed by the <b>udld port</b> or <b>udld port aggressive</b> interface configuration command to reenable UDLD on the specified interface.</li> </ul>				

- The **errdisable recovery cause udld** and **errdisable recovery interval** *interval* global configuration commands to automatically recover from the UDLD error-disabled state.

This example shows how to enable UDLD on all fiber-optic interfaces:

```
Device(config)# udld enable
```

You can verify your setting by entering the **show udld** privileged EXEC command.

# udld port

To enable UniDirectional Link Detection (UDLD) on an individual interface or to prevent a fiber-optic interface from being enabled by the **udld** global configuration command, use the **udld port** command in interface configuration mode. To return to the **udld** global configuration command setting or to disable UDLD if entered for a nonfiber-optic port, use the **no** form of this command.

**udld port [aggressive]**  
**no udld port [aggressive]**

<b>Syntax Description</b>	<b>aggressive</b> (Optional) Enables UDLD in aggressive mode on the specified interface.
---------------------------	--

<b>Command Default</b>	On fiber-optic interfaces, UDLD is disabled and fiber-optic interfaces enable UDLD according to the state of the <b>udld enable</b> or <b>udld aggressive</b> global configuration command.
------------------------	---

On nonfiber-optic interfaces, UDLD is disabled.

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	A UDLD-capable port cannot detect a unidirectional link if it is connected to a UDLD-incapable port of another device.
-------------------------	--

UDLD supports two modes of operation: normal (the default) and aggressive. In normal mode, UDLD detects unidirectional links due to misconnected interfaces on fiber-optic connections. In aggressive mode, UDLD also detects unidirectional links due to one-way traffic on fiber-optic and twisted-pair links and due to misconnected interfaces on fiber-optic links.

To enable UDLD in normal mode, use the **udld port** interface configuration command. To enable UDLD in aggressive mode, use the **udld port aggressive** interface configuration command.

Use the **no udld port** command on fiber-optic ports to return control of UDLD to the **udld enable** global configuration command or to disable UDLD on nonfiber-optic ports.

Use the **udld port aggressive** command on fiber-optic ports to override the setting of the **udld enable** or **udld aggressive** global configuration command. Use the **no** form on fiber-optic ports to remove this setting and to return control of UDLD enabling to the **udld** global configuration command or to disable UDLD on nonfiber-optic ports.

You can use these commands to reset an interface shut down by UDLD:

- The **udld reset** privileged EXEC command resets all interfaces shut down by UDLD.
- The **shutdown** and **no shutdown** interface configuration commands.
- The **no udld enable** global configuration command, followed by the **udld {aggressive | enable}** global configuration command reenables UDLD globally.
- The **no udld port** interface configuration command, followed by the **udld port** or **udld port aggressive** interface configuration command reenables UDLD on the specified interface.

**udld port**

- The **errdisable recovery cause udld** and **errdisable recovery interval** *interval* global configuration commands automatically recover from the UDLD error-disabled state.

This example shows how to enable UDLD on an port:

```
Device(config)# interface gigabitethernet6/0/1
Device(config-if)# udld port
```

This example shows how to disable UDLD on a fiber-optic interface despite the setting of the **udld** global configuration command:

```
Device(config)# interface gigabitethernet6/0/1
Device(config-if)# no udld port
```

You can verify your settings by entering the **show running-config** or the **show udld interface** privileged EXEC command.

## udld reset

To reset all interfaces disabled by UniDirectional Link Detection (UDLD) and permit traffic to begin passing through them again (though other features, such as spanning tree, Port Aggregation Protocol (PAgP), and Dynamic Trunking Protocol (DTP) still have their normal effects, if enabled), use the **udld reset** command in privileged EXEC mode.

### udld reset

<b>Syntax Description</b>	This command has no arguments or keywords.	
<b>Command Default</b>	None	
<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** If the interface configuration is still enabled for UDLD, these ports begin to run UDLD again and are disabled for the same reason if the problem has not been corrected.

This example shows how to reset all interfaces disabled by UDLD:

```
Device# udld reset
1 ports shutdown by UDLD were reset.
```

**udld reset**



PART **VII**

## **Multiprotocol Label Switching**

- [MPLS Commands, on page 441](#)
- [Multicast VPN Commands, on page 451](#)





## MPLS Commands

---

- [mpls ip default-route, on page 442](#)
- [mpls ip \(global configuration\), on page 443](#)
- [mpls ip \(interface configuration\), on page 444](#)
- [mpls label protocol \(global configuration\), on page 445](#)
- [mpls label protocol \(interface configuration\), on page 446](#)
- [mpls label range, on page 447](#)
- [show mpls label range, on page 449](#)

**mpls ip default-route**

# **mpls ip default-route**

To enable the distribution of labels associated with the IP default route, use the **mpls ip default-route** command in global configuration mode.

**mpls ip default-route**

**Syntax Description** This command has no arguments or keywords.

**Command Default** No distribution of labels for the IP default route.

**Command Modes** Global configuration

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** Dynamic label switching (that is, distribution of labels based on routing protocols) must be enabled before you can use the **mpls ip default-route** command.

**Examples** The following example shows how to enable the distribution of labels associated with the IP default route:

```
Switch# configure terminal
Switch(config)# mpls ip
Switch(config)# mpls ip default-route
```

Related Commands	Command	Description
	<b>mpls ip</b> (global configuration)	Enables MPLS forwarding of IPv4 packets along normally routed paths for the platform.
	<b>mpls ip</b> (interface configuration)	Enables MPLS forwarding of IPv4 packets along normally routed paths for a particular interface.

# mpls ip (global configuration)

To enable Multiprotocol Label Switching (MPLS) forwarding of IPv4 and IPv6 packets along normally routed paths for the platform, use the **mpls ip** command in global configuration mode. To disable this feature, use the **no** form of this command.

```
mpls ip
no mpls ip
```

## Syntax Description

This command has no arguments or keywords.

## Command Default

Label switching of IPv4 and IPv6 packets along normally routed paths is enabled for the platform.

## Command Modes

Global configuration

## Command History

	<b>Release</b>	<b>Modification</b>
Cisco IOS XE Denali 16.3.1		This command was introduced.

## Usage Guidelines

MPLS forwarding of IPv4 and IPv6 packets along normally routed paths (sometimes called dynamic label switching) is enabled by this command. For a given interface to perform dynamic label switching, this switching function must be enabled for the interface and for the platform.

The **no** form of this command stops dynamic label switching for all platform interfaces regardless of the interface configuration; it also stops distribution of labels for dynamic label switching. However, the no form of this command does not affect the sending of labeled packets through label switch path (LSP) tunnels.

## Examples

The following example shows that dynamic label switching is disabled for the platform, and all label distribution is terminated for the platform:

```
Switch(config)# no mpls ip
```

## Related Commands

<b>Command</b>	<b>Description</b>
<b>mpls ip</b> (interface configuration)	Enables MPLS forwarding of IPv4 and IPv6 packets along normally routed paths for the associated interface.

# mpls ip (interface configuration)

To enable Multiprotocol Label Switching (MPLS) forwarding of IPv4 and IPv6 packets along normally routed paths for a particular interface, use the **mpls ip** command in interface configuration mode. To disable this configuration, use the **no** form of this command.

```
mpls ip
no mpls ip
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** MPLS forwarding of IPv4 and IPv6 packets along normally routed paths for the interface is disabled.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** MPLS forwarding of IPv4 and IPv6 packets along normally routed paths is sometimes called dynamic label switching. If dynamic label switching has been enabled for the platform when this command is issued on an interface, label distribution for the interface begins with the periodic transmission of neighbor discovery Hello messages on the interface. When the outgoing label for a destination routed through the interface is known, packets for the destination are labeled with that outgoing label and forwarded through the interface.

The **no** form of this command causes packets routed out through the interface to be sent unlabeled; this form of the command also terminates label distribution for the interface. However, the no form of the command does not affect the sending of labeled packets through any link-state packet (LSP) tunnels that might use the interface.

**Examples** The following example shows how to enable label switching on the specified Ethernet interface:

```
Switch(config)# configure terminal
Switch(config-if)# interface TenGigabitEthernet1/0/3
Switch(config-if)# mpls ip
```

The following example shows that label switching is enabled on the specified vlan interface (SVI) on a Cisco Catalyst switch:

```
Switch(config)# configure terminal
Switch(config-if)# interface vlan 1
Switch(config-if)# mpls ip
```

# mpls label protocol (global configuration)

To specify the Label Distribution Protocol (LDP) for a platform, use the **mpls label protocol** command in global configuration mode. To restore the default LDP, use the **no** form of this command.

```
mpls label protocol ldp  
no mpls label protocol ldp
```

## Syntax Description

<b>ldp</b>	Specifies that LDP is the default label distribution protocol.
------------	--

## Command Default

LDP is the default label distribution protocol.

## Command Modes

Global configuration

## Command History

	<b>Release</b>	<b>Modification</b>
Cisco IOS XE Denali 16.3.1		This command was introduced.

## Usage Guidelines

If neither the global `mpls label protocol ldp` command nor the interface `mpls label protocol ldp` command is used, all label distribution sessions use LDP.

## Examples

The following command establishes LDP as the label distribution protocol for the platform:

```
Switch(config)# mpls label protocol ldp
```

# mpls label protocol (interface configuration)

To specify the label distribution protocol for an interface, use the **mpls label protocol** command in interface configuration mode. To remove the label distribution protocol from the interface, use the **no** form of this command.

```
mpls label protocol ldp
no mpls label protocol ldp
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>ldp</b></td><td>Specifies that the label distribution protocol (LDP) is to be used on the interface.</td></tr> </table>	<b>ldp</b>	Specifies that the label distribution protocol (LDP) is to be used on the interface.		
<b>ldp</b>	Specifies that the label distribution protocol (LDP) is to be used on the interface.				
<b>Command Default</b>	If no protocol is explicitly configured for an interface, the label distribution protocol that was configured for the platform is used. To set the platform label distribution protocol, use the global <b>mpls label protocol</b> command.				
<b>Command Modes</b>	Interface configuration (config-if)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.1</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Denali 16.3.1	This command was introduced.				
<b>Usage Guidelines</b>	To successfully establish a session for label distribution for a link connecting two label switch routers (LSRs), the link interfaces on the LSRs must be configured to use the same label distribution protocol. If there are multiple links connecting two LSRs, all of the link interfaces connecting the two LSRs must be configured to use the same protocol.				

## Examples

The following example shows how to establish LDP as the label distribution protocol for the interface:

```
Switch(config-if)# mpls label protocol ldp
```

# mpls label range

To configure the range of local labels available for use with Multiprotocol Label Switching (MPLS) applications on packet interfaces, use the **mpls label range** command in global configuration mode. To revert to the platform defaults, use the **no** form of this command.

**mpls label range** *minimum-value maximum-value* [**static** *minimum-static-value maximum-static-value*]  
**no mpls label range**

Syntax Description	<i>minimum-value</i>	The value of the smallest label allowed in the label space. The default is 16.
	<i>maximum-value</i>	The value of the largest label allowed in the label space. The default is platform-dependent.
	<b>static</b>	(Optional) Reserves a block of local labels for static label assignments. If you omit the <b>static</b> keyword and the <i>minimum-static-value maximum-static-value</i> arguments, no labels are reserved for static assignment.
	<i>minimum-static-value</i>	(Optional) The minimum value for static label assignments. There is no default value.
	<i>maximum-static-value</i>	(Optional) The maximum value for static label assignments. There is no default value.

**Command Default** The platform's default values are used.

**Command Modes** Global configuration

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** The labels 0 through 15 are reserved by the IETF (see RFC 3032, MPLS Label Stack Encoding, for details) and cannot be included in the range specified in the **mpls label range** command. If you enter a 0 in the command, you will get a message that indicates that the command is an unrecognized command.

The label range defined by the **mpls label range** command is used by all MPLS applications that allocate local labels (for dynamic label switching, MPLS traffic engineering, MPLS Virtual Private Networks (VPNs), and so on).

You can use label distribution protocols, such as Label Distribution Protocol (LDP), to reserve a generic range of labels from 16 through 1048575 for dynamic assignment.

You specify the optional **static** keyword, to reserve labels for static assignment. The MPLS Static Labels feature requires that you configure a range of labels for static assignment. You can configure static bindings only from the current static range. If the static range is not configured or is exhausted, then you cannot configure static bindings.

The range of label values is 16 to 4096. The maximum value defaults to 4096. You can split for static label space between say 16 to 100 and for dynamic label space between 101 to 4096.

**mpls label range**

The upper and lower minimum static label values are displayed in the help line. For example, if you configure the dynamic label with a minimum value of 16 and a maximum value of 100, the help lines display as follows:

```
Switch(config)# mpls label range 16 100 static ?
<100> Upper Minimum static label value
<16> Lower Minimum static label value
Reserved Label Range --> 0 to 15
Available Label Range --> 16 to 4096
Static Label Range --> 16 to 100
Dynamic Label Range --> 101 to 4096
```

In this example, you can configure a static range from 16 to 100.

If the lower minimum static label space is not available, the lower minimum is not displayed in the help line. For example:

```
Switch(config)# mpls label range 16 100 static ?
<16-100> static label value range
```

**Examples**

The following example shows how to configure the size of the local label space. In this example, the minimum static value is set to 200, and the maximum static value is set to 4000.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# mpls label range 200 4000
Switch(config)#

```

If you had specified a new range that overlaps the current range (for example, the new range of the minimum static value set to 16 and the maximum static value set to 1000), then the new range takes effect immediately.

The following example show how to configure a dynamic local label space with a minimum static value set to 100 and the maximum static value set to 1000 and a static label space with a minimum static value set to 16 and a maximum static value set to 99:

```
Switch(config)# mpls label range 100 1000 static 16 99
Switch(config)#

```

In the following output, the **show mpls label range** command, executed after a reload, shows that the configured range is now in effect:

```
Switch# show mpls label range
Downstream label pool: Min/Max label: 100/1000
Range for static labels: Min/Max/Number: 16/99
```

The following example shows how to restore the label range to its default value:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# no mpls label range
Switch(config)# end
```

**Related Commands**

Command	Description
<b>show mpls label range</b>	Displays the range of the MPLS local label space.

# show mpls label range

To display the range of local labels available for use on packet interfaces, use the **show mpls label range** command in privileged EXEC mode.

**show mpls label range**

## Syntax Description

This command has no arguments or keywords.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

## Usage Guidelines

You can use the **mpls label range** command to configure a range for local labels that is different from the default range. The **show mpls label range** command displays both the label range currently in use and the label range that will be in use following the next switch reload.

## Examples

In the following example, the use of the **show mpls label range** command is shown before and after the **mpls label range** command is used to configure a label range that does not overlap the starting label range:

```
Switch# show mpls label range
Downstream label pool: Min/Max label: 16/100
Switch# configure terminal
Switch(config)# mpls label range 101 4000
Switch(config)# exit
Switch# show mpls label range
Downstream label pool: Min/Max label: 101/4000
```

## Related Commands

Command	Description
<b>mpls label range</b>	Configures a range of values for use as local labels.

```
show mpls label range
```



## Multicast VPN Commands

---

- [ip multicast-routing](#), on page 452
- [ip multicast mrinfo-filter](#), on page 453
- [mdt data](#), on page 454
- [mdt default](#), on page 456
- [mdt log-reuse](#), on page 458
- [show ip pim mdt bgp](#), on page 459
- [show ip pim mdt history](#), on page 460
- [show ip pim mdt receive](#), on page 461
- [show ip pim mdt send](#), on page 463

# ip multicast-routing

To enable IP multicast routing, use the **ip multicast-routing** command in global configuration mode. To disable IP multicast routing, use the **no** form of this command.

```
ip multicast-routing [vrf vrf-name]
no ip multicast-routing [vrf vrf-name]
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>vrf vrf-name</b></td><td>(Optional) Enables IP multicast routing for the Multicast VPN routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.</td></tr> </table>	<b>vrf vrf-name</b>	(Optional) Enables IP multicast routing for the Multicast VPN routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.
<b>vrf vrf-name</b>	(Optional) Enables IP multicast routing for the Multicast VPN routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.		

<b>Command Default</b>	IP multicast routing is disabled.
------------------------	-----------------------------------

<b>Command Modes</b>	Global configuration (config).
----------------------	--------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.2	This command was introduced.

<b>Usage Guidelines</b>	When IP multicast routing is disabled, the Cisco IOS software does not forward any multicast packets.
-------------------------	---



**Note** For IP multicast, after enabling IP multicast routing, PIM must be configured on all interfaces. Disabling IP multicast routing does not remove PIM; PIM still must be explicitly removed from the interface configurations.

## Examples

The following example shows how to enable IP multicast routing:

```
Switch(config)# ip multicast-routing
```

The following example shows how to enable IP multicast routing on a specific VRF:

```
Switch(config)#
ip multicast-routing vrf vrf1
```

The following example shows how to disable IP multicast routing:

```
Switch(config)#
no ip multicast-routing
```

The following example shows how to enable MDS in Cisco IOS XE Release 3.3S a specific VRF:

```
Switch(config)#
ip multicast-routing vrf vrf1
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>ip pim</b>	Enables PIM on an interface.

# ip multicast mrinfo-filter

To filter multicast router information (mrinfo) request packets, use the **ip multicast mrinfo-filter** command in global configuration mode. To remove the filter on mrinfo requests, use the **no** form of this command.

```
ip multicast [vrf vrf-name] mrinfo-filter access-list
no ip multicast [vrf vrf-name] mrinfo-filter
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>vrf</b></td><td>(Optional) Supports the multicast VPN routing and forwarding (VRF) instance.</td></tr> <tr> <td><i>vrf-name</i></td><td>(Optional) Name assigned to the VRF.</td></tr> <tr> <td><i>access-list</i></td><td>IP standard numbered or named access list that determines which networks or hosts can query the local multicast device with the <b>mrinfo</b> command.</td></tr> </table>	<b>vrf</b>	(Optional) Supports the multicast VPN routing and forwarding (VRF) instance.	<i>vrf-name</i>	(Optional) Name assigned to the VRF.	<i>access-list</i>	IP standard numbered or named access list that determines which networks or hosts can query the local multicast device with the <b>mrinfo</b> command.
<b>vrf</b>	(Optional) Supports the multicast VPN routing and forwarding (VRF) instance.						
<i>vrf-name</i>	(Optional) Name assigned to the VRF.						
<i>access-list</i>	IP standard numbered or named access list that determines which networks or hosts can query the local multicast device with the <b>mrinfo</b> command.						

**Command Default** No default behavior or values

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.2	This command was introduced.

**Usage Guidelines** The **ip multicast mrinfo-filter** command filters the mrinfo request packets from all of the sources denied by the specified access list. That is, if the access list denies a source, that source's mrinfo requests are filtered. mrinfo requests from any sources permitted by the ACL are allowed to proceed.

**Examples** The following example shows how to filter mrinfo request packets from all hosts on network 192.168.1.1 while allowing requests from any other hosts:

```
ip multicast mrinfo-filter 51
access-list 51 deny 192.168.1.1
access list 51 permit any
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>mrinfo</b>	Queries a multicast device about which neighboring multicast devices are peering with it.

# mdt data

To specify a range of addresses to be used in the data multicast distribution tree (MDT) pool, use the **mdt data** command in VRF configuration or VRF address family configuration mode. To disable this function, use the **no** form of this command.

**mdt data threshold kb/s**  
**no mdt data threshold kb/s**

<b>Syntax Description</b>	<b>threshold kb/s</b> (Optional) Defines the bandwidth threshold value in kilobits per second (kb/s). The range is from 1 to 4294967.
---------------------------	---

**Command Default** A data MDT pool is not configured.

**Command Modes** VRF address family configuration (config-vrf-af)  
VRF configuration (config-vrf)

Release	Modification
Cisco IOS XE Denali 16.3.2	This command was introduced.

**Usage Guidelines** A data MDT can include a maximum of 256 multicast groups per MVPN. Multicast groups used to create the data MDT are dynamically chosen from a pool of configured IP addresses.

Use the **mdt data** command to specify a range of addresses to be used in the data MDT pool. The threshold is specified in kb/s. Using the optional **list** keyword and *access-list* argument, you can define the (S, G) MVPN entries to be used in a data MDT pool, which would further limit the creation of a data MDT pool to the particular (S, G) MVPN entries defined in the access list specified for the *access-list* argument.

You can access the **mdt data** command by using the **ip vrf** global configuration command. You can also access the **mdt data** command by using the **vrf definition** global configuration command followed by the **address-family ipv4** VRF configuration command.

## Examples

The following example shows how to configure the range of group addresses for the MDT data pool. A threshold of 500 kb/s has been set, which means that if a multicast stream exceeds 1 kb/s, then a data MDT is created.

```
ip vrf vrf1
rd 1000:1
route-target export 10:27
route-target import 10:27
mdt default 236.1.1.1
mdt data 228.0.0.0 0.0.0.127 threshold 500 list 101
!
.
.
.
.
ip pim ssm default
```

```
ip pim vrf vrf1 accept-rp auto-rp
!
```

**Related Commands**

Command	Description
<b>mdt default</b>	Configures a default MDT group for a VPN VRF.

**mdt default**

# mdt default

To configure a default multicast distribution tree (MDT) group for a Virtual Private Network (VPN) routing and forwarding (VRF) instance, use the **mdt default** command in VRF configuration or VRF address family configuration mode. To disable this function, use the **no** form of this command.

**mdt default***group-address*  
**no mdt default***group-address*

<b>Syntax Description</b>	<i>group-address</i> IP address of the default MDT group. This address serves as an identifier for the community in that provider edge (PE) devices configured with the same group address become members of the group, allowing them to receive packets sent by each other.				
<b>Command Default</b>	The command is disabled.				
<b>Command Modes</b>	VRF address family configuration (config-vrf-af) VRF configuration (config-vrf)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.2</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.3.2	This command was introduced.
Release	Modification				
Cisco IOS XE Denali 16.3.2	This command was introduced.				
<b>Usage Guidelines</b>	<p>The default MDT group must be the same group configured on all PE devices that belong to the same VPN. If Source Specific Multicast (SSM) is used as the protocol for the default MDT, the source IP address will be the address used to source the Border Gateway Protocol (BGP) sessions.</p> <p>A tunnel interface is created as a result of this command. By default, the destination address of the tunnel header is the <i>group-address</i> argument.</p> <p>You can access the <b>mdt default</b> command by using the <b>ip vrf</b> global configuration command. You can also access the <b>mdt default</b> command by using the <b>vrf definition</b> global configuration command followed by the <b>address-family ipv4</b> VRF configuration command.</p>				
<b>Examples</b>	In the following example, Protocol Independent Multicast (PIM) SSM is configured in the backbone. Therefore, the default and data MDT groups are configured within the SSM range of IP addresses. Inside the VPN, PIM sparse mode (PIM-SM) is configured and only Auto-RP announcements are accepted.				

```
ip vrf vrf1
  rd 1000:1
  mdt default 236.1.1.1
  mdt data 228.0.0.0 0.0.0.127 threshold 50
  mdt data threshold 50
  route-target export 1000:1
  route-target import 1000:1
!
!
```

Related Commands	Command	Description
	<b>mdt data</b>	Configures the multicast group address range for data MDT groups.

**mdt log-reuse**

## mdt log-reuse

To enable the recording of data multicast distribution tree (MDT) reuse, use the **mdt log-reuse** command in VRF configuration or in VRF address family configuration mode. To disable this function, use the **no** form of this command.

```
mdt log-reuse
no mdt log-reuse
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** The command is disabled.

**Command Modes** VRF address family configuration (config-vrf-af) VRF configuration (config-vrf)

Release	Modification
Cisco IOS XE Denali 16.3.2	This command was introduced.

**Usage Guidelines** The **mdt log-reuse** command generates a syslog message whenever a data MDT is reused.

You can access the **mdt log-reuse** command by using the **ip vrf** global configuration command. You can also access the **mdt log-reuse** command by using the **vrf definition** global configuration command followed by the **address-family ipv4** VRF configuration command.

### Examples

The following example shows how to enable MDT log reuse:

```
mdt log-reuse
```

Related Commands	Command	Description
	<b>mdt data</b>	Configures the multicast group address range for data MDT groups.
	<b>mdt default</b>	Configures a default MDT group for a VPN VRF.

# show ip pim mdt bgp

To show details about the Border Gateway Protocol (BGP) advertisement of the route distinguisher (RD) for the multicast distribution tree (MDT) default group, use the `show ip pim mdt bgp` command in user EXEC or privileged EXEC mode.

`show ip pim [vrf vrf-name] mdt bgp`

<b>Syntax Description</b>	<b>vrf <i>vrf-name</i></b> (Optional) Displays information about the BGP advertisement of the RD for the MDT default group associated with Multicast Virtual Private Network (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.
---------------------------	--

<b>Command Modes</b>	User EXEC Privileged EXEC
----------------------	---------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.2	This command was introduced.

<b>Usage Guidelines</b>	Use this command to show detailed BGP advertisement of the RD for the MDT default group.
-------------------------	--

<b>Examples</b>	The following is sample output from the <code>show ip pim mdt bgp</code> command:
-----------------	---

```
Device# show ip pim mdt bgp
MDT-default group 232.2.1.4
  rid:10.1.1.1 next_hop:10.1.1.1
```

The table below describes the significant fields shown in the display.

**Table 28: show ip pim mdt bgp Field Descriptions**

<b>Field</b>	<b>Description</b>
MDT-default group	The MDT default groups that have been advertised to this router.
rid:10.1.1.1	The BGP router ID of the advertising router.
next_hop:10.1.1.1	The BGP next hop address that was contained in the advertisement.

**show ip pim mdt history**

## show ip pim mdt history

To display information about the history of data multicast distribution tree (MDT) groups that have been reused, use the **show ip pim mdt history** command in privileged EXEC mode.

**show ip pim vrf *vrf-name* mdt history interval *minutes***

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>vrf</b> <i>vrf-name</i></td><td>Displays the history of data MDT groups that have been reused for the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.</td></tr> <tr> <td><b>interval</b> <i>minutes</i></td><td>Specifies the interval (in minutes) for which to display information about the history of data MDT groups that have been reused. The range is from 1 to 71512 minutes (7 weeks).</td></tr> </table>	<b>vrf</b> <i>vrf-name</i>	Displays the history of data MDT groups that have been reused for the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.	<b>interval</b> <i>minutes</i>	Specifies the interval (in minutes) for which to display information about the history of data MDT groups that have been reused. The range is from 1 to 71512 minutes (7 weeks).
<b>vrf</b> <i>vrf-name</i>	Displays the history of data MDT groups that have been reused for the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.				
<b>interval</b> <i>minutes</i>	Specifies the interval (in minutes) for which to display information about the history of data MDT groups that have been reused. The range is from 1 to 71512 minutes (7 weeks).				

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.2	This command was introduced.

**Usage Guidelines** The output of the **show ip pim mdt history** command displays the history of reused MDT data groups for the interval specified with the **interval** keyword and *minutes* argument. The interval is from the past to the present, that is, from the time specified for the *minutes* argument to the time at which the command is issued.

### Examples

The following is sample output from the **show ip pim mdt history** command:

```
Device# show ip pim vrf vrf1 mdt history interval 20
      MDT-data send history for VRF - vrf1 for the past 20 minutes
      MDT-data group          Number of reuse
          10.9.9.8              3
          10.9.9.9              2
```

The table below describes the significant fields shown in the display.

**Table 29: show ip pim mdt history Field Descriptions**

<b>Field</b>	<b>Description</b>
MDT-data group	The MDT data group for which information is being shown.
Number of reuse	The number of data MDTs that have been reused in this group.

# show ip pim mdt receive

To display the data multicast distribution tree (MDT) group mappings received from other provider edge (PE) routers, use the **show ip pim mdt receive** command in privileged EXEC mode.

**show ip pim vrf *vrf-name* mdt receive [detail]**

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>vrf</b> <i>vrf-name</i></td><td>Displays the data MDT group mappings for the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.</td></tr> <tr> <td><b>detail</b></td><td>(Optional) Provides a detailed description of the data MDT advertisements received.</td></tr> </table>	<b>vrf</b> <i>vrf-name</i>	Displays the data MDT group mappings for the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.	<b>detail</b>	(Optional) Provides a detailed description of the data MDT advertisements received.
<b>vrf</b> <i>vrf-name</i>	Displays the data MDT group mappings for the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.				
<b>detail</b>	(Optional) Provides a detailed description of the data MDT advertisements received.				

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.2	This command was introduced.

<b>Usage Guidelines</b>	When a router wants to switch over from the default MDT to a data MDT, it advertises the VRF source, the group pair, and the global multicast address over which the traffic will be sent. If the remote router wants to receive this data, then it will join this global address multicast group.
-------------------------	--

<b>Examples</b>	The following is sample output from the <b>show ip pim mdt receive</b> command using the <b>detail</b> keyword for further information:
-----------------	---

```
Device# show ip pim vrf vpn8 mdt receive detail
Joined MDT-data groups for VRF:vpn8
group:172.16.8.0 source:10.0.0.100 ref_count:13
(10.101.8.10, 225.1.8.1), 1d13h/00:03:28/00:02:26, OIF count:1, flags:TY
(10.102.8.10, 225.1.8.1), 1d13h/00:03:28/00:02:27, OIF count:1, flags:TY
```

The table below describes the significant fields shown in the display.

**Table 30: show ip pim mdt receive Field Descriptions**

<b>Field</b>	<b>Description</b>
group:172.16.8.0	Group that caused the data MDT to be built.
source:10.0.0.100	VRF source that caused the data MDT to be built.
ref_count:13	Number of (S, G) pairs that are reusing this data MDT.
OIF count:1	Number of interfaces out of which this multicast data is being forwarded.

**show ip pim mdt receive**

Field	Description
flags:	<p>Information about the entry.</p> <ul style="list-style-type: none"> <li>• A--candidate Multicast Source Discovery Protocol (MSDP) advertisement</li> <li>• B--bidirectional group</li> <li>• D--dense</li> <li>• C--connected</li> <li>• F--register flag</li> <li>• I--received source-specific host report</li> <li>• J--join shortest path source tree (SPT)</li> <li>• L--local</li> <li>• M--MSDP created entry</li> <li>• P--pruned</li> <li>• R--RP bit set</li> <li>• S--sparse</li> <li>• s--Source Specific Multicast (SSM) group</li> <li>• T--SPT bit set</li> <li>• X--proxy join timer running</li> <li>• U--URL Rendezvous Directory (URD)</li> <li>• Y--joined MDT data group</li> <li>• y--sending to MDT data group</li> <li>• Z--multicast tunnel</li> </ul>

# show ip pim mdt send

To display the data multicast distribution tree (MDT) groups in use, use the **show ip pim mdt send** command in privileged EXEC mode.

**show ip pim vrf *vrf-name* mdt send**

<b>Syntax Description</b>	<b>vrf <i>vrf-name</i></b>	Displays the data MDT groups in use by the Multicast VPN (MVPN) routing and forwarding (MVRF) instance specified for the <i>vrf-name</i> argument.
---------------------------	----------------------------	--

<b>Command Modes</b>	Privileged EXEC
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.2	This command was introduced.

<b>Usage Guidelines</b>	Use this command to show the data MDT groups in use by a specified MVRF.
-------------------------	--

<b>Examples</b>	The following is sample output from the <b>show ip pim mdt send</b> command:
-----------------	--

```
Device# show ip pim vrf vpn8 mdt send
MDT-data send list for VRF:vpn8
  (source, group)          MDT-data group      ref_count
  (10.100.8.10, 225.1.8.1) 232.2.8.0          1
  (10.100.8.10, 225.1.8.2) 232.2.8.1          1
  (10.100.8.10, 225.1.8.3) 232.2.8.2          1
  (10.100.8.10, 225.1.8.4) 232.2.8.3          1
  (10.100.8.10, 225.1.8.5) 232.2.8.4          1
  (10.100.8.10, 225.1.8.6) 232.2.8.5          1
  (10.100.8.10, 225.1.8.7) 232.2.8.6          1
  (10.100.8.10, 225.1.8.8) 232.2.8.7          1
  (10.100.8.10, 225.1.8.9) 232.2.8.8          1
  (10.100.8.10, 225.1.8.10) 232.2.8.9         1
```

The table below describes the significant fields shown in the display.

**Table 31: show ip pim mdt send Field Descriptions**

<b>Field</b>	<b>Description</b>
source, group	Source and group addresses that this router has switched over to data MDTs.
MDT-data group	Multicast address over which these data MDTs are being sent.
ref_count	Number of (S, G) pairs that are reusing this data MDT.

```
show ip pim mdt send
```



PART **VIII**

## **Network Management**

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## Flexible NetFlow Commands

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# cache

To configure a flow cache parameter for a flow monitor, use the **cache** command in flow monitor configuration mode. To remove a flow cache parameter for a flow monitor, use the **no** form of this command.

```
cache {timeout {active | inactive | update} seconds | type {normal | permanent}}
no cache {timeout {active | inactive | update} | type}
```

## Syntax Description

<b>timeout</b>	Specifies the flow timeout.
<b>active</b>	Specifies the active flow timeout.
<b>inactive</b>	Specifies the inactive flow timeout.
<b>update</b>	Specifies the update timeout for a permanent flow cache.
<b>seconds</b>	The timeout value in seconds. The range is 30 to 604800 (7 days) for a normal flow cache. For a permanent flow cache the range is 1 to 604800 (7 days).
<b>type</b>	Specifies the type of the flow cache.
<b>normal</b>	Configures a normal cache type. The entries in the flow cache will be aged out according to the <b>timeout active seconds</b> and <b>timeout inactive seconds</b> settings. This is the default cache type.
<b>permanent</b>	Configures a permanent cache type. This cache type disables flow removal from the flow cache.

## Command Default

The default flow monitor flow cache parameters are used.

The following flow cache parameters for a flow monitor are enabled:

- Cache type: normal
- Active flow timeout: 1800 seconds
- Inactive flow timeout: 15 seconds
- Update timeout for a permanent flow cache: 1800 seconds

## Command Modes

Flow monitor configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

Each flow monitor has a cache that it uses to store all the flows it monitors. Each cache has various configurable elements, such as the time that a flow is allowed to remain in it. When a flow times out, it is removed from the cache and sent to any exporters that are configured for the corresponding flow monitor.

The **cache timeout active** command controls the aging behavior of the normal type of cache. If a flow has been active for a long time, it is usually desirable to age it out (starting a new flow for any subsequent packets in the flow). This age out process allows the monitoring application that is receiving the exports to remain up to date. By default, this timeout is 1800 seconds (30 minutes), but it can be adjusted according to system requirements. A larger value ensures that long-lived flows are accounted for in a single flow record; a smaller value results in a shorter delay between starting a new long-lived flow and exporting some data for it. When you change the active flow timeout, the new timeout value takes effect immediately.

The **cache timeout inactive** command also controls the aging behavior of the normal type of cache. If a flow has not seen any activity for a specified amount of time, that flow will be aged out. By default, this timeout is 15 seconds, but this value can be adjusted depending on the type of traffic expected. If a large number of short-lived flows is consuming many cache entries, reducing the inactive timeout can reduce this overhead. If a large number of flows frequently get aged out before they have finished collecting their data, increasing this timeout can result in better flow correlation. When you change the inactive flow timeout, the new timeout value takes effect immediately.

The **cache timeout update** command controls the periodic updates sent by the permanent type of cache. This behavior is similar to the active timeout, except that it does not result in the removal of the cache entry from the cache. By default, this timer value is 1800 seconds (30 minutes).

The **cache type normal** command specifies the normal cache type. This is the default cache type. The entries in the cache will be aged out according to the **timeout active seconds** and **timeout inactive seconds** settings. When a cache entry is aged out, it is removed from the cache and exported via any exporters configured for the monitor associated with the cache.

To return a cache to its default settings, use the **default cache** flow monitor configuration command.



**Note** When a cache becomes full, new flows will not be monitored.



**Note** A permanent cache uses update counters rather than delta counters. When a flow is exported, the counters represent the totals seen for the full lifetime of the flow and not the additional packets and bytes seen since the last export was sent.

The following example shows how to configure the active timeout for the flow monitor cache:

```
Device(config)# flow monitor FLOW-MONITOR-1
Device(config-flow-monitor)# cache timeout active 4800
```

The following example shows how to configure the inactive timer for the flow monitor cache:

```
Device(config)# flow monitor FLOW-MONITOR-1
Device(config-flow-monitor)# cache timeout inactive 30
```

The following example shows how to configure the permanent cache update timeout:

```
Device(config)# flow monitor FLOW-MONITOR-1
Device(config-flow-monitor)# cache timeout update 5000
```

The following example shows how to configure a normal cache:

```
Device(config)# flow monitor FLOW-MONITOR-1
Device(config-flow-monitor)# cache type normal
```

**clear flow exporter**

# clear flow exporter

To clear the statistics for a Flexible Netflow flow exporter, use the **clear flow exporter** command in privileged EXEC mode.

```
clear flow exporter [[name] exporter-name] statistics
```

<b>Syntax Description</b>	<b>name</b> (Optional) Specifies the name of a flow exporter. <b>exporter-name</b> (Optional) Name of a flow exporter that was previously configured. <b>statistics</b> Clears the flow exporter statistics.
---------------------------	--

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	The <b>clear flow exporter</b> command removes all statistics from the flow exporter. These statistics will not be exported and the data gathered in the cache will be lost.  You can view the flow exporter statistics by using the <b>show flow exporter statistics</b> privileged EXEC command.
-------------------------	--

<b>Examples</b>	The following example clears the statistics for all of the flow exporters configured on the device:
-----------------	---

```
Device# clear flow exporter statistics
```

The following example clears the statistics for the flow exporter named FLOW-EXPORTER-1:

```
Device# clear flow exporter FLOW-EXPORTER-1 statistics
```

# clear flow monitor

To clear a flow monitor cache or flow monitor statistics and to force the export of the data in the flow monitor cache, use the **clear flow monitor** command in privileged EXEC mode.

**clear flow monitor [name] monitor-name [{[cache] force-export | statistics}]**

## Syntax Description

<b>name</b>	Specifies the name of a flow monitor.
<i>monitor-name</i>	Name of a flow monitor that was previously configured.
<b>cache</b>	(Optional) Clears the flow monitor cache information.
<b>force-export</b>	(Optional) Forces the export of the flow monitor cache statistics.
<b>statistics</b>	(Optional) Clears the flow monitor statistics.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

The **clear flow monitor cache** command removes all entries from the flow monitor cache. These entries will not be exported and the data gathered in the cache will be lost.



**Note** The statistics for the cleared cache entries are maintained.

The **clear flow monitor force-export** command removes all entries from the flow monitor cache and exports them using all flow exporters assigned to the flow monitor. This action can result in a short-term increase in CPU usage. Use this command with caution.

The **clear flow monitor statistics** command clears the statistics for this flow monitor.



**Note** The current entries statistic will not be cleared by the **clear flow monitor statistics** command because this is an indicator of how many entries are in the cache and the cache is not cleared with this command.

You can view the flow monitor statistics by using the **show flow monitor statistics** privileged EXEC command.

## Examples

The following example clears the statistics and cache entries for the flow monitor named FLOW-MONITOR-1:

```
Device# clear flow monitor name FLOW-MONITOR-1
```

The following example clears the statistics and cache entries for the flow monitor named FLOW-MONITOR-1 and forces an export:

**clear flow monitor**

```
Device# clear flow monitor name FLOW-MONITOR-1 force-export
```

The following example clears the cache for the flow monitor named FLOW-MONITOR-1 and forces an export:

```
Device# clear flow monitor name FLOW-MONITOR-1 cache force-export
```

The following example clears the statistics for the flow monitor named FLOW-MONITOR-1:

```
Device# clear flow monitor name FLOW-MONITOR-1 statistics
```

# collect

To configure non-key fields for the flow monitor record and to enable capturing the values in the fields for the flow created with the record, use the **collect** command in flow record configuration mode.

**collect {counter | interface | timestamp | transport}**

<b>Syntax Description</b>	<b>counter</b> Configures the number of bytes or packets in a flow as a non-key field for a flow record. For more information, see <a href="#">collect counter, on page 476</a> . <b>interface</b> Configures the input and output interface name as a non-key field for a flow record. For more information, see <a href="#">collect interface, on page 477</a> . <b>timestamp</b> Configures the absolute time of the first seen or last seen packet in a flow as a non-key field for a flow record. For more information, see <a href="#">collect timestamp absolute, on page 478</a> . <b>transport</b> Enables the collecting of transport TCP flags from a flow record. For more information, see <a href="#">collect transport tcp flags, on page 479</a> .				
<b>Command Default</b>	Non-key fields are not configured for the flow monitor record.				
<b>Command Modes</b>	Flow record configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** The values in non-key fields are added to flows to provide additional information about the traffic in the flows. A change in the value of a non-key field does not create a new flow. In most cases, the values for non-key fields are taken from only the first packet in the flow.

The **collect** commands are used to configure non-key fields for the flow monitor record and to enable capturing the values in the fields for the flow created with the record. The values in non-key fields are added to flows to provide additional information about the traffic in the flows. A change in the value of a non-key field does not create a new flow. In most cases the values for non-key fields are taken from only the first packet in the flow.



**Note** Although it is visible in the command-line help string, the **flow username** keyword is not supported.

The following example configures the total number of bytes in the flows as a non-key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# collect counter bytes long
```

# collect counter

To configure the number of bytes or packets in a flow as a non-key field for a flow record, use the **collect counter** command in flow record configuration mode. To disable the use of the number of bytes or packets in a flow (counters) as a non-key field for a flow record, use the **no** form of this command.

```
collect counter {bytes layer2 long | bytes long | packets long}
no collect counter {bytes layer2 long | bytes long | packets long}
```

<b>Syntax Description</b>	<b>bytes layer2 long</b> Configures the number of Layer 2 bytes seen in a flow as a non-key field, and enables collecting the total number of Layer 2 bytes from the flow using a 64-bit counter. <b>bytes long</b> Configures the number of bytes seen in a flow as a non-key field, and enables collecting the total number of bytes from the flow using a 64-bit counter. <b>packets long</b> Configures the number of packets seen in a flow as a non-key field and enables collecting the total number of packets from the flow using a 64-bit counter.
---------------------------	--

**Command Default** The number of bytes or packets in a flow is not configured as a non-key field.

**Command Modes** Flow record configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The **collect counter bytes long** command configures a 64-bit counter for the number of bytes seen in a flow. The **collect counter packets long** command configures a 64-bit counter that will be incremented for each packet seen in the flow. It is unlikely that a 64-bit counter will ever restart at 0. To return this command to its default settings, use the **no collect counter** or **default collect counter** flow record configuration command.

The following example configures the total number of bytes in the flows as a non-key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)#collect counter bytes long
```

The following example configures the total number of packets from the flows as a non-key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# collect counter packets long
```

# collect interface

To configure the input and output interface name as a non-key field for a flow record, use the **collect interface** command in flow record configuration mode. To disable the use of the input and output interface as a non-key field for a flow record, use the **no** form of this command.

```
collect interface {input | output}
no collect interface {input | output}
```

<b>Syntax Description</b>	<b>input</b> Configures the input interface name as a non-key field and enables collecting the input interface from the flows. <b>output</b> Configures the output interface name as a non-key field and enables collecting the output interface from the flows.				
<b>Command Default</b>	The input and output interface names are not configured as a non-key field.				
<b>Command Modes</b>	Flow record configuration				
<b>Command History</b>	<table> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** The Flexible NetFlow **collect** commands are used to configure non-key fields for the flow monitor record and to enable capturing the values in the fields for the flow created with the record. The values in non-key fields are added to flows to provide additional information about the traffic in the flows. A change in the value of a non-key field does not create a new flow. In most cases, the values for non-key fields are taken from only the first packet in the flow.

To return this command to its default settings, use the **no collect interface** or **default collect interface** flow record configuration command.

The following example configures the output interface as a non-key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# collect interface output
```

The following example configures the input interface as a non-key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# collect interface input
```

**collect timestamp absolute**

# collect timestamp absolute

To configure the absolute time of the first seen or last seen packet in a flow as a non-key field for a flow record, use the **collect timestamp absolute** command in flow record configuration mode. To disable the use of the first seen or last seen packet in a flow as a non-key field for a flow record, use the **no** form of this command.

```
collect timestamp absolute {first | last}
no collect timestamp absolute {first | last}
```

<b>Syntax Description</b>	<b>first</b> Configures the absolute time of the first seen packet in a flow as a non-key field and enables collecting time stamps from the flows. <b>last</b> Configures the absolute time of the last seen packet in a flow as a non-key field and enables collecting time stamps from the flows.				
<b>Command Default</b>	The absolute time field is not configured as a non-key field.				
<b>Command Modes</b>	Flow record configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	The <b>collect</b> commands are used to configure non-key fields for the flow monitor record and to enable capturing the values in the fields for the flow created with the record. The values in non-key fields are added to flows to provide additional information about the traffic in the flows. A change in the value of a non-key field does not create a new flow. In most cases the values for non-key fields are taken from only the first packet in the flow.				

The following example configures time stamps based on the absolute time of the first seen packet in a flow as a non-key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# collect timestamp absolute first
```

The following example configures time stamps based on the absolute time of the last seen packet in a flow as a non-key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# collect timestamp absolute last
```

# collect transport tcp flags

To enable the collecting of transport TCP flags from a flow, use the **collect transport tcp flags** command in flow record configuration mode. To disable the collecting of transport TCP flags from the flow, use the **no** form of this command.

```
collect transport tcp flags
no collect transport tcp flags
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** The transport layer fields are not configured as a non-key field.

**Command Modes** Flow record configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The values of the transport layer fields are taken from all packets in the flow. You cannot specify which TCP flag to collect. You can only specify to collect transport TCP flags. All TCP flags will be collected with this command. The following transport TCP flags are collected:

- **ack**—TCP acknowledgement flag
- **cwr**—TCP congestion window reduced flag
- **ece**—TCP ECN echo flag
- **fin**—TCP finish flag
- **psh**—TCP push flag
- **rst**—TCP reset flag
- **syn**—TCP synchronize flag
- **urg**—TCP urgent flag

To return this command to its default settings, use the **no collect collect transport tcp flags** or **default collect collect transport tcp flags** flow record configuration command.

The following example collects the TCP flags from a flow:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# collect transport tcp flags
```

# datalink flow monitor

To apply a Flexible NetFlow flow monitor to an interface, use the **datalink flow monitor** command in interface configuration mode. To disable a Flexible NetFlow flow monitor, use the **no** form of this command.

```
datalink flow monitor monitor-name {input | output | sampler sampler-name}
no datalink flow monitor monitor-name {input | output | sampler sampler-name}
```

## Syntax Description

<i>monitor-name</i>	Name of the flow monitor to apply to the interface.
<b>sampler</b> <i>sampler-name</i>	Enables the specified flow sampler for the flow monitor.
<b>input</b>	Monitors traffic that the switch receives on the interface.
<b>output</b>	Monitors traffic that the switch sends on the interface.

## Command Default

A flow monitor is not enabled.

## Command Modes

Interface configuration

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

Before you apply a flow monitor to an interface with the **datalink flow monitor** command, you must have already created the flow monitor using the **flow monitor** global configuration command and the flow sampler using the **sampler** global configuration command.

To enable a flow sampler for the flow monitor, you must have already created the sampler.



**Note** The **datalink flow monitor** command only monitors non-IPv4 and non-IPv6 traffic. To monitor IPv4 traffic, use the **ip flow monitor** command. To monitor IPv6 traffic, use the **ipv6 flow monitor** command.

This example shows how to enable Flexible NetFlow datalink monitoring on an interface:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# datalink flow monitor FLOW-MONITOR-1 sampler FLOW-SAMPLER-1 input
```

# debug flow exporter

To enable debugging output for Flexible Netflow flow exporters, use the **debug flow exporter** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

```
debug flow exporter [[name] exporter-name] [{error | event | packets number}]
no debug flow exporter [[name] exporter-name] [{error | event | packets number}]
```

## Syntax Description

<b>name</b>	(Optional) Specifies the name of a flow exporter.
<i>exporter-name</i>	(Optional) The name of a flow exporter that was previously configured.
<b>error</b>	(Optional) Enables debugging for flow exporter errors.
<b>event</b>	(Optional) Enables debugging for flow exporter events.
<b>packets</b>	(Optional) Enables packet-level debugging for flow exporters.
<i>number</i>	(Optional) The number of packets to debug for packet-level debugging of flow exporters. The range is 1 to 65535.

## Command Modes

Privileged EXEC

## Command History

### Release Modification

Cisco IOS XE 3.2SE This command was introduced.

## Examples

The following example indicates that a flow exporter packet has been queued for process send:

```
Device# debug flow exporter
May 21 21:29:12.603: FLOW EXP: Packet queued for process send
```

# debug flow monitor

To enable debugging output for Flexible NetFlow flow monitors, use the **debug flow monitor** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

```
debug flow monitor [{error | [name] monitor-name [{cache [error] | error | packets packets}]]}
no debug flow monitor [{error | [name] monitor-name [{cache [error] | error | packets packets}]]}
```

<b>Syntax Description</b>	<p><b>error</b> (Optional) Enables debugging for flow monitor errors for all flow monitors or for the specified flow monitor.</p> <p><b>name</b> (Optional) Specifies the name of a flow monitor.</p> <p><i>monitor-name</i> (Optional) Name of a flow monitor that was previously configured.</p> <p><b>cache</b> (Optional) Enables debugging for the flow monitor cache.</p> <p><b>cache error</b> (Optional) Enables debugging for flow monitor cache errors.</p> <p><b>packets</b> (Optional) Enables packet-level debugging for flow monitors.</p> <p><i>packets</i> (Optional) Number of packets to debug for packet-level debugging of flow monitors. The range is 1 to 65535.</p>				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

## Examples

The following example shows that the cache for FLOW-MONITOR-1 was deleted:

```
Device# debug flow monitor FLOW-MONITOR-1 cache
May 21 21:53:02.839: FLOW MON: 'FLOW-MONITOR-1' deleted cache
```

# debug flow record

To enable debugging output for Flexible NetFlow flow records, use the **debug flow record** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

```
debug flow record [{name] record-name | options {sampler-table} | [{detailed | error}]]  
no debug flow record [{name] record-name | options {sampler-table} | [{detailed | error}]]
```

## Syntax Description

<b>name</b>	(Optional) Specifies the name of a flow record.
<i>record-name</i>	(Optional) Name of a user-defined flow record that was previously configured.
<b>options</b>	(Optional) Includes information on other flow record options.
<b>sampler-table</b>	(Optional) Includes information on the sampler tables.
<b>detailed</b>	(Optional) Displays detailed information.
<b>error</b>	(Optional) Displays errors only.

## Command Modes

Privileged EXEC

## Command History

### Release Modification

Cisco IOS XE 3.2SE This command was introduced.

## Examples

The following example enables debugging for the flow record:

```
Device# debug flow record FLOW-record-1
```

# debug sampler

To enable debugging output for Flexible NetFlow samplers, use the **debug sampler** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

```
debug sampler [{detailed | error | [name] sampler-name [{detailed | error | sampling samples}]}]
no debug sampler [{detailed | error | [name] sampler-name [{detailed | error | sampling}]}]
```

## Syntax Description

<b>detailed</b>	(Optional) Enables detailed debugging for sampler elements.
<b>error</b>	(Optional) Enables debugging for sampler errors.
<b>name</b>	(Optional) Specifies the name of a sampler.
<i>sampler-name</i>	(Optional) Name of a sampler that was previously configured.
<b>sampling</b> <i>samples</i>	(Optional) Enables debugging for sampling and specifies the number of samples to debug.

## Command Modes

Privileged EXEC

## Command History

### Release Modification

Cisco IOS XE 3.2SE This command was introduced.

## Examples

The following sample output shows that the debug process has obtained the ID for the sampler named SAMPLER-1:

```
Device# debug sampler detailed
*May 28 04:14:30.883: Sampler: Sampler(SAMPLER-1: flow monitor FLOW-MONITOR-1 (ip,Et1/0,O)
get ID succeeded:1
*May 28 04:14:30.971: Sampler: Sampler(SAMPLER-1: flow monitor FLOW-MONITOR-1 (ip,Et0/0,I)
get ID succeeded:1
```

# description

To configure a description for a flow monitor, flow exporter, or flow record, use the **description** command in the appropriate configuration mode. To remove a description, use the **no** form of this command.

**description** *description*  
**no description** *description*

## Syntax Description

*description* Text string that describes the flow monitor, flow exporter, or flow record.

## Command Default

The default description for a flow sampler, flow monitor, flow exporter, or flow record is "User defined."

## Command Modes

The following command modes are supported:

- Flow exporter configuration
- Flow monitor configuration
- Flow record configuration

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

To return this command to its default setting, use the **no description** or **default description** command in the appropriate configuration mode.

The following example configures a description for a flow monitor:

```
Device(config)# flow monitor FLOW-MONITOR-1
Device(config-flow-monitor)# description Monitors traffic to 172.16.0.1 255.255.0.0
```

**destination**

# destination

To configure an export destination for a flow exporter, use the **destination** command in flow exporter configuration mode. To remove an export destination for a flow exporter, use the **no** form of this command.

```
destination {hostname|ip-address} vrf vrf-label
no destination {hostname|ip-address} vrf vrf-label
```

## Syntax Description

<i>hostname</i>	Hostname of the device to which you want to send the NetFlow information.
<i>ip-address</i>	IPv4 address of the workstation to which you want to send the NetFlow information.
<b>vrf</b>	(Optional) Specifies that the export data packets are to be sent to the named Virtual Private Network (VPN) routing and forwarding (VRF) instance for routing to the destination, instead of to the global routing table.
<i>vrf-label</i>	Name of the VRF instance.

## Command Default

An export destination is not configured.

## Command Modes

Flow exporter configuration

## Command History

<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

Each flow exporter can have only one destination address or hostname.

When you configure a hostname instead of the IP address for the device, the hostname is resolved immediately and the IPv4 address is stored in the running configuration. If the hostname-to-IP-address mapping that was used for the original Domain Name System (DNS) name resolution changes dynamically on the DNS server, the device does not detect this, and the exported data continues to be sent to the original IP address, resulting in a loss of data.

To return this command to its default setting, use the **no destination** or **default destination** command in flow exporter configuration mode.

The following example shows how to configure the networking device to export the Flexible NetFlow cache entry to a destination system:

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter)# destination 10.0.0.4
```

The following example shows how to configure the networking device to export the Flexible NetFlow cache entry to a destination system using a VRF named VRF-1:

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter)# destination 172.16.0.2 vrf VRF-1
```

# dscp

To configure a differentiated services code point (DSCP) value for flow exporter datagrams, use the **dscp** command in flow exporter configuration mode. To remove a DSCP value for flow exporter datagrams, use the **no** form of this command.

```
dscp dscp
no dscp dscp
```

---

**Syntax Description**

*dscp* DSCP to be used in the DSCP field in exported datagrams. The range is 0 to 63. The default is 0.

---

**Command Default**

The differentiated services code point (DSCP) value is 0.

**Command Modes**

Flow exporter configuration

**Command History**

---

**Release**      **Modification**

Cisco IOS XE 3.2SE This command was introduced.

---

**Usage Guidelines**

To return this command to its default setting, use the **no dscp** or **default dscp** flow exporter configuration command.

The following example sets 22 as the value of the DSCP field in exported datagrams:

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter)# dscp 22
```

**export-protocol netflow-v9**

## export-protocol netflow-v9

To configure NetFlow Version 9 export as the export protocol for a Flexible NetFlow exporter, use the **export-protocol netflow-v9** command in flow exporter configuration mode.

**export-protocol netflow-v9**

**Syntax Description** This command has no arguments or keywords.

**Command Default** NetFlow Version 9 is enabled.

**Command Modes** Flow exporter configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The device does not support NetFlow v5 export format, only NetFlow v9 export format is supported.

The following example configures NetFlow Version 9 export as the export protocol for a NetFlow exporter:

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter)# export-protocol netflow-v9
```

# exporter

To add a flow exporter for a flow monitor, use the **exporter** command in the appropriate configuration mode. To remove a flow exporter for a flow monitor, use the **no** form of this command.

```
exporter exporter-name
no exporter exporter-name
```

## Syntax Description

*exporter-name* Name of a flow exporter that was previously configured.

## Command Default

An exporter is not configured.

## Command Modes

Flow monitor configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

You must have already created a flow exporter by using the **flow exporter** command before you can apply the flow exporter to a flow monitor with the **exporter** command.

To return this command to its default settings, use the **no exporter** or **default exporter** flow monitor configuration command.

## Examples

The following example configures an exporter for a flow monitor:

```
Device(config)# flow monitor FLOW-MONITOR-1
Device(config-flow-monitor)# exporter EXPORTER-1
```

# flow exporter

To create a Flexible NetFlow flow exporter, or to modify an existing Flexible NetFlow flow exporter, and enter Flexible NetFlow flow exporter configuration mode, use the **flow exporter** command in global configuration mode. To remove a Flexible NetFlow flow exporter, use the **no** form of this command.

```
flow exporter exporter-name
no flow exporter exporter-name
```

<b>Syntax Description</b>	<i>exporter-name</i> Name of the flow exporter that is being created or modified.				
<b>Command Default</b>	Flexible NetFlow flow exporters are not present in the configuration.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	Flow exporters export the data in the flow monitor cache to a remote system, such as a server running NetFlow collector, for analysis and storage. Flow exporters are created as separate entities in the configuration. Flow exporters are assigned to flow monitors to provide data export capability for the flow monitors. You can create several flow exporters and assign them to one or more flow monitors to provide several export destinations. You can create one flow exporter and apply it to several flow monitors.				

## Examples

The following example creates a flow exporter named FLOW-EXPORTER-1 and enters Flexible NetFlow flow exporter configuration mode:

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter) #
```

# flow monitor

To create a flow monitor, or to modify an existing flow monitor, and enter flow monitor configuration mode, use the **flow monitor** command in global configuration mode. To remove a flow monitor, use the **no** form of this command.

```
flow monitor monitor-name
no flow monitor monitor-name
```

## Syntax Description

*monitor-name* Name of the flow monitor that is being created or modified.

## Command Default

Flexible NetFlow flow monitors are not present in the configuration.

## Command Modes

Global configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

Flow monitors are the Flexible NetFlow component that is applied to interfaces to perform network traffic monitoring. Flow monitors consist of a flow record and a cache. You add the record to the flow monitor after you create the flow monitor. The flow monitor cache is automatically created at the time the flow monitor is applied to the first interface. Flow data is collected from the network traffic during the monitoring process based on the key and nonkey fields in the flow monitor's record and stored in the flow monitor cache.

## Examples

The following example creates a flow monitor named FLOW-MONITOR-1 and enters flow monitor configuration mode:

```
Device(config)# flow monitor FLOW-MONITOR-1
Device(config-flow-monitor) #
```

# flow record

To create a Flexible NetFlow flow record, or to modify an existing Flexible NetFlow flow record, and enter Flexible NetFlow flow record configuration mode, use the **flow record** command in global configuration mode. To remove a Flexible NetFlow record, use the **no** form of this command.

```
flow record record-name
no flow record record-name
```

## Syntax Description

*record-name* Name of the flow record that is being created or modified.

## Command Default

A Flexible NetFlow flow record is not configured.

## Command Modes

Global configuration

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

A flow record defines the keys that Flexible NetFlow uses to identify packets in the flow, as well as other fields of interest that Flexible NetFlow gathers for the flow. You can define a flow record with any combination of keys and fields of interest. The supports a rich set of keys. A flow record also defines the types of counters gathered per flow. You can configure 64-bit packet or byte counters.

## Examples

The following example creates a flow record named FLOW-RECORD-1, and enters Flexible NetFlow flow record configuration mode:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record) #
```

# ip flow monitor

To enable a Flexible NetFlow flow monitor for IPv4 traffic that the device is receiving or forwarding, use the **ip flow monitor** command in interface configuration mode. To disable a flow monitor, use the **no** form of this command.

```
ip flow monitor monitor-name [sampler sampler-name] {input | output}
no ip flow monitor monitor-name [sampler sampler-name] {input | output}
```

## Syntax Description

<b>monitor-name</b>	Name of the flow monitor to apply to the interface.
<b>sampler sampler-name</b>	(Optional) Enables the specified flow sampler for the flow monitor.
<b>input</b>	Monitors IPv4 traffic that the device receives on the interface.
<b>output</b>	Monitors IPv4 traffic that the device transmits on the interface.

## Command Default

A flow monitor is not enabled.

## Command Modes

Interface configuration

## Command History

	<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE	This command was introduced.	

## Usage Guidelines

Before you can apply a flow monitor to an interface with the **ip flow monitor** command, you must have already created the flow monitor using the **flow monitor** global configuration command.

When you add a sampler to a flow monitor, only packets that are selected by the named sampler will be entered into the cache to form flows. Each use of a sampler causes separate statistics to be stored for that usage.

You cannot add a sampler to a flow monitor after the flow monitor has been enabled on the interface. You must first remove the flow monitor from the interface and then enable the same flow monitor with a sampler.



**Note** The statistics for each flow must be scaled to give the expected true usage. For example, with a 1 in 100 sampler it is expected that the packet and byte counters will have to be multiplied by 100.

The following example enables a flow monitor for monitoring input traffic:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip flow monitor FLOW-MONITOR-1 input
```

The following example enables the same flow monitor on the same interface for monitoring input and output traffic:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip flow monitor FLOW-MONITOR-1 input
Device(config-if)# ip flow monitor FLOW-MONITOR-1 output
```

**ip flow monitor**

The following example enables two different flow monitors on the same interface for monitoring input and output traffic:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip flow monitor FLOW-MONITOR-1 input
Device(config-if)# ip flow monitor FLOW-MONITOR-2 output
```

The following example enables the same flow monitor on two different interfaces for monitoring input and output traffic:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip flow monitor FLOW-MONITOR-1 input
Device(config-if)# exit
Device(config)# interface gigabitethernet2/0/3
Device(config-if)# ip flow monitor FLOW-MONITOR-1 output
```

The following example enables a flow monitor for monitoring input traffic, with a sampler to limit the input packets that are sampled:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip flow monitor FLOW-MONITOR-1 sampler SAMPLER-1 input
```

The following example shows what happens when you try to add a sampler to a flow monitor that has already been enabled on an interface without a sampler:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip flow monitor FLOW-MONITOR-1 sampler SAMPLER-2 input
% Flow Monitor: Flow Monitor 'FLOW-MONITOR-1' is already on in full mode and cannot be
enabled with a sampler.
```

The following example shows how to remove a flow monitor from an interface so that it can be enabled with the sampler:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# no ip flow monitor FLOW-MONITOR-1 input
Device(config-if)# ip flow monitor FLOW-MONITOR-1 sampler SAMPLER-2 input
```

# ipv6 flow monitor

To enable a flow monitor for IPv6 traffic that the device is receiving or forwarding, use the **ipv6 flow monitor** command in interface configuration mode. To disable a flow monitor, use the **no** form of this command.

```
ipv6 flow monitor monitor-name [sampler sampler-name] {input | output}
no ipv6 flow monitor monitor-name [sampler sampler-name] {input | output}
```

## Syntax Description

<i>monitor-name</i>	Name of the flow monitor to apply to the interface.
<b>sampler</b> <i>sampler-name</i>	(Optional) Enables the specified flow sampler for the flow monitor.
<b>input</b>	Monitors IPv6 traffic that the device receives on the interface.
<b>output</b>	Monitors IPv6 traffic that the device transmits on the interface.

## Command Default

A flow monitor is not enabled.

## Command Modes

Interface configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

Before you can apply a flow monitor to the interface with the **ipv6 flow monitor** command, you must have already created the flow monitor using the **flow monitor** global configuration command.

When you add a sampler to a flow monitor, only packets that are selected by the named sampler will be entered into the cache to form flows. Each use of a sampler causes separate statistics to be stored for that usage.

You cannot add a sampler to a flow monitor after the flow monitor has been enabled on the interface. You must first remove the flow monitor from the interface and then enable the same flow monitor with a sampler.



**Note** The statistics for each flow must be scaled to give the expected true usage. For example, with a 1 in 100 sampler it is expected that the packet and byte counters will have to be multiplied by 100.

The following example enables a flow monitor for monitoring input traffic:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ipv6 flow monitor FLOW-MONITOR-1 input
```

The following example enables the same flow monitor on the same interface for monitoring input and output traffic:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ipv6 flow monitor FLOW-MONITOR-1 input
Device(config-if)# ipv6 flow monitor FLOW-MONITOR-1 output
```

**ipv6 flow monitor**

The following example enables two different flow monitors on the same interface for monitoring input and output traffic:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ipv6 flow monitor FLOW-MONITOR-1 input
Device(config-if)# ipv6 flow monitor FLOW-MONITOR-2 output
```

The following example enables the same flow monitor on two different interfaces for monitoring input and output traffic:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ipv6 flow monitor FLOW-MONITOR-1 input
Device(config-if)# exit
Device(config)# interface gigabitethernet2/0/3
Device(config-if)# ipv6 flow monitor FLOW-MONITOR-1 output
```

The following example enables a flow monitor for monitoring input traffic, with a sampler to limit the input packets that are sampled:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ipv6 flow monitor FLOW-MONITOR-1 sampler SAMPLER-1 input
```

The following example shows what happens when you try to add a sampler to a flow monitor that has already been enabled on an interface without a sampler:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ipv6 flow monitor FLOW-MONITOR-1 sampler SAMPLER-2 input
% Flow Monitor: Flow Monitor 'FLOW-MONITOR-1' is already on in full mode and cannot be
enabled with a sampler.
```

The following example shows how to remove a flow monitor from an interface so that it can be enabled with the sampler:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# no ipv6 flow monitor FLOW-MONITOR-1 input
Device(config-if)# ipv6 flow monitor FLOW-MONITOR-1 sampler SAMPLER-2 input
```

# match datalink dot1q priority

To configure the 802.1Q (dot1q) priority value as a key field for a flow record, use the **match datalink dot1q priority** command in flow record configuration mode. To disable the use of the priority as a key field for a flow record, use the **no** form of this command.

```
match datalink dot1q priority
no match datalink dot1q priority
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** The priority field is not configured as a key field.

**Command Modes** Flow record configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The observation point of the **match datalink dot1q priority** command is the interface to which the flow monitor that contains the flow record with the command is applied.

The following example configures the 802.1Q priority as a key field for a flow record:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match datalink dot1q priority
```

**match datalink dot1q vlan**

## match datalink dot1q vlan

To configure the 802.1Q (dot1q) VLAN value as a key field for a flow record, use the **match datalink dot1q vlan** command in flow record configuration mode. To disable the use of the 802.1Q VLAN value as a key field for a flow record, use the **no** form of this command.

```
match datalink dot1q vlan {input | output}
no match datalink dot1q vlan {input | output}
```

### Syntax Description

**input** Configures the VLAN ID of traffic being received by the as a key field.

**output** Configures the VLAN ID of traffic being transmitted by the as a key field.

### Command Default

The 802.1Q VLAN ID is not configured as a key field.

### Command Modes

Flow record configuration

### Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

### Usage Guidelines

A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The input and output keywords of the **match datalink dot1q vlan** command are used to specify the observation point that is used by the **match datalink dot1q vlan** command to create flows based on the unique 802.1q VLAN IDs in the network traffic.

The following example configures the 802.1Q VLAN ID of traffic being received by the as a key field for a flow record:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match datalink dot1q vlan input
```

# match datalink ethertype

To configure the EtherType of the packet as a key field for a flow record, use the **match datalink ethertype** command in flow record configuration mode. To disable the EtherType of the packet as a key field for a flow record, use the **no** form of this command.

**match datalink ethertype**  
**no match datalink ethertype**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The EtherType of the packet is not configured as a key field.

**Command Modes** Flow record configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

When you configure the EtherType of the packet as a key field for a flow record using the **match datalink ethertype** command, the traffic flow that is created is based on the type of flow monitor that is assigned to the interface:

- When a datalink flow monitor is assigned to an interface using the **datalink flow monitor** interface configuration command, it creates unique flows for different Layer 2 protocols.
- When an IP flow monitor is assigned to an interface using the **ip flow monitor** interface configuration command, it creates unique flows for different IPv4 protocols.
- When an IPv6 flow monitor is assigned to an interface using the **ipv6 flow monitor** interface configuration command, it creates unique flows for different IPv6 protocols.

To return this command to its default settings, use the **no match datalink ethertype** or **default match datalink ethertype** flow record configuration command.

The following example configures the EtherType of the packet as a key field for a Flexible NetFlow flow record:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match datalink ethertype
```

**match datalink mac**

# match datalink mac

To configure the use of MAC addresses as a key field for a flow record, use the **match datalink mac** command in flow record configuration mode. To disable the use of MAC addresses as a key field for a flow record, use the **no** form of this command.

```
match datalink mac {destination address {input | output} | source address {input | output}}
no match datalink mac {destination address{input | output} | source address{input | output}}
```

<b>Syntax Description</b>	<b>destination address</b> Configures the use of the destination MAC address as a key field. <b>input</b> Specifies the MAC address of input packets. <b>output</b> Specifies the MAC address of output packets. <b>source address</b> Configures the use of the source MAC address as a key field.				
<b>Command Default</b>	MAC addresses are not configured as a key field.				
<b>Command Modes</b>	Flow record configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The **input** and **output** keywords are used to specify the observation point that is used by the **match datalink mac** command to create flows based on the unique MAC addressees in the network traffic.



**Note** When a datalink flow monitor is assigned to an interface or VLAN record, it creates flows only for non-IPv6 or non-IPv4 traffic.

To return this command to its default settings, use the **no match datalink mac** or **default match datalink mac** flow record configuration command.

The following example configures the use of the source MAC addresses of packets that are transmitted by the device as a key field for a flow record:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match datalink mac source address output
```

The following example configures the use of the destination MAC address of packets that are received by the device as a key field for a flow record:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match datalink mac destination address input
```

# match datalink vlan

To configure the VLAN ID as a key field for a flow record, use the **match datalink vlan** command in flow record configuration mode. To disable the use of the VLAN ID value as a key field for a flow record, use the **no** form of this command.

```
match datalink vlan {input | output}  
no match datalink vlan {input | output}
```

## Syntax Description

**input** Configures the VLAN ID of traffic being received by the device as a key field.

**output** Configures the VLAN ID of traffic being transmitted by the device as a key field.

## Command Default

The VLAN ID is not configured as a key field.

## Command Modes

Flow record configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE	This command was introduced.
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## Usage Guidelines

A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The **input** and **output** keywords of the **match datalink vlan** command are used to specify the observation point that is used by the **match datalink vlan** command to create flows based on the unique VLAN IDs in the network traffic.

The following example configures the VLAN ID of traffic being received by the device as a key field for a flow record:

```
Device(config)# flow record FLOW-RECORD-1  
Device(config-flow-record)# match datalink vlan input
```

**match flow cts**

# match flow cts

To configure CTS source group tag and destination group tag for a flow record, use the **match flow cts** command in flow record configuration mode. To disable the group tag as key field for a flow record, use the **no** form of this command.

```
match flow cts {source | destination} group-tag
no match flow cts {source | destination} group-tag
```

<b>Syntax Description</b>	<b>cts destination group-tag</b> Configures the CTS destination field group as a key field. <b>cts source group-tag</b> Configures the CTS source field group as a key field.						
<b>Command Default</b>	The CTS destination or source field group, flow direction and the flow sampler ID are not configured as key fields.						
<b>Command Modes</b>	Flexible NetFlow flow record configuration (config-flow-record) Policy inline configuration (config-if-policy-inline)						
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.7.3E</td><td>This command was introduced.</td></tr> <tr> <td>Cisco IOS XE Denali 16.2.1</td><td>           This command was reintroduced.            This command was not supported in Cisco IOS XE Denali 16.1.x         </td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.7.3E	This command was introduced.	Cisco IOS XE Denali 16.2.1	This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x
<b>Release</b>	<b>Modification</b>						
Cisco IOS XE 3.7.3E	This command was introduced.						
Cisco IOS XE Denali 16.2.1	This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x						

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The following example configures the source group-tag as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match flow cts source group-tag
```

# match flow direction

To configure the flow direction as key fields for a flow record, use the **match flow direction** command in flow record configuration mode. To disable the use of the flow direction as key fields for a flow record, use the **no** form of this command.

**match flow direction**  
**no match flow direction**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The flow direction is not configured as key fields.

**Command Modes** Flow record configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The **match flow direction** command captures the direction of the flow as a key field. This feature is most useful when a single flow monitor is configured for input and output flows. It can be used to find and eliminate flows that are being monitored twice, once on input and once on output. This command can help to match up pairs of flows in the exported data when the two flows are flowing in opposite directions.

The following example configures the direction the flow was monitored in as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match flow direction
```

# match interface

To configure the input and output interfaces as key fields for a flow record, use the **match interface** command in flow record configuration mode. To disable the use of the input and output interfaces as key fields for a flow record, use the **no** form of this command.

```
match interface {input | output}
no match interface {input | output}
```

## Syntax Description

**input** Configures the input interface as a key field.

**output** Configures the output interface as a key field.

## Command Default

The input and output interfaces are not configured as key fields.

## Command Modes

Flow record configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The following example configures the input interface as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match interface input
```

The following example configures the output interface as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match interface output
```

# match ipv4

To configure one or more of the IPv4 fields as a key field for a flow record, use the **match ipv4** command in flow record configuration mode. To disable the use of one or more of the IPv4 fields as a key field for a flow record, use the **no** form of this command.

```
match ipv4 {destination address | protocol | source address | tos | ttl | version}
no match ipv4 {destination address | protocol | source address | tos | ttl | version}
```

<b>Syntax Description</b>	<b>destination address</b> Configures the IPv4 destination address as a key field. For more information see <a href="#">match ipv4 destination address, on page 506</a> .
	<b>protocol</b> Configures the IPv4 protocol as a key field.
	<b>source address</b> Configures the IPv4 destination address as a key field. For more information see <a href="#">match ipv4 source address, on page 507</a> .
	<b>tos</b> Configures the IPv4 ToS as a key field.
	<b>ttl</b> Configures the IPv4 time-to-live (TTL) field as a key field for a flow record. For more information see <a href="#">match ipv4 ttl, on page 508</a> .
	<b>version</b> Configures the IP version from IPv4 header as a key field.

**Command Default** The use of one or more of the IPv4 fields as a key field for a user-defined flow record is not enabled.

**Command Modes** Flow record configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The following example configures the IPv4 protocol as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match ipv4 protocol
```

**match ipv4 destination address**

# match ipv4 destination address

To configure the IPv4 destination address as a key field for a flow record, use the **match ipv4 destination address** command in flow record configuration mode. To disable the IPv4 destination address as a key field for a flow record, use the **no** form of this command.

**match ipv4 destination address**  
**no match ipv4 destination address**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The IPv4 destination address is not configured as a key field.

**Command Modes** Flow record configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

To return this command to its default settings, use the **no match ipv4 destination address** or **default match ipv4 destination address** flow record configuration command.

The following example configures the IPv4 destination address as a key field for a flow record:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match ipv4 destination address
```

# match ipv4 source address

To configure the IPv4 source address as a key field for a flow record, use the **match ipv4 source address** command in flow record configuration mode. To disable the use of the IPv4 source address as a key field for a flow record, use the **no** form of this command.

**match ipv4 source address**  
**no match ipv4 source address**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The IPv4 source address is not configured as a key field.

**Command Modes** Flow record configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

To return this command to its default settings, use the **no match ipv4 source address** or **default match ipv4 source address** flow record configuration command.

The following example configures the IPv4 source address as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match ipv4 source address
```

**match ipv4 ttl**

## match ipv4 ttl

To configure the IPv4 time-to-live (TTL) field as a key field for a flow record, use the **match ipv4 ttl** command in flow record configuration mode. To disable the use of the IPv4 TTL field as a key field for a flow record, use the **no** form of this command.

```
match ipv4 ttl
no match ipv4 ttl
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** The IPv4 time-to-live (TTL) field is not configured as a key field.

**Command Modes** Flow record configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match ipv4 ttl** command.

The following example configures IPv4 TTL as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match ipv4 ttl
```

# match ipv6

To configure one or more of the IPv6 fields as a key field for a flow record, use the **match ipv6** command in flow record configuration mode. To disable the use of one or more of the IPv6 fields as a key field for a flow record, use the **no** form of this command.

```
match ipv6 {destination address | hop-limit | protocol | source address | traffic-class | version}
no match ipv6 {destination address | hop-limit | protocol | source address | traffic-class | version}
```

<b>Syntax Description</b>	<b>destination address</b> Configures the IPv4 destination address as a key field. For more information see <a href="#">match ipv6 destination address, on page 510</a> .
	<b>hop-limit</b> Configures the IPv6 hop limit as a key field. For more information see <a href="#">match ipv6 hop-limit, on page 511</a> .
	<b>protocol</b> Configures the IPv6 protocol as a key field.
	<b>source address</b> Configures the IPv4 destination address as a key field. For more information see <a href="#">match ipv6 source address, on page 512</a> .
	<b>traffic-class</b> Configures the IPv6 traffic class as a key field.
	<b>version</b> Configures the IPv6 version from IPv6 header as a key field.

**Command Default** The IPv6 fields are not configured as a key field.

**Command Modes** Flow record configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The following example configures the IPv6 protocol field as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match ipv6 protocol
```

**match ipv6 destination address**

# match ipv6 destination address

To configure the IPv6 destination address as a key field for a flow record, use the **match ipv6 destination address** command in flow record configuration mode. To disable the IPv6 destination address as a key field for a flow record, use the **no** form of this command.

```
match ipv6 destination address
no match ipv6 destination address
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** The IPv6 destination address is not configured as a key field.

**Command Modes** Flow record configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

To return this command to its default settings, use the **no match ipv6 destination address** or **default match ipv6 destination address** flow record configuration command.

The following example configures the IPv6 destination address as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match ipv6 destination address
```

# match ipv6 hop-limit

To configure the IPv6 hop limit as a key field for a flow record, use the **match ipv6 hop-limit** command in flow record configuration mode. To disable the use of a section of an IPv6 packet as a key field for a flow record, use the **no** form of this command.

**match ipv6 hop-limit**  
**no match ipv6 hop-limit**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The use of the IPv6 hop limit as a key field for a user-defined flow record is not enabled by default.

**Command Modes** Flow record configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The following example configures the hop limit of the packets in the flow as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match ipv6 hop-limit
```

**match ipv6 source address**

## match ipv6 source address

To configure the IPv6 source address as a key field for a flow record, use the **match ipv6 source address** command in flow record configuration mode. To disable the use of the IPv6 source address as a key field for a flow record, use the **no** form of this command.

**match ipv6 source address**  
**no match ipv6 source address**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The IPv6 source address is not configured as a key field.

**Command Modes** Flow record configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

To return this command to its default settings, use the **no match ipv6 source address** or **default match ipv6 source address** flow record configuration command.

The following example configures a IPv6 source address as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match ipv6 source address
```

# match transport

To configure one or more of the transport fields as a key field for a flow record, use the **match transport** command in flow record configuration mode. To disable the use of one or more of the transport fields as a key field for a flow record, use the **no** form of this command.

```
match transport {destination-port | icmp ipv4 | icmp ipv6 | igmp type | source-port}
no match transport {destination-port | icmp ipv4 | icmp ipv6 | igmp type | source-port}
```

<b>Syntax Description</b>	<b>destination-port</b> Configures the transport destination port as a key field. <b>icmp ipv4</b> Configures the ICMP IPv4 type field and the code field as key fields. For more information see, <a href="#">match transport icmp ipv4, on page 514</a> . <b>icmp ipv6</b> Configures the ICMP IPv6 type field and the code field as key fields. For more information see, <a href="#">match transport icmp ipv6, on page 515</a> . <b>igmp type</b> Configures time stamps based on the system uptime as a key field. <b>source-port</b> Configures the transport source port as a key field.
---------------------------	--

<b>Command Default</b>	The transport fields are not configured as a key field.
------------------------	---

<b>Command Modes</b>	Flow record configuration
----------------------	---------------------------

<b>Command History</b>	<b>Release</b> <b>Modification</b> Cisco IOS XE 3.2SE This command was introduced.
------------------------	---

<b>Usage Guidelines</b>	A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the <b>match</b> command.
-------------------------	--

The following example configures the destination port as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match transport destination-port
```

The following example configures the source port as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match transport source-port
```

**match transport icmp ipv4**

## match transport icmp ipv4

To configure the ICMP IPv4 type field and the code field as key fields for a flow record, use the **match transport icmp ipv4** command in flow record configuration mode. To disable the use of the ICMP IPv4 type field and code field as key fields for a flow record, use the **no** form of this command.

```
match transport icmp ipv4 {code | type}
no match transport icmp ipv4 {code | type}
```

### Syntax Description

- |             |   |
|-------------|---|
| <b>code</b> | Configures the IPv4 ICMP code as a key field. |
| <b>type</b> | Configures the IPv4 ICMP type as a key field. |

### Command Default

The ICMP IPv4 type field and the code field are not configured as key fields.

### Command Modes

Flow record configuration

### Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

### Usage Guidelines

A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The following example configures the IPv4 ICMP code field as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match transport icmp ipv4 code
```

The following example configures the IPv4 ICMP type field as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match transport icmp ipv4 type
```

# match transport icmp ipv6

To configure the ICMP IPv6 type field and the code field as key fields for a flow record, use the **match transport icmp ipv6** command in flow record configuration mode. To disable the use of the ICMP IPv6 type field and code field as key fields for a flow record, use the **no** form of this command.

```
match transport icmp ipv6 {code | type}
no match transport icmp ipv6 {code | type}
```

<b>Syntax Description</b>	<b>code</b> Configures the IPv6 ICMP code as a key field. <b>type</b> Configures the IPv6 ICMP type as a key field.				
<b>Command Default</b>	The ICMP IPv6 type field and the code field are not configured as key fields.				
<b>Command Modes</b>	Flow record configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** A flow record requires at least one key field before it can be used in a flow monitor. The key fields distinguish flows, with each flow having a unique set of values for the key fields. The key fields are defined using the **match** command.

The following example configures the IPv6 ICMP code field as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match transport icmp ipv6 code
```

The following example configures the IPv6 ICMP type field as a key field:

```
Device(config)# flow record FLOW-RECORD-1
Device(config-flow-record)# match transport icmp ipv6 type
```

**mode random 1 out-of**

# mode random 1 out-of

To enable random sampling and to specify the packet interval for a Flexible NetFlow sampler, use the **mode random 1 out-of** command in sampler configuration mode. To remove the packet interval information for a Flexible NetFlow sampler, use the **no** form of this command.

```
mode random 1 out-of window-size
no mode
```

---

## Syntax Description

*window-size* Specifies the window size from which to select packets. The range is 2 to 1024.

---

## Command Default

The mode and the packet interval for a sampler are not configured.

## Command Modes

Sampler configuration

---

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

---

Cisco IOS XE 3.3SE The **deterministic** keyword was removed.

---



---

## Usage Guidelines

A total of four unique samplers are supported on the . Packets are chosen in a manner that should eliminate any bias from traffic patterns and counter any attempt by users to avoid monitoring.




---

**Note** The **deterministic** keyword is not supported, even though it is visible in the command-line help string.

---

## Examples

The following example enables random sampling with a window size of 1000:

```
Device(config)# sampler SAMPLER-1
Device(config-sampler)# mode random 1 out-of 1000
```

# option

To configure optional data parameters for a flow exporter for Flexible NetFlow, use the **option** command in flow exporter configuration mode. To remove optional data parameters for a flow exporter, use the **no** form of this command.

```
option {exporter-stats | interface-table | sampler-table} [{timeout seconds}]
no option {exporter-stats | interface-table | sampler-table}
```

<b>Syntax Description</b>	<b>exporter-stats</b> Configures the exporter statistics option for flow exporters. <b>interface-table</b> Configures the interface table option for flow exporters. <b>sampler-table</b> Configures the export sampler table option for flow exporters. <b>timeout seconds</b> (Optional) Configures the option resend time in seconds for flow exporters. The range is 1 to 86400. The default is 600.
---------------------------	---

**Command Default** The timeout is 600 seconds. All other optional data parameters are not configured.

**Command Modes** Flow exporter configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE	This command was introduced.	
Cisco IOS XE 3.3SE	The <b>application-table</b> and <b>usermac-table</b> keywords were added.	

**Usage Guidelines** The **option exporter-stats** command causes the periodic sending of the exporter statistics, including the number of records, bytes, and packets sent. This command allows the collector to estimate packet loss for the export records it receives. The optional timeout alters the frequency at which the reports are sent.

The **option interface-table** command causes the periodic sending of an options table, which allows the collector to map the interface SNMP indexes provided in the flow records to interface names. The optional timeout can alter the frequency at which the reports are sent.

The **option sampler-table** command causes the periodic sending of an options table, which details the configuration of each sampler and allows the collector to map the sampler ID provided in any flow record to a configuration that it can use to scale up the flow statistics. The optional timeout can alter the frequency at which the reports are sent.

To return this command to its default settings, use the **no option** or **default option** flow exporter configuration command.

The following example shows how to enable the periodic sending of the sampler option table, which allows the collector to map the sampler ID to the sampler type and rate:

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter)# option sampler-table
```

The following example shows how to enable the periodic sending of the exporter statistics, including the number of records, bytes, and packets sent:

**option**

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter)# option exporter-stats
```

The following example shows how to enable the periodic sending of an options table, which allows the collector to map the interface SNMP indexes provided in the flow records to interface names:

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter)# option interface-table
```

# record

To add a flow record for a Flexible NetFlow flow monitor, use the **record** command in flow monitor configuration mode. To remove a flow record for a Flexible NetFlow flow monitor, use the **no** form of this command.

**record** *record-name*  
**no record**

---

## Syntax Description

*record-name* Name of a user-defined flow record that was previously configured.

---

## Command Default

A flow record is not configured.

## Command Modes

Flow monitor configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

---

## Usage Guidelines

Each flow monitor requires a record to define the contents and layout of its cache entries. The flow monitor can use one of the wide range of predefined record formats, or advanced users may create their own record formats.



**Note** You must use the **no ip flow monitor** command to remove a flow monitor from all of the interfaces to which you have applied it before you can modify the parameters for the **record** command for the flow monitor.

---

## Examples

The following example configures the flow monitor to use FLOW-RECORD-1:

```
Device(config)# flow monitor FLOW-MONITOR-1
Device(config-flow-monitor)# record FLOW-RECORD-1
```

# sampler

To create a Flexible NetFlow flow sampler, or to modify an existing Flexible NetFlow flow sampler, and to enter Flexible NetFlow sampler configuration mode, use the **sampler** command in global configuration mode. To remove a sampler, use the **no** form of this command.

```
sampler sampler-name
no sampler sampler-name
```

## Syntax Description

*sampler-name* Name of the flow sampler that is being created or modified.

## Command Default

Flexible NetFlow flow samplers are not configured.

## Command Modes

Global configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

Flow samplers are used to reduce the load placed by Flexible NetFlow on the networking device to monitor traffic by limiting the number of packets that are analyzed. You configure a rate of sampling that is 1 out of a range of 2-1024 packets. Flow samplers are applied to interfaces in conjunction with a flow monitor to implement sampled Flexible NetFlow.

To enable flow sampling, you configure the record that you want to use for traffic analysis and assign it to a flow monitor. When you apply a flow monitor with a sampler to an interface, the sampled packets are analyzed at the rate specified by the sampler and compared with the flow record associated with the flow monitor. If the analyzed packets meet the criteria specified by the flow record, they are added to the flow monitor cache.

## Examples

The following example creates a flow sampler name SAMPLER-1:

```
Device(config)# sampler SAMPLER-1
Device(config-sampler)#
Device(config-sampler)#
```

# show flow exporter

To display flow exporter status and statistics, use the **show flow exporter** command in privileged EXEC mode.

```
show flow exporter [{broker [{detail | picture}]} | export-ids netflow-v9 [name] exporter-name [{statistics | templates}] | statistics | templates}]
```

<b>Syntax Description</b>	<b>broker</b> (Optional) Displays information about the state of the broker for the Flexible NetFlow flow exporter. <b>detail</b> (Optional) Displays detailed information about the flow exporter broker. <b>picture</b> (Optional) Displays a picture of the broker state. <b>export-ids netflow-v9</b> (Optional) Displays the NetFlow Version 9 export fields that can be exported and their IDs. <b>name</b> (Optional) Specifies the name of a flow exporter. <b>exporter-name</b> (Optional) Name of a flow exporter that was previously configured. <b>statistics</b> (Optional) Displays statistics for all flow exporters or for the specified flow exporter. <b>templates</b> (Optional) Displays template information for all flow exporters or for the specified flow exporter.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

The following example displays the status and statistics for all of the flow exporters configured on a device:

```
Device# show flow exporter
Flow Exporter FLOW-EXPORTER-1:
  Description:                 Exports to the datacenter
  Export protocol:             NetFlow Version 9
  Transport Configuration:
    Destination IP address: 192.168.0.1
    Source IP address:       192.168.0.2
    Transport Protocol:      UDP
    Destination Port:        9995
    Source Port:             55864
    DSCP:                   0x0
    TTL:                     255
    Output Features:         Used
```

This table describes the significant fields shown in the display:

**show flow exporter****Table 32: show flow exporter Field Descriptions**

<b>Field</b>	<b>Description</b>
Flow Exporter	The name of the flow exporter that you configured.
Description	The description that you configured for the exporter, or the default description User defined.
Transport Configuration	The transport configuration fields for this exporter.
Destination IP address	The IP address of the destination host.
Source IP address	The source IP address used by the exported packets.
Transport Protocol	The transport layer protocol used by the exported packets.
Destination Port	The destination UDP port to which the exported packets are sent.
Source Port	The source UDP port from which the exported packets are sent.
DSCP	The differentiated services code point (DSCP) value.
TTL	The time-to-live value.
Output Features	Specifies whether the <b>output-features</b> command, which causes the output features to be run on Flexible NetFlow export packets, has been used or not.

The following example displays the status and statistics for all of the flow exporters configured on a device:

```
Device# show flow exporter name FLOW-EXPORTER-1 statistics
Flow Exporter FLOW-EXPORTER-1:
  Packet send statistics (last cleared 2w6d ago):
    Successfully sent:          0           (0 bytes)
```

# show flow interface

To display the Flexible NetFlow configuration and status for an interface, use the **show flow interface** command in privileged EXEC mode.

**show flow interface [type number]**

<b>Syntax Description</b>	<p><i>type</i> (Optional) The type of interface on which you want to display Flexible NetFlow accounting configuration information.</p> <p><i>number</i> (Optional) The number of the interface on which you want to display Flexible NetFlow accounting configuration information.</p>				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Examples** The following example displays the Flexible NetFlow accounting configuration on Ethernet interfaces 0/0 and 0/1:

```
Device# show flow interface gigabitethernet1/0/1

Interface Ethernet1/0
    monitor:          FLOW-MONITOR-1
    direction:        Output
    traffic(ip):     on
Device# show flow interface gigabitethernet1/0/2
Interface Ethernet0/0
    monitor:          FLOW-MONITOR-1
    direction:        Input
    traffic(ip):     sampler SAMPLER-2#
```

The table below describes the significant fields shown in the display.

**Table 33: show flow interface Field Descriptions**

Field	Description
Interface	The interface to which the information applies.
monitor	The name of the flow monitor that is configured on the interface.
direction:	<p>The direction of traffic that is being monitored by the flow monitor.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• Input—Traffic is being received by the interface.</li> <li>• Output—Traffic is being transmitted by the interface.</li> </ul>

**show flow interface**

Field	Description
traffic(ip)	Indicates if the flow monitor is in normal mode or sampler mode. The possible values are: <ul style="list-style-type: none"><li>• on—The flow monitor is in normal mode.</li><li>• sampler—The flow monitor is in sampler mode (the name of the sampler will be included in the display).</li></ul>

# show flow monitor

To display the status and statistics for a Flexible NetFlow flow monitor, use the **show flow monitor** command in privileged EXEC mode.

```
show flow monitor [{broker [{detail | picture}] | [name] monitor-name [{cache [format {csv | record | table} | aggregate | filter | sort}] | provisioning | statistics}]}
```

<b>Syntax Description</b>	
<b>broker</b>	(Optional) Displays information about the state of the broker for the flow monitor
<b>detail</b>	(Optional) Displays detailed information about the flow monitor broker.
<b>picture</b>	(Optional) Displays a picture of the broker state.
<b>name</b>	(Optional) Specifies the name of a flow monitor.
<i>monitor-name</i>	(Optional) Name of a flow monitor that was previously configured.
<b>cache</b>	(Optional) Displays the contents of the cache for the flow monitor.
<b>format</b>	(Optional) Specifies the use of one of the format options for formatting the display output.
<b>aggregate</b>	(Optional) Displays an aggregate of the given fields.
<b>filter</b>	(Optional) Filters and displays only matching flow records.
<b>sort</b>	(Optional) Sorts the resulting flow records in the required order.
<b>csv</b>	(Optional) Displays the flow monitor cache contents in comma-separated variables (CSV) format.
<b>record</b>	(Optional) Displays the flow monitor cache contents in record format.
<b>table</b>	(Optional) Displays the flow monitor cache contents in table format.
<b>provisioning</b>	(Optional) Displays the flow monitor provisioning information.
<b>statistics</b>	(Optional) Displays the statistics for the flow monitor.

<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE This command was introduced.	

<b>Usage Guidelines</b>	The <b>cache</b> keyword uses the record format by default.  The uppercase field names in the display output of the <b>show flowmonitor monitor-name cache</b> command are key fields that Flexible NetFlow uses to differentiate flows. The lowercase field names in the display output of the <b>show flow monitor monitor-name cache</b> command are nonkey fields from which Flexible NetFlow collects values as additional data for the cache.
-------------------------	---

**show flow monitor**

## Examples

The following example displays the status for a flow monitor:

```
Device# show flow monitor FLOW-MONITOR-1

Flow Monitor FLOW-MONITOR-1:
  Description:      Used for basic traffic analysis
  Flow Record:     flow-record-1
  Flow Exporter:   flow-exporter-1
                    flow-exporter-2
  Cache:
    Type:          normal
    Status:        allocated
    Size:          4096 entries / 311316 bytes
    Inactive Timeout: 15 secs
    Active Timeout: 1800 secs
    Update Timeout: 1800 secs
```

This table describes the significant fields shown in the display.

**Table 34: show flow monitor monitor-name Field Descriptions**

Field	Description
Flow Monitor	Name of the flow monitor that you configured.
Description	Description that you configured or the monitor, or the default description User defined.
Flow Record	Flow record assigned to the flow monitor.
Flow Exporter	Exporters that are assigned to the flow monitor.
Cache	Information about the cache for the flow monitor.
Type	<p>Flow monitor cache type.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• immediate—Flows are expired immediately.</li> <li>• normal—Flows are expired normally.</li> <li>• Permanent—Flows are never expired.</li> </ul>
Status	<p>Status of the flow monitor cache.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• allocated—The cache is allocated.</li> <li>• being deleted—The cache is being deleted.</li> <li>• not allocated—The cache is not allocated.</li> </ul>
Size	Current cache size.
Inactive Timeout	Current value for the inactive timeout in seconds.
Active Timeout	Current value for the active timeout in seconds.

Field	Description
Update Timeout	Current value for the update timeout in seconds.

The following example displays the status, statistics, and data for the flow monitor named FLOW-MONITOR-1:

```
Device# show flow monitor FLOW-MONITOR-1 cache
Cache type: Normal (Platform cache)
Cache size: Unknown
Current entries: 1

Flows added: 3
Flows aged: 2
- Active timeout ( 300 secs) 2

DATALINK MAC SOURCE ADDRESS INPUT: 0000.0000.1000
DATALINK MAC DESTINATION ADDRESS INPUT: 6400.F125.59E6
IPV6 SOURCE ADDRESS: 2001:DB8::1
IPV6 DESTINATION ADDRESS: 2001:DB8:1::1
TRNS SOURCE PORT: 1111
TRNS DESTINATION PORT: 2222
IP VERSION: 6
IP PROTOCOL: 6
IP TOS: 0x05
IP TTL: 11
tcp flags: 0x20
counter bytes long: 132059538
counter packets long: 1158417
```

This table describes the significant fields shown in the display.

**Table 35: show flow monitor monitor-name cache Field Descriptions**

Field	Description
Cache type	Flow monitor cache type. The value is always normal, as it is the only supported cache type.
Cache Size	Number of entries in the cache.
Current entries	Number of entries in the cache that are in use.
Flows added	Flows added to the cache since the cache was created.
Flows aged	Flows expired from the cache since the cache was created.
Active timeout	Current value for the active timeout in seconds.
Inactive timeout	Current value for the inactive timeout in seconds.
DATALINK MAC SOURCE ADDRESS INPUT	MAC source address of input packets.
DATALINK MAC DESTINATION ADDRESS INPUT	MAC destination address of input packets.
IPV6 SOURCE ADDRESS	IPv6 source address.

show flow monitor

Field	Description
IPV6 DESTINATION ADDRESS	IPv6 destination address.
TRNS SOURCE PORT	Source port for the transport protocol.
TRNS DESTINATION PORT	Destination port for the transport protocol.
IP VERSION	IP version.
IP PROTOCOL	Protocol number.
IP TOS	IP type of service (ToS) value.
IP TTL	IP time-to-live (TTL) value.
tcp flags	Value of the TCP flags.
counter bytes	Number of bytes that have been counted.
counter packets	Number of packets that have been counted.

The following example displays the status, statistics, and data for the flow monitor named FLOW-MONITOR-1 in a table format:

```
Device# show flow monitor FLOW-MONITOR-1 cache format table
Cache type: Normal (Platform cache)
Cache size: Unknown
Current entries: 1

Flows added: 3
Flows aged: 2
- Active timeout ( 300 secs) 2

DATALINK MAC SRC ADDR INPUT DATALINK MAC DST ADDR INPUT IPV6 SRC ADDR IPV6 DST ADDR
TRNS SRC PORT TRNS DST PORT IP VERSION IP PROT IP TOS IP TTL tcp flags bytes long
pkts long
=====
===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== =====
===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== =====
0000.0000.1000 6400.F125.59E6 2001:DB8::1 2001:DB8:1::1
1111 2222 6 6 0x05 11 0x20 132059538
1158417
```

The following example displays the status, statistics, and data for the flow monitor named FLOW-MONITOR-IPv6 (the cache contains IPv6 data) in record format:

```
Device# show flow monitor name FLOW-MONITOR-IPv6 cache format record
Cache type: Normal (Platform cache)
Cache size: Unknown
Current entries: 1

Flows added: 3
Flows aged: 2
- Active timeout ( 300 secs) 2

DATALINK MAC SOURCE ADDRESS INPUT: 0000.0000.1000
DATALINK MAC DESTINATION ADDRESS INPUT: 6400.F125.59E6
IPV6 SOURCE ADDRESS: 2001::2
IPV6 DESTINATION ADDRESS: 2002::2
```

```
TRNS SOURCE PORT: 1111
TRNS DESTINATION PORT: 2222
IP VERSION: 6
IP PROTOCOL: 6
IP TOS: 0x05
IP TTL: 11
tcp flags: 0x20
counter bytes long: 132059538
counter packets long: 1158417
```

The following example displays the status and statistics for a flow monitor:

```
Device# show flow monitor FLOW-MONITOR-1 statistics
Cache type: Normal (Platform cache)
Cache size: Unknown
Current entries: 1

Flows added: 3
Flows aged: 2
- Active timeout ( 300 secs) 2
```

**show flow record**

# show flow record

To display the status and statistics for a Flexible NetFlow flow record, use the **show flow record** command in privileged EXEC mode.

```
show flow record [{broker [{detail | picture}] | [name] record-name}]
```

<b>Syntax Description</b>	<b>broker</b> (Optional) Displays information about the state of the broker for the Flexible NetFlow flow record. <b>detail</b> (Optional) Displays detailed information about the flow record broker. <b>picture</b> (Optional) Displays a picture of the broker state. <b>name</b> (Optional) Specifies the name of a flow record. <i>record-name</i> (Optional) Name of a user-defined flow record that was previously configured.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

The following example displays the status and statistics for FLOW-RECORD-1:

```
Device# show flow record FLOW-RECORD-1
flow record FLOW-RECORD-1:
  Description:      User defined
  No. of users:    0
  Total field space: 24 bytes
  Fields:
    match ipv6 destination address
    match transport source-port
    collect interface input
```

# show sampler

To display the status and statistics for a Flexible NetFlow sampler, use the **show sampler** command in privileged EXEC mode.

```
show sampler [{broker [{detail | picture}] | [name] sampler-name}]
```

<b>Syntax Description</b>	<b>broker</b> (Optional) Displays information about the state of the broker for the Flexible NetFlow sampler. <b>detail</b> (Optional) Displays detailed information about the sampler broker. <b>picture</b> (Optional) Displays a picture of the broker state. <b>name</b> (Optional) Specifies the name of a sampler. <i>sampler-name</i> (Optional) Name of a sampler that was previously configured.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

The following example displays the status and statistics for all of the flow samplers configured:

```
Device# show sampler
Sampler SAMPLER-1:
  ID:          2083940135
  export ID:    0
  Description: User defined
  Type:        Invalid (not in use)
  Rate:        1 out of 32
  Samples:     0
  Requests:    0
  Users (0):

Sampler SAMPLER-2:
  ID:          3800923489
  export ID:    1
  Description: User defined
  Type:        random
  Rate:        1 out of 100
  Samples:     1
  Requests:    124
  Users (1):
    flow monitor FLOW-MONITOR-1 (datalink,vlan1)  0 out of 0
```

This table describes the significant fields shown in the display.

show sampler

**Table 36: show sampler Field Descriptions**

<b>Field</b>	<b>Description</b>
ID	ID number of the flow sampler.
Export ID	ID of the flow sampler export.
Description	Description that you configured for the flow sampler, or the default description User defined.
Type	Sampling mode that you configured for the flow sampler.
Rate	Window size (for packet selection) that you configured for the flow sampler. The range is 2 to 32768.
Samples	Number of packets sampled since the flow sampler was configured or the device was restarted. This is equivalent to the number of times a positive response was received when the sampler was queried to determine if the traffic needed to be sampled. See the explanation of the Requests field in this table.
Requests	Number of times the flow sampler was queried to determine if the traffic needed to be sampled.
Users	Interfaces on which the flow sampler is configured.

# source

To configure the source IP address interface for all of the packets sent by a Flexible NetFlow flow exporter, use the **source** command in flow exporter configuration mode. To remove the source IP address interface for all of the packets sent by a Flexible NetFlow flow exporter, use the **no** form of this command.

```
source interface-type interface-number
no source
```

<b>Syntax Description</b>	<i>interface-type</i> Type of interface whose IP address you want to use for the source IP address of the packets sent by a Flexible NetFlow flow exporter.				
	<i>interface-number</i> Interface number whose IP address you want to use for the source IP address of the packets sent by a Flexible NetFlow flow exporter.				
<b>Command Default</b>	The IP address of the interface over which the Flexible NetFlow datagram is transmitted is used as the source IP address.				
<b>Command Modes</b>	Flow exporter configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>The benefits of using a consistent IP source address for the datagrams that Flexible NetFlow sends include the following:</p> <ul style="list-style-type: none"> <li>• The source IP address of the datagrams exported by Flexible NetFlow is used by the destination system to determine from which device the Flexible NetFlow data is arriving. If your network has two or more paths that can be used to send Flexible NetFlow datagrams from the device to the destination system and you do not specify the source interface from which the source IP address is to be obtained, the device uses the IP address of the interface over which the datagram is transmitted as the source IP address of the datagram. In this situation the destination system might receive Flexible NetFlow datagrams from the same device, but with different source IP addresses. When the destination system receives Flexible NetFlow datagrams from the same device with different source IP addresses, the destination system treats the Flexible NetFlow datagrams as if they were being sent from different devices. To avoid having the destination system treat the Flexible NetFlow datagrams as if they were being sent from different devices, you must configure the destination system to aggregate the Flexible NetFlow datagrams it receives from all of the possible source IP addresses in the device into a single Flexible NetFlow flow.</li> <li>• If your device has multiple interfaces that can be used to transmit datagrams to the destination system, and you do not configure the <b>source</b> command, you will have to add an entry for the IP address of each interface into any access lists that you create for permitting Flexible NetFlow traffic. Creating and maintaining access lists for permitting Flexible NetFlow traffic from known sources and blocking it from unknown sources is easier when you limit the source IP address for Flexible NetFlow datagrams to a single IP address for each device that is exporting Flexible NetFlow traffic.</li> </ul>				



**Caution** The interface that you configure as the **source** interface must have an IP address configured, and it must be up.



**Tip** When a transient outage occurs on the interface that you configured with the **source** command, the Flexible NetFlow exporter reverts to the default behavior of using the IP address of the interface over which the datagrams are being transmitted as the source IP address for the datagrams. To avoid this problem, use a loopback interface as the source interface because loopback interfaces are not subject to the transient outages that can occur on physical interfaces.

To return this command to its default settings, use the **no source** or **default source** flow exporter configuration command.

## Examples

The following example shows how to configure Flexible NetFlow to use a loopback interface as the source interface for NetFlow traffic:

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter)# source loopback 0
```

# template data timeout

To specify a timeout period for resending flow exporter template data, use the **template data timeout** command in flow exporter configuration mode. To remove the template resend timeout for a flow exporter, use the **no** form of this command.

```
template data timeout seconds  
no template data timeout seconds
```

---

**Syntax Description**

*seconds* Timeout value in seconds. The range is 1 to 86400. The default is 600.

---

**Command Default**

The default template resend timeout for a flow exporter is 600 seconds.

**Command Modes**

Flow exporter configuration

**Command History**

---

**Release**      **Modification**

Cisco IOS XE 3.2SE This command was introduced.

---

**Usage Guidelines**

Flow exporter template data describes the exported data records. Data records cannot be decoded without the corresponding template. The **template data timeout** command controls how often those templates are exported.

To return this command to its default settings, use the **no template data timeout** or **default template data timeout** flow record exporter command.

The following example configures resending templates based on a timeout of 1000 seconds:

```
Device(config)# flow exporter FLOW-EXPORTER-1  
Device(config-flow-exporter)# template data timeout 1000
```

# transport

To configure the transport protocol for a flow exporter for Flexible NetFlow, use the **transport** command in flow exporter configuration mode. To remove the transport protocol for a flow exporter, use the **no** form of this command.

```
transport udp udp-port
no transport udp udp-port
```

---

## Syntax Description

**udp** *udp-port* Specifies User Datagram Protocol (UDP) as the transport protocol and the UDP port number.

---

## Command Default

Flow exporters use UDP on port 9995.

## Command Modes

Flow exporter configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

---

## Usage Guidelines

To return this command to its default settings, use the **no transport** or **default transport flow exporter** configuration command.

The following example configures UDP as the transport protocol and a UDP port number of 250:

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter)# transport udp 250
```

## ttl

To configure the time-to-live (TTL) value, use the **ttl** command in flow exporter configuration mode. To remove the TTL value, use the **no** form of this command.

```
ttl ttl
no ttl ttl
```

---

### Syntax Description

*ttl* Time-to-live (TTL) value for exported datagrams. The range is 1 to 255. The default is 255.

---

### Command Default

Flow exporters use a TTL of 255.

### Command Modes

Flow exporter configuration

### Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

---

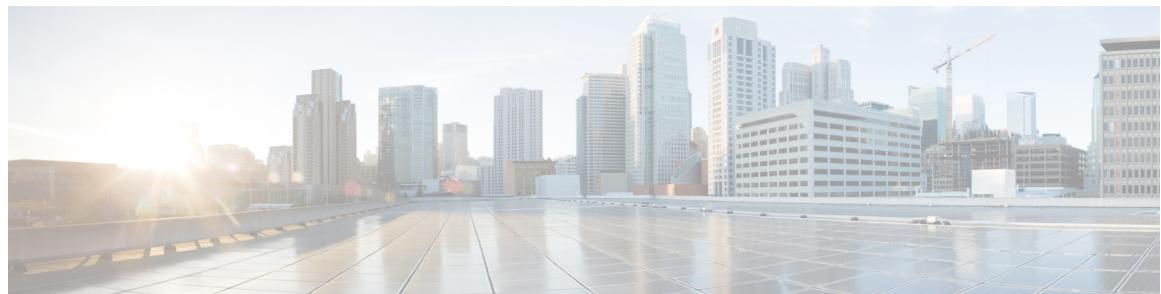
### Usage Guidelines

To return this command to its default settings, use the **no ttl** or **default ttl** flow exporter configuration command.

The following example specifies a TTL of 15:

```
Device(config)# flow exporter FLOW-EXPORTER-1
Device(config-flow-exporter)# ttl 15
```





# Network Management Commands

---

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# debug event manager auto-deploy

To enable the debugging of Embedded Event Manager (EEM) auto-deploy policies, use the **debug event manager auto-deploy** command in privileged EXEC mode. To disable debug messages, use the **no** form of this command.

```
debug event manager auto-deploy {common | parser | schedule}
no debug event manager auto-deploy {common | parser | schedule}
```

Syntax Description	common	Enables the logging of EEM auto-deploy infrastructure-related debugs.
Command Default	Debugs are not enabled.	
Command Modes	Privileged EXEC (#)	
Command History	Release	Modification
	Cisco IOS XE Everest 16.6.1	This command was introduced.

## Example

The following example shows how to enable schedule logs:

```
Device# debug event manager auto-deploy schedule

*Jul 26 16:45:22.731 IST: [fadpa]
*Jul 26 16:45:22.731 IST: [fadec]
*Jul 26 16:45:22.733 IST: fadpa: CLI execution is done
*Jul 26 16:45:22.733 IST:
*Jul 26 16:45:22.733 IST: Provisioned ENV A.ENV policy

*Jul 26 16:45:22.734 IST: [fadpl]
*Jul 26 16:45:22.734 IST: [fadv]
*Jul 26 16:45:22.734 IST: Successfully provisioned env vars

*Jul 26 16:45:22.734 IST: [fadpl]
*Jul 26 16:45:22.734 IST: [fadv]
*Jul 26 16:45:22.734 IST: [fadpfp]
*Jul 26 16:45:22.735 IST: [fadfxr]
*Jul 26 16:45:22.735 IST: [fadft]
*Jul 26 16:45:22.790 IST:
*Jul 26 16:45:22.790 IST: Downloaded APP policy
```

debug event manager auto-deploy

**Related Commands**

Command	Description
<b>event manager auto-deploy</b>	Configures an EEM auto-deployment profile.

# default

To set policy provisioning commands to the default state, use the default command in auto-deploy configuration mode.

```
default {enable | exit | log-url | manifest format xml url | retry count retry-count interval interval-duration | schedule start-in hours hours minutes minutes {oneshot | recurring {days days | hours hours} } | window minutes}
```

Syntax Description						
<b>enable</b>		Enables the profile.				
<b>exit</b>		Exits auto-deploy configuration mode.				
<b>log-url</b>		Sets the location where the log file for policy provisioning must be stored.				
<b>manifest format xml url</b>		Sets the manifest file format, and the location from where the manifest file must be downloaded.				
<b>retry count <i>retry-count</i> interval <i>interval-duration</i></b>		Sets the number of retries to transfer a file, if the file transfer is not successful.				
<b>schedule start-in hours <i>hours</i> minutes <i>minutes</i></b>		Schedules policy provisioning after the specified time.				
<b>oneshot</b>		Schedules policy provisioning.				
<b>recurring days <i>days</i> hours <i>hours</i></b>		Schedules recurring policy provisioning during the specified time.				
<b>window <i>minutes</i></b>		Sets a random time for profile provisioning to be triggered. The window duration is added to the scheduled start-in time, and policy provisioning will happen any time between the scheduled start-in time and the configured window duration.				
<b>Command Default</b>	Auto-deploy commands are not enabled.					
<b>Command Modes</b>	Auto-deploy configuration mode (config-auto-deploy)					
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.6.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>		Release	Modification	Cisco IOS XE Everest 16.6.1	This command was introduced.
Release	Modification					
Cisco IOS XE Everest 16.6.1	This command was introduced.					

## Example

The following example shows how to set a command to its default:

**default**

```
Device(config)# event manager auto-deploy name deploy1
Device(auto-deploy)# default retry count 2 interval 3
```

**Related Commands**

Command	Description
<b>event-manager auto-deploy</b>	Configures an EEM auto-deployment profile.

# description (ERSPAN)

To describe an Encapsulated Remote Switched Port Analyzer (ERSPAN) source session, use the **description** command in ERSPAN monitor source session configuration mode. To remove a description, use the **no** form of this command.

**description** *description*  
**no** **description**

<b>Syntax Description</b>	<i>description</i> Describes the properties for this session.
---------------------------	---

<b>Command Default</b>	Description is not configured.
------------------------	--------------------------------

<b>Command Modes</b>	ERSPAN monitor source session configuration mode (config-mon-erspan-src)
----------------------	--

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

<b>Usage Guidelines</b>	The <i>description</i> argument can be up to 240 characters.
-------------------------	--

<b>Examples</b>	The following example shows how to describe an ERSPAN source session:
-----------------	---

```
Switch(config)# monitor session 2 type erspan-source
Switch(config-mon-erspan-src)# description source1
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>monitor session type erspan-source</b>	Configures a local ERSPAN source session.

# destination (ERSPAN)

To configure an Encapsulated Remote Switched Port Analyzer (ERSPAN) source session destination and specify destination properties, use the **destination** command in ERSPAN monitor source session configuration mode. To remove a destination session, use the **no** form of this command.

**destination**  
**no destination**

**Syntax Description** This command has no arguments or keywords.

**Command Default** A source session destination is not configured.

**Command Modes** ERSPAN monitor source session configuration mode (config-mon-erspan-src)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** ERSPAN traffic is GRE-encapsulated SPAN traffic that can only be processed by an ERSPAN destination session.

All ERSPAN source session (maximum 8) destination IP address need not be same. Enter the **ip address** command to configure the IP address for the ERSPAN destination sessions.

The ERSPAN source session destination IP address, which is configured on an interface on the destination switch, is the source of traffic that an ERSPAN destination session sends to destination ports. Configure the same address in both the source and destination sessions with the **ip address** command.

## Examples

The following example shows how to configure an ERSPAN source session destination and enter the ERSPAN monitor destination session configuration mode to specify the destination properties:

```
Switch(config)# monitor session 2 type erspan-source
Switch(config-mon-erspan-src)# destination
Switch(config-mon-erspan-src-dst)#ip address 10.1.1.1
Switch(config-mon-erspan-src-dst)#+
```

The following sample output from the **show monitor session all** displays different IP addresses for source session destinations:

```
Switch# show monitor session all

Session 1
-----
Type : ERSPAN Source Session
Status : Admin Disabled
Description : session1
Destination IP Address : 10.1.1.1

Session 2
-----
Type : ERSPAN Source Session
```

```

Status : Admin Disabled
Description : session2
Destination IP Address : 192.0.2.1

Session 3
-----
Type : ERSPAN Source Session
Status : Admin Disabled
Description : session3
Destination IP Address : 198.51.100.1

Session 4
-----
Type : ERSPAN Source Session
Status : Admin Disabled
Description : session4
Destination IP Address : 203.0.113.1

Session 5
-----
Type : ERSPAN Source Session
Status : Admin Disabled
Description : session5
Destination IP Address : 209.165.200.225

```

Related Commands	Command	Description
	<b>erspan-id</b>	Configures the ID used by the destination session to identify the ERSPAN traffic.
	<b>ip ttl</b>	Configures TTL values for packets in the ERSPAN traffic.
	<b>monitor session type erspan-source</b>	Configures a local ERSPAN source session.
	<b>origin</b>	Configures an IP address used as the source of the ERSPAN traffic.

**enable**

# enable

To enable the Embedded Event Manager (EEM) profile, use the **enable** command in auto-deploy configuration mode. To disable the EEM profile, use the **no** form of this command.

**enable**

**no enable**

This command has no arguments or keywords.

**Command Default** EEM profiles are not enabled.

**Command Modes** Auto-deploy configuration (config-auto-deploy)

Command History	Release	Modification
	Cisco IOS XE Everest 16.6.1	This command was introduced.

**Usage Guidelines** Unless the configured profile is enabled, that profile will not be active, and policy provisioning will not start.

## Example

The following example shows how to enable an EEM profile:

```
Device(config)# event manager auto-deploy name deploy1
Device(config-auto-deploy)# enable
```

## Related Commands

Command	Description
<b>event-manager auto-deploy</b>	Configures an EEM auto-deployment profile.

# erspan-id

To configure the ID used by the destination session to identify the Encapsulated Remote Switched Port Analyzer (ERSPAN) traffic, use the **erspan-id** command in ERSPAN monitor destination session configuration mode. To remove the configuration, use the **no** form of this command.

**erspan-id *erspan-ID***  
**no erspan-id *erspan-ID***

## Syntax Description

*erspan-id* ERSPAN ID used by the destination session. Valid values are from 1 to 1023.

## Command Default

ERSPAN IDs for destination sessions are not configured.

## Command Modes

ERSPAN monitor destination session configuration mode (config-mon-erspan-src-dst)

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Examples

The following example shows how to configure an ERSPAN ID for a destination session:

```
Switch(config)# monitor session 2 type erspan-source
Switch(config-mon-erspan-src)# destination
Switch(config-mon-erspan-src-dst)# erspan-id 3
```

## Related Commands

Command	Description
<b>destination</b>	Configures an ERSPAN destination session and specifies destination properties.
<b>monitor session type erspan-source</b>	Configures a local ERSPAN source session.

# event manager auto-deploy

To configure an Embedded Event Manager (EEM) auto-deployment profile, use the **event manager auto-deploy** command in global configuration mode. To disable the configuration, use the **no** form of this command.

```
event manager auto-deploy name profile-name
no event manager auto-deploy name profile-name
```

<b>Syntax Description</b>	<b>name</b> <i>profile-name</i>	Specifies a name for the auto-deployment profile.
<b>Command Default</b>	Default profile is not enabled.	
<b>Command Modes</b>	Global configuration (config)	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Everest 16.6.1	<b>Modification</b> This command was introduced.

**Usage Guidelines** After you configure this command, the mode changes to auto-deploy configuration mode. Auto-deployment configuration settings can be configured in this mode. At any given point of time, more than one profile cannot be enabled.

## Example

The following example shows how to configure the auto-deployment of an EEM profile:

```
Device(config)# event manager auto-deploy name deploy1
```

Related Commands	Command	Description
	<b>show event-manager auto-deploy summary</b>	Displays information about auto-deployed profiles.

# event manager auto-deploy start

To trigger the Embedded Event Manager (EEM) auto-deployment instantly, and to start the policy processing, use the **event manager auto-deploy start** command in privileged EXEC mode.

```
event manager auto-deploy start name profile-name {now | window duration}
```

<b>Syntax Description</b>	<b>name</b> <i>profile-name</i> <b>now</b> <b>window</b> <i>duration</i>	Specifies a name for the auto-deployment profile. Specifies that the EEM auto-deployment should start immediately. Specifies that the EEM auto-deployment should start at any random time of the specified window duration. Valid values for the <i>duration</i> argument are 5 to 30 minutes.				
<b>Command Default</b>	EEM auto-deployment is not enabled.					
<b>Command Modes</b>	Privileged EXEC (#)					
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.6.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>		<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.6.1	This command was introduced.
<b>Release</b>	<b>Modification</b>					
Cisco IOS XE Everest 16.6.1	This command was introduced.					

## Example

The following example shows how to start policy processing immediately:

```
Device# event manager auto-deploy start name deploy1 now
```

The following example shows how to start policy processing at any time within the specified window duration:

```
Device# event manager auto-deploy start name deploy1 window 20
```

# filter (ERSPAN)

To configure the Encapsulated Remote Switched Port Analyzer (ERSPAN) source VLAN filtering when the ERSPAN source is a trunk port, use the **filter** command in ERSPAN monitor source session configuration mode. To remove the configuration, use the **no** form of this command.

```
filter {ip access-group {standard-access-list extended-access-list acl-name} | ipv6 access-group acl-name | mac access-group acl-name | sgt sgt-id [{,}] [{-}] | vlan vlan-id [{,}] [{-}]}
no filter {ip [{access-group} | [{standard-access-list extended-access-list acl-name}]] | ipv6 [{access-group}] | mac [{access-group}] | sgt sgt-id [{,}] [{-}] | vlan vlan-id [{,}] [{-}]}
```

<b>Syntax Description</b>	<p><b>ip</b> Specifies the IP access control rules.</p> <p><b>access-group</b> Specifies an access control group.</p> <p><b>standard-access-list</b> Standard IP access list.</p> <p><b>extended-access-list</b> Extended IP access list.</p> <p><b>acl-name</b> Access list name.</p> <p><b>ipv6</b> Specifies the IPv6 access control rules.</p> <p><b>mac</b> Specifies the media access control (MAC) rules.</p> <p><b>sgt sgt-ID</b> Specifies the Security Group Tag (SGT). Valid values are from 1 to 65535.</p> <p><b>vlan vlan-ID</b> Specifies the ERSPAN source VLAN. Valid values are from 1 to 4094.</p> <p><b>,</b> (Optional) Specifies another VLAN.</p> <p><b>-</b> (Optional) Specifies a range of VLANs.</p>						
<b>Command Default</b>	Source VLAN filtering is not configured.						
<b>Command Modes</b>	ERSPAN monitor source session configuration mode (config-mon-erspan-src)						
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.1</td> <td>This command was introduced.</td> </tr> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td> <td>The <b>sgt</b> keyword was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.1	This command was introduced.	Cisco IOS XE Gibraltar 16.11.1	The <b>sgt</b> keyword was introduced.
<b>Release</b>	<b>Modification</b>						
Cisco IOS XE Denali 16.3.1	This command was introduced.						
Cisco IOS XE Gibraltar 16.11.1	The <b>sgt</b> keyword was introduced.						
<b>Usage Guidelines</b>	<p>You cannot include source VLANs and filter VLANs in the same session.</p> <p>When you configure the <b>filter</b> command on a monitored trunk interface, only traffic on that set of specified VLANs is monitored.</p>						
<b>Examples</b>	The following example shows how to configure source VLAN filtering:						

```
Device(config)# monitor session 2 type erspan-source
Device(config-mon-erspan-src)# filter vlan 3
```

**Related Commands**

Command	Description
<b>monitor session type erspan-source</b>	Configures a local ERSPAN source session.

**header-type**

# header-type

To configure the ERSPAN header type for encapsulation, use the **header-type** command in ERSPAN monitor source session configuration mode. To remove the configuration, use the **no** form of this command.

```
header-type header-type
no header-type header-type
```

<b>Syntax Description</b>	<i>header-type</i> ERSPAN header type. Valid header types are 2 and 3.				
<b>Command Default</b>	ERSPAN header type is set to 2.				
<b>Command Modes</b>	ERSPAN monitor source session configuration mode (config-mon-erspan-src)				
<b>Command History</b>	<table> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.				
<b>Examples</b>	The following example shows how to change the ERSPAN header type to 3:				
	<pre>Device(config)# monitor session 2 type erspan-source Device(config-mon-erspan-src)# header-type 3</pre>				
<b>Related Commands</b>	<table border="1"> <thead> <tr> <th><b>Command</b></th><th><b>Description</b></th></tr> </thead> <tbody> <tr> <td><b>monitor session type</b></td><td>Configures a local ERSPAN source or destination session.</td></tr> </tbody> </table>	<b>Command</b>	<b>Description</b>	<b>monitor session type</b>	Configures a local ERSPAN source or destination session.
<b>Command</b>	<b>Description</b>				
<b>monitor session type</b>	Configures a local ERSPAN source or destination session.				

# ip dscp (ERSPAN)

To configure Differentiated Services Code Point (DSCP) values for packets in the Encapsulated Remote Switched Port Analyzer (ERSPAN) traffic, use the **ip dscp** command in ERSPAN monitor destination session configuration mode. To remove the dscp values, use the **no** form of this command.

```
ip dscp dscp-value
no ip dscp dscp-value
```

<b>Syntax Description</b>	<i>dscp-value</i> DSCP value. Valid values are from 0 to 63.
---------------------------	--

<b>Command Default</b>	This command has no default behavior or values.
------------------------	---

<b>Command Modes</b>	ERSPAN monitor destination session configuration mode (config-mon-erspan-src-dst)
----------------------	---

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

<b>Examples</b>	The following example shows how to configure DSCP value for ERSPAN traffic:
-----------------	---

```
Device(config)# monitor session 2 type erspan-source
Device(config-mon-erspan-src)# destination
Device(config-mon-erspan-src-dst)# ip dscp 15
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>destination</b>	Configures an ERSPAN destination session and specifies destination properties.
	<b>monitor session type</b>	Configures a local ERSPAN source or destination session.

# ip ttl (ERSPAN)

To configure Time to Live (TTL) values for packets in the Encapsulated Remote Switched Port Analyzer (ERSPAN) traffic, use the **ip ttl** command in ERSPAN monitor destination session configuration mode. To remove the TTL values, use the **no** form of this command.

```
ip ttl ttl-value
no ip ttl ttl-value
```

## Syntax Description

*ttl-value* TTL value. Valid values are from 2 to 255.

## Command Default

TTL value is set as 255.

## Command Modes

ERSPAN monitor destination session configuration mode (config-mon-erspan-src-dst)

## Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

## Examples

The following example shows how to configure TTL value for ERSPAN traffic:

```
Switch(config)# monitor session 2 type erspan-source
Switch(config-mon-erspan-src)# destination
Switch(config-mon-erspan-src-dst)# ip ttl 32
```

## Related Commands

Command	Description
<b>destination</b>	Configures an ERSPAN destination session and specifies destination properties.
<b>monitor session type erspan-source</b>	Configures a local ERSPAN source session.

# ip wccp

To enable the web cache service, and specify the service number that corresponds to a dynamic service that is defined by the application engine, use the **ip wccp** global configuration command on the device. Use the **no** form of this command to disable the service.

```
ip wccp { web-cache | service-number } [group-address groupaddress] [group-list access-list]
[redirect-list access-list] [password encryption-number password]
no ip wccp { web-cache | service-number } [group-address groupaddress] [group-list access-list]
[redirect-list access-list] [password encryption-number password]
```

Syntax Description	<b>web-cache</b>	Specifies the web-cache service (WCCP Version 1 and Version 2).
	<i>service-number</i>	Dynamic service identifier, which means the service definition is dictated by the cache. The dynamic service number can be from 0 to 254. The maximum number of services is 256, which includes the web-cache service specified with the <b>web-cache</b> keyword.
	<b>group-address</b> <i>groupaddress</i>	(Optional) Specifies the multicast group address used by the devices and the application engines to participate in the service group.
	<b>group-list</b> <i>access-list</i>	(Optional) If a multicast group address is not used, specifies a list of valid IP addresses that correspond to the application engines that are participating in the service group.
	<b>redirect-list</b> <i>access-list</i>	(Optional) Specifies the redirect service for specific hosts or specific packets from hosts.
	<b>password</b> <i>encryption-number</i> <i>password</i>	(Optional) Specifies an encryption number. The range is 0 to 7. Use 0 for not encrypted, and use 7 for proprietary. Also, specifies a password name up to seven characters in length. The device combines the password with the MD5 authentication value to create security for the connection between the device and the application engine. By default, no password is configured, and no authentication is performed.
Command Default	WCCP services are not enabled on the device.	
Command Modes	Global configuration	
Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.
Usage Guidelines	WCCP transparent caching bypasses Network Address Translation (NAT) when Cisco Express Forwarding switching is enabled. To work around this situation, configure WCCP transparent caching in the outgoing direction, enable Cisco Express Forwarding switching on the content engine interface, and specify the <b>ip wccp web-cache redirect out</b> command. Configure WCCP in the incoming direction on the inside interface by	

specifying the **ip wccp redirect exclude in** command on the router interface facing the cache. This configuration prevents the redirection of any packets arriving on that interface.

You can also include a redirect list when configuring a service group. The specified redirect list will deny packets with a NAT (source) IP address and prevent redirection.

This command instructs a device to enable or disable support for the specified service number or the web-cache service name. A service number can be from 0 to 254. Once the service number or name is enabled, the router can participate in the establishment of a service group.

When the **no ip wccp** command is entered, the device terminates participation in the service group, deallocates space if none of the interfaces still have the service configured, and terminates the WCCP task if no other services are configured.

The keywords following the **web-cache** keyword and the *service-number* argument are optional and may be specified in any order, but only may be specified once.

### Example

The following example configures a web cache, the interface connected to the application engine or the server, and the interface connected to the client:

```
Device(config)# ip wccp web-cache
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# no switchport
Device(config-if)# ip address 172.20.10.30 255.255.255.0
Device(config-if)# no shutdown
Device(config-if)# exit
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# no switchport
Device(config-if)#
*Dec  6 13:11:29.507: %LINK-3-UPDOWN: Interface GigabitEthernet1/0/3, changed state to down

Device(config-if)# ip address 175.20.20.10 255.255.255.0
Device(config-if)# no shutdown
Device(config-if)# ip wccp web-cache redirect in
Device(config-if)# ip wccp web-cache group-listen
Device(config-if)# exit
```

# log-url

To specify the location where provisioning logs must be stored, use the **log-url** command in auto-deploy configuration mode. To remove the configuration, use the **no** form of this command.

**log-url URL**  
**no log-url**

<b>Syntax Description</b>	<i>URL</i>	Location for status logs.
<b>Command Default</b>	URL for status logs is not specified.	
<b>Command Modes</b>	Auto-deploy configuration (config-auto-deploy)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>

Cisco IOS XE Everest 16.6.1 This command was introduced.

**Usage Guidelines** The log URL can be configured either in the manifest file or by using the **log-url** command. If the log URL is configured by both ways, the log URL in the manifest file is used. Valid values for the *URL* argument are the following:

- flash:
- ftp:
- http:
- https:
- tftp:

## Example

The following example shows how to specify an URL to log status logs:

```
Device(config)# event manager auto-deploy name deploy1
Device(config-auto-deploy)# log-url tftp://10.106.16.20/folder1/EEM
```

## Related Commands

Command	Description
<b>event-manager auto-deploy</b>	Configures an EEM auto-deployment profile.

**manifest format**

# manifest format

To specify the manifest file format and location details, use the **manifest format** command in auto-deploy configuration mode. To remove the configuration, use the **no** form of this command.

```
manifest format xml url URL
no manifest format xml url
```

**Syntax Description**

**xml** Specifies the manifest file format as XML.

**url URL** Specifies the location to store manifest files.

**Command Default**

Manifest file details are not specified.

**Command Modes**

Auto-deploy configuration (config-auto-deploy)

**Command History**

<b>Release</b>	<b>Modification</b>
----------------	---------------------

Cisco IOS XE Everest 16.6.1 This command was introduced.

**Usage Guidelines**

Valid values for the *URL* argument are the following:

- flash:
- ftp:
- http:
- https:
- tftp:

**Example**

The following example shows how to specify the manifest file format and location details:

```
Device(config)# event manager auto-deploy name deploy1
Device(config-auto-deploy)# manifest format xml url tftp://10.106.16.20/folder1/123.xml
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>event-manager auto-deploy</b>	Configures an EEM auto-deployment profile.

# map platform-type

To set the parameter map attribute filter criteria to platform type, use the **map platform-type** command in parameter-map filter mode. To remove this criteria, use the **no** form of this command.

```
map-number map platform-type { {eq | not-eq | regex} platform-type }
no map-number map platform-type { {eq | not-eq | regex} platform-type }
```

<i>map-number</i>	Specifies the parameter map number.
<b>eq</b>	Specifies the filter type name is equal to the platform type name.
<b>not-eq</b>	Specifies the filter type name is not equal to the platform type name.
<b>regex</b>	Specifies the filter type name is a regular expression.
<i>platform-type</i>	Specifies the platform type for the parameter map attribute filter criteria.

**Command Default** This command is disabled by default.

**Command Modes** Parameter map filter mode (config-parameter-map-filter)

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.12.1	This command was introduced.

**Examples** The following example shows how to set the parameter map attribute filter criteria to platform type:

```
Device> enable
Device# configure terminal
Device(config)# parameter-map type subscriber attribute-to-service Aironet-Policy-para
Device(config-parameter-map-filter)# 10 map platform-type eq C9xxx
```

**match platform-type**

# match platform-type

To evaluate control classes based on the platform type, use the **match platform-type** command in control class-map filter mode. To remove this condition, use the **no** form of this command.

**match platform-type** *platform-name*  
**no match platform-type** *platform-name*

<b>Syntax Description</b>	<i>platform-name</i>	Specifies the name of the platform.
---------------------------	----------------------	-------------------------------------

<b>Command Default</b>	This command is disabled by default.
------------------------	--------------------------------------

<b>Command Modes</b>	Control class-map filter mode (config-filter-control-classmap)
----------------------	--

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.12.1	This command was introduced.

<b>Examples</b>	The following example shows how to set the class map filter to match platform type:
-----------------	---

```
Device> enable
Device# configure terminal
Device(config)# class-map type control subscriber match-all DOT1X_NO_AGENT
Device(config-filter-control-classmap)# match platform-type C9xxx
```

## **monitor capture (interface/control plane)**

To configure monitor capture points specifying an attachment point and the packet flow direction or add more attachment points to a capture point, use the **monitor capture** command in privileged EXEC mode. To disable the monitor capture with the specified attachment point and the packet flow direction or disable one of multiple attachment points on a capture point, use the **no** form of this command.

```
monitor capture {capture-name} {interface interface-type interface-id | control-plane} {in | out | both}  
no monitor capture {capture-name} {interface interface-type interface-id | control-plane} {in | out | both}
```

Syntax Description	<b>capture-name</b>	The name of the capture to be defined.
	<b>interface</b> <i>interface-type interface-id</i>	Specifies an interface with <i>interface-type</i> and <i>interface-id</i> as an attachment point. The arguments have these meanings:
	<b>control-plane</b>	Specifies the control plane as an attachment point.
	<b>in   out   both</b>	Specifies the traffic direction to be captured.
Command Default		A Wireshark capture is not configured.
Command Modes		Privileged EXEC
Command History	Release	Modification
	Cisco IOS XE 3.3SE	This command was introduced.
Usage Guidelines	<p>Once an attachment point has been associated with a capture point using this command, the only way to change its direction is to remove the attachment point using the <b>no</b> form of the command and reattach the attachment point with the new direction. An attachment point's direction cannot be overridden.</p> <p>If an attachment point is removed from a capture point and only one attachment point is associated with it, the capture point is effectively deleted.</p> <p>Multiple attachment points can be associated with a capture point by re-running this command with another attachment point. An example is provided below.</p> <p>Multiple capture points can be defined, but only one can be active at a time. In other words, you have to stop one before you can start the other.</p> <p>Packets captured in the output direction of an interface might not reflect the changes made by switch rewrite (includes TTL, VLAN tag, CoS, checksum, MAC addresses, DSCP, precedent, UP, etc.).</p> <p>No specific order applies when defining a capture point; you can define capture point parameters in any order. The Wireshark CLI allows as many parameters as possible on a single line. This limits the number of commands required to define a capture point.</p> <p>Neither VRFs, management ports, nor private VLANs can be used as attachment points.</p> <p>Wireshark cannot capture packets on a destination SPAN port.</p>	

**monitor capture (interface/control plane)**

When a VLAN is used as a Wireshark attachment point, packets are captured in the input direction only.

**Examples**

To define a capture point using a physical interface as an attachment point:

```
Device# monitor capture mycap interface GigabitEthernet1/0/1 in
Device# monitor capture mycap match ipv4 any any
```




---

**Note** The second command defines the core filter for the capture point. This is required for a functioning capture point unless you are using a CAPWAP tunneling attachment point in your capture point.

If you are using CAPWAP tunneling attachment points in your capture point, you cannot use core filters.

---

To define a capture point with multiple attachment points:

```
Device# monitor capture mycap interface GigabitEthernet1/0/1 in
Device# monitor capture mycap match ipv4 any any
Device# monitor capture mycap control-plane in
Device# show monitor capture mycap parameter
    monitor capture mycap interface GigabitEthernet1/0/1 in
    monitor capture mycap control-plane in
```

To remove an attachment point from a capture point defined with multiple attachment points:

```
Device# show monitor capture mycap parameter
    monitor capture mycap interface GigabitEthernet1/0/1 in
    monitor capture mycap control-plane in
Device# no monitor capture mycap control-plane
Device# show monitor capture mycap parameter
    monitor capture mycap interface GigabitEthernet1/0/1 in
```

To define a capture point with a CAPWAP attachment point:

```
Device# show capwap summary
```

```
CAPWAP Tunnels General Statistics:
  Number of Capwap Data Tunnels      = 1
  Number of Capwap Mobility Tunnels = 0
  Number of Capwap Multicast Tunnels = 0
```

Name	APName	Type	PhyPortIf	Mode	McastIf
Ca0	AP442b.03a9.6715	data	Gi3/0/6	unicast	-

Name	SrcIP	SrcPort	DestIP	DstPort	DtlsEn	MTU	Xact
Ca0	10.10.14.32	5247	10.10.14.2	38514	No	1449	0

```
Device# monitor capture mycap interface capwap 0 both
Device# monitor capture mycap file location flash:mycap.pcap
Device# monitor capture mycap file buffer-size 1
Device# monitor capture mycap start
```

\*Aug 20 11:02:21.983: %BUFCAP-6-ENABLE: Capture Point mycap enabled.on

```
Device# show monitor capture mycap parameter
```

```

monitor capture mycap interface capwap 0 in
monitor capture mycap interface capwap 0 out
monitor capture mycap file location flash:mycap.pcap buffer-size 1
Device#
Device# show monitor capture mycap

Status Information for Capture mycap
Target Type:
  Interface: CAPWAP,
    Ingress:
  0
    Egress:
  0
      Status : Active
    Filter Details:
      Capture all packets
  Buffer Details:
    Buffer Type: LINEAR (default)
  File Details:
    Associated file name: flash:mycap.pcap
    Size of buffer(in MB): 1
  Limit Details:
    Number of Packets to capture: 0 (no limit)
    Packet Capture duration: 0 (no limit)
    Packet Size to capture: 0 (no limit)
    Packets per second: 0 (no limit)
    Packet sampling rate: 0 (no sampling)
Device#
Device# show monitor capture file flash:mycap.pcap
  1 0.000000 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  2 0.499974 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  3 2.000000 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  4 2.499974 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  5 3.000000 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  6 4.000000 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  7 4.499974 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  8 5.000000 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  9 5.499974 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  10 6.000000 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  11 8.000000 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  12 9.225986 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
  13 9.225986 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
  14 9.225986 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
  15 9.231998 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
  16 9.231998 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
  17 9.231998 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
  18 9.236987 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
  19 10.000000 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  20 10.499974 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
  21 12.000000 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....

```

**monitor capture (interface/control plane)**

```
22 12.239993 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
23 12.244997 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
24 12.244997 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
25 12.250994 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
26 12.256990 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
27 12.262987 10.10.14.2 -> 10.10.14.32 DTLSv1.0 Application Data
28 12.499974 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
29 12.802012 10.10.14.3 -> 10.10.14.255 NBNS Name query NB WPAD.<00>
30 13.000000 00:00:00:00:00:00 -> 3c:ce:73:39:c6:60 IEEE 802.11 Probe Request, SN=0, FN=0,
Flags=.....
```

# monitor capture buffer

To configure the buffer for monitor capture (Wireshark), use the **monitor capture buffer** command in privileged EXEC mode. To disable the monitor capture buffer or change the buffer back to a default linear buffer from a circular buffer, use the **no** form of this command.

```
monitor capture {capture-name} buffer {circular [size buffer-size] | size buffer-size}  
no monitor capture {capture-name} buffer [circular]
```

<b>Syntax Description</b>	<p><i>capture-name</i> The name of the capture whose buffer is to be configured.</p> <p><b>circular</b> Specifies that the buffer is of a circular type. The circular type of buffer continues to capture data, even after the buffer is consumed, by overwriting the data captured previously.</p> <p><b>size <i>buffer-size</i></b> (Optional) Specifies the size of the buffer. The range is from 1 MB to 100 MB.</p>				
<b>Command Default</b>	A linear buffer is configured.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"><thead><tr><th>Release</th><th>Modification</th></tr></thead><tbody><tr><td>Cisco IOS XE 3.3SE</td><td>This command was introduced.</td></tr></tbody></table>	Release	Modification	Cisco IOS XE 3.3SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.3SE	This command was introduced.				
<b>Usage Guidelines</b>	When you first configure a Wireshark capture, a circular buffer of a small size is suggested.				

## Example

To configure a circular buffer with a size of 1 MB:

```
Device# monitor capture mycap buffer circular size 1
```

**monitor capture clear**

# monitor capture clear

To clear the monitor capture (Wireshark) buffer, use the **monitor capture clear** command in privileged EXEC mode.

**monitor capture {capture-name} clear**

---

<b>Syntax Description</b>	<i>capture-name</i> The name of the capture whose buffer is to be cleared.
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<b>Command Default</b>	The buffer content is not cleared.
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<b>Command Modes</b>	Privileged EXEC
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
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Cisco IOS XE 3.3SE	This command was introduced.
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<b>Usage Guidelines</b>	Use the <b>monitor capture clear</b> command either during capture or after the capture has stopped either because one or more end conditions has been met, or you entered the <b>monitor capture stop</b> command. If you enter the <b>monitor capture clear</b> command after the capture has stopped, the <b>monitor capture export</b> command that is used to store the contents of the captured packets in a file will have no impact because the buffer has no captured packets.
-------------------------	---

If you have more than one capture that is storing packets in a buffer, clear the buffer before starting a new capture to avoid memory loss.

## Example

To clear the buffer contents for capture mycap:

```
Device# monitor capture mycap clear
```

# monitor capture export

To export a monitor capture (Wireshark) to a file, use the **monitor capture export** command in privileged EXEC mode.

**monitor capture {capture-name} export file-location : file-name**

## Syntax Description

*capture-name* The name of the capture to be exported.

*file-location : file-name* (Optional) Specifies the location and file name of the capture storage file.  
Acceptable values for *file-location* :

- flash—On-board flash storage
- (usbflash0:)—USB drive

## Command Default

The captured packets are not stored.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
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Cisco IOS XE 3.3SE	This command was introduced.
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## Usage Guidelines

Use the **monitor capture export** command only when the storage destination is a capture buffer. The file may be stored either remotely or locally. Use this command either during capture or after the packet capture has stopped. The packet capture is stopped when one or more end conditions have been met or you entered the **monitor capture stop** command.

When Wireshark is used on switches in a stack, packet captures can be stored only on the devices specified for *file-location* above that are connected to the active switch. Example: flash1 is connected to the active switch. flash2 is connected to the secondary switch. Only flash1 can be used to store packet captures.



**Note** Attempts to store packet captures on unsupported devices or devices not connected to the active switch will probably result in errors.

## Example

To export the capture buffer contents to mycap.pcap on a flash drive:

```
Device# monitor capture mycap export flash:mycap.pcap
```

**monitor capture file**

# monitor capture file

To configure monitor capture (Wireshark) storage file attributes, use the **monitor capture file** command in privileged EXEC mode. To remove a storage file attribute, use the **no** form of this command.

```
monitor capture {capture-name} file{ [ buffer-size temp-buffer-size ] [ location file-location : file-name ] [ ring number-of-ring-files ] [ size total-size ] }
no monitor capture {capture-name} file{ [ buffer-size ] [ location ] [ ring ] [ size ] }
```

## Syntax Description

<i>capture-name</i>	The name of the capture to be modified.
<b>buffer-size</b> <i>temp-buffer-size</i>	(Optional) Specifies the size of the temporary buffer. The range for <i>temp-buffer-size</i> is 1 to 100 MB. This is specified to reduce packet loss.
<b>location</b> <i>file-location : file-name</i>	(Optional) Specifies the location and file name of the capture storage file. Acceptable values for <i>file-location</i> :
	<ul style="list-style-type: none"> <li>• flash—On-board flash storage</li> <li>• (usbflash0:)—USB drive</li> </ul>
<b>ring</b> <i>number-of-ring-files</i>	(Optional) Specifies that the capture is to be stored in a circular file chain and the number of files in the file ring.
<b>size</b> <i>total-size</i>	(Optional) Specifies the total size of the capture files.

## Command Default

None

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.3SE	This command was introduced.

## Usage Guidelines

Use the **monitor capture file** command only when the storage destination is a file. The file may be stored either remotely or locally. Use this command after the packet capture has stopped. The packet capture is stopped when one or more end conditions have been met or you entered the **monitor capture stop** command.

When Wireshark is used on switches in a stack, packet captures can be stored only on the devices specified for *file-location* above that are connected to the active switch. Example: flash1 is connected to the active switch. flash2 is connected to the secondary switch. Only flash1 can be used to store packet captures.



**Note** Attempts to store packet captures on unsupported devices or devices not connected to the active switch will probably result in errors.

**Example**

To specify that the storage file name is mycap.pcap, stored on a flash drive:

```
Device# monitor capture mycap file location flash:mycap.pcap
```

**monitor capture limit**

# monitor capture limit

To configure capture limits, use the **monitor capture limit** command in privileged EXEC mode. To remove the capture limits, use the **no** form of this command.

```
monitor capture {capture-name} limit { [duration seconds] [packet-length size] [packets num] }
no monitor capture {capture-name} limit [duration] [packet-length] [packets]
```

<b>Syntax Description</b>	<p><b>capture-name</b>      The name of the capture to be assigned capture limits.</p> <p><b>duration seconds</b>    (Optional) Specifies the duration of the capture, in seconds. The range is from 1 to 1000000.</p> <p><b>packet-length size</b> (Optional) Specifies the packet length, in bytes. If the actual packet is longer than the specified length, only the first set of bytes whose number is denoted by the bytes argument is stored.</p> <p><b>packets num</b>        (Optional) Specifies the number of packets to be processed for capture.</p>				
<b>Command Default</b>	Capture limits are not configured.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.3SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.3SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.3SE	This command was introduced.				

## Example

To configure a session limit of 60 seconds and a packet segment length of 400 bytes:

```
Device# monitor capture mycap limit duration 60 packet-len 400
```

# monitor capture match



**Note** Do not use this command when capturing a CAPWAP tunnel. Also, when control plane and CAPWAP tunnels are mixed, this command will have no effect.

To define an explicit inline core filter for a monitor (Wireshark) capture, use the **monitor capture match** command in privileged EXEC mode. To remove this filter, use the **no** form of this command.

```
monitor capture {capture-name} match {any | mac mac-match-string | ipv4 {any | host | protocol} {any | host} | ipv6 {any | host | protocol} {any | host}}
no monitor capture {capture-name} match
```

## Syntax Description

<i>capture-name</i>	The name of the capture to be assigned a core filter.
<b>any</b>	Specifies all packets.
<b>mac</b> <i>mac-match-string</i>	Specifies a Layer 2 packet.
<b>ipv4</b>	Specifies IPv4 packets.
<b>host</b>	Specifies the host.
<b>protocol</b>	Specifies the protocol.
<b>ipv6</b>	Specifies IPv6 packets.

## Command Default

A core filter is not configured.

## Command Modes

Privileged EXEC

## Command History

	<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.3SE		This command was introduced.

## Examples

To define a capture point and the core filter for the capture point that matches to any IP version 4 packets on the source or destination:

```
Device# monitor capture mycap interface GigabitEthernet1/0/1 in
Device# monitor capture mycap match ipv4 any any
```

**monitor capture start**

# monitor capture start

To start the capture of packet data at a traffic trace point into a buffer, use the **monitor capture start** command in privileged EXEC mode.

**monitor capture {capture-name} start**

<b>Syntax Description</b>	<i>capture-name</i> The name of the capture to be started.	
<b>Command Default</b>	The buffer content is not cleared.	
<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.3SE	This command was introduced.

**Usage Guidelines** Use the **monitor capture clear** command to enable the packet data capture after the capture point is defined. To stop the capture of packet data, use the **monitor capture stop** command.  
Ensure that system resources such as CPU and memory are available before starting a capture.

## Example

To start capturing buffer contents:

```
Device# monitor capture mycap start
```

# monitor capture stop

To stop the capture of packet data at a traffic trace point, use the **monitor capture stop** command in privileged EXEC mode.

**monitor capture {capture-name} stop**

<b>Syntax Description</b>	<i>capture-name</i> The name of the capture to be stopped.				
<b>Command Default</b>	The packet data capture is ongoing.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table><thead><tr><th>Release</th><th>Modification</th></tr></thead><tbody><tr><td>Cisco IOS XE 3.3SE</td><td>This command was introduced.</td></tr></tbody></table>	Release	Modification	Cisco IOS XE 3.3SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.3SE	This command was introduced.				

**Usage Guidelines** Use the **monitor capture stop** command to stop the capture of packet data that you started using the **monitor capture start** command. You can configure two types of capture buffers: linear and circular. When the linear buffer is full, data capture stops automatically. When the circular buffer is full, data capture starts from the beginning and the data is overwritten.

## Example

To stop capturing buffer contents:

```
Device# monitor capture mycap stop
```

# monitor session

To create a new Ethernet Switched Port Analyzer (SPAN) or a Remote Switched Port Analyzer (RSPAN) or Encapsulated Remote Switched Port Analyzer (ERSPAN) session configuration for analyzing traffic between ports or add to an existing session configuration, use the **monitor session** global configuration command. To clear sessions, use the **no** form of this command.

```
monitor session session-number {destination | filter | source | type {erspan-destination | erspan-source} }  
no monitor session {session-number [destination | filter | source | type {erspan-destination | erspan-source}] | all | local | range session-range | remote}
```

<b>Syntax Description</b>	<i>session-number</i>	The session number identified with the session.						
	<b>all</b>	Clears all monitor sessions.						
	<b>local</b>	Clears all local monitor sessions.						
	<b>range</b> <i>session-range</i>	Clears monitor sessions in the specified range.						
	<b>remote</b>	Clears all remote monitor sessions.						
<b>Command Default</b>	No monitor sessions are configured.							
<b>Command Modes</b>	Global configuration							
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td></tr> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td> <td>The <b>type</b> {<b>erspan-destination</b>   <b>erspan-source</b>} keywords were introduced.</td></tr> </tbody> </table>		<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.	Cisco IOS XE Gibraltar 16.11.1	The <b>type</b> { <b>erspan-destination</b>   <b>erspan-source</b> } keywords were introduced.
<b>Release</b>	<b>Modification</b>							
Cisco IOS XE 3.2SE	This command was introduced.							
Cisco IOS XE Gibraltar 16.11.1	The <b>type</b> { <b>erspan-destination</b>   <b>erspan-source</b> } keywords were introduced.							

<b>Usage Guidelines</b>	You can set a combined maximum of two local SPAN sessions and RSPAN source sessions. You can have a total of 66 SPAN, RSPAN, and ERSPAN sessions on a switch or switch stack.  You can verify your settings by entering the <b>show monitor</b> privileged EXEC command. You can display SPAN, RSPAN, FSPAN, FRSPAN, and ERSPAN configuration on the switch by entering the <b>show running-config</b> privileged EXEC command. SPAN information appears near the end of the output.
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## Example

This example shows how to create a local SPAN session 1 to monitor traffic on Po13 (an EtherChannel port) and limit SPAN traffic in the session only to VLAN 1281. Egress traffic replicates the source; ingress forwarding is not enabled.

```
Device(config)# monitor session 1 source interface Po13
Device(config)# monitor session 1 filter vlan 1281
Device(config)# monitor session 1 destination interface GigabitEthernet2/0/36 encapsulation
```

```
replicate
Device(config)# monitor session 1 destination interface GigabitEthernet3/0/36 encapsulation
replicate
```

The following is the output of a **show monitor session all** command after completing these setup instructions:

```
Device# show monitor session all

Session 1
-----
Type : Local Session
Source Ports :
    Both : Po13
Destination Ports : Gi2/0/36,Gi3/0/36
    Encapsulation : Replicate
    Ingress : Disabled
Filter VLANs : 1281
...
...
```

**monitor session destination**

# monitor session destination

To start a new Switched Port Analyzer (SPAN) session or Remote SPAN (RSPAN) destination session, to enable ingress traffic on the destination port for a network security device (such as a Cisco IDS Sensor Appliance), and to add or delete interfaces or VLANs to or from an existing SPAN or RSPAN session, use the **monitor session destination** global configuration command. To remove the SPAN or RSPAN session or to remove destination interfaces from the SPAN or RSPAN session, use the **no** form of this command.

```
monitor session session-number destination {interface interface-id [, | -] [encapsulation
{replicate | dot1q} ] {ingress [dot1q | untagged] } | {remote} vlan vlan-id
no monitor session session-number destination {interface interface-id [, | -] [encapsulation
{replicate | dot1q} ] {ingress [dot1q | untagged] } | {remote} vlan vlan-id
```

Syntax Description		
	<i>session-number</i>	The session number identified with the SPAN
	<b>interface</b> <i>interface-id</i>	Specifies the destination or source interface for physical ports (including type, stack member, channel is also a valid interface type, and the
,		(Optional) Specifies a series of interfaces or VLANs from a previous range. Enter a space before a
-		(Optional) Specifies a range of interfaces or VLANs
<b>encapsulation</b> <b>replicate</b>		(Optional) Specifies that the destination interface. If not selected, the default is to send packets in their original VLAN ID; therefore, packets are always ignored with the <b>no</b> form of the command.
<b>encapsulation</b> <b>dot1q</b>		(Optional) Specifies that the destination interface uses IEEE 802.1Q encapsulation.
		These keywords are valid only for local SPAN sessions. These keywords are valid only for local SPAN sessions.
<b>ingress</b>		Enables ingress traffic forwarding.
<b>dot1q</b>		(Optional) Accepts incoming packets with IEEE 802.1Q encapsulation.
<b>untagged</b>		(Optional) Accepts incoming packets with untagged VLANs.
<b>isl</b>		Specifies ingress forwarding using ISL encapsulation.
<b>remote</b>		Specifies the remote VLAN for an RSPAN session. The RSPAN VLAN cannot be VLAN 1 (the default for Token Ring and FDDI VLANs).

<b>vlan <i>vlan-id</i></b>	Sets the default VLAN for ingress traffic				
<b>Command Default</b>	No monitor sessions are configured.				
	If <b>encapsulation replicate</b> is not specified on a local SPAN destination port, packets are sent in native form with no encapsulation tag.				
	Ingress forwarding is disabled on destination ports.				
	You can specify <b>all</b> , <b>local</b> , <b>range <i>session-range</i></b> , or <b>remote</b> with the <b>no monitor session</b> command to clear all SPAN and RSPAN, all local SPAN, a range, or all RSPAN sessions.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>You can set a combined maximum of 8 local SPAN sessions and RSPAN source sessions. You can have a total of 66 SPAN and RSPAN sessions on a switch or switch stack.</p> <p>A SPAN or RSPAN destination must be a physical port.</p> <p>You can have a maximum of 64 destination ports on a switch or a switch stack.</p> <p>Each session can include multiple ingress or egress source ports or VLANs, but you cannot combine source ports and source VLANs in a single session. Each session can include multiple destination ports.</p> <p>When you use VLAN-based SPAN (VSPAN) to analyze network traffic in a VLAN or set of VLANs, all active ports in the source VLANs become source ports for the SPAN or RSPAN session. Trunk ports are included as source ports for VSPAN, and only packets with the monitored VLAN ID are sent to the destination port.</p> <p>You can monitor traffic on a single port or VLAN or on a series or range of ports or VLANs. You select a series or range of interfaces or VLANs by using the <b>[</b>, <b>  -</b>] options.</p> <p>If you specify a series of VLANs or interfaces, you must enter a space before and after the comma. If you specify a range of VLANs or interfaces, you must enter a space before and after the hyphen (-).</p> <p>EtherChannel ports can be configured as SPAN or RSPAN destination ports. A physical port that is a member of an EtherChannel group can be used as a destination port, but it cannot participate in the EtherChannel group while it is as a SPAN destination.</p> <p>A port used as a destination port cannot be a SPAN or RSPAN source, nor can a port be a destination port for more than one session at a time.</p> <p>You can enable IEEE 802.1x authentication on a port that is a SPAN or RSPAN destination port; however, IEEE 802.1x authentication is disabled until the port is removed as a SPAN destination. If IEEE 802.1x authentication is not available on the port, the switch returns an error message. You can enable IEEE 802.1x authentication on a SPAN or RSPAN source port.</p> <p>If ingress traffic forwarding is enabled for a network security device, the destination port forwards traffic at Layer 2.</p> <p>Destination ports can be configured to function in these ways:</p>				

**monitor session destination**

- When you enter **monitor session session\_number destination interface interface-id** with no other keywords, egress encapsulation is untagged, and ingress forwarding is not enabled.
- When you enter **monitor session session\_number destination interface interface-id ingress**, egress encapsulation is untagged; ingress encapsulation depends on the keywords that follow—**dot1q** or **untagged**.
- When you enter **monitor session session\_number destination interface interface-id encapsulation replicate** with no other keywords, egress encapsulation replicates the source interface encapsulation; ingress forwarding is not enabled. (This applies to local SPAN only; RSPAN does not support encapsulation replication.)
- When you enter **monitor session session\_number destination interface interface-id encapsulation replicate ingress**, egress encapsulation replicates the source interface encapsulation; ingress encapsulation depends on the keywords that follow—**dot1q** or **untagged**. (This applies to local SPAN only; RSPAN does not support encapsulation replication.)

You can verify your settings by entering the **show monitor** privileged EXEC command. You can display SPAN, RSPAN, FSPAN, and FRSPAN configuration on the switch by entering the **show running-config** privileged EXEC command. SPAN information appears near the end of the output.

### Examples

This example shows how to create a local SPAN session 1 to monitor both sent and received traffic on source port 1 on stack member 1 to destination port 2 on stack member 2:

```
Device(config)# monitor session 1 source interface gigabitethernet1/0/1 both
Device(config)# monitor session 1 destination interface gigabitethernet1/0/2
```

This example shows how to delete a destination port from an existing local SPAN session:

```
Device(config)# no monitor session 2 destination interface gigabitethernet1/0/2
```

This example shows how to configure RSPAN source session 1 to monitor a source interface and to configure the destination RSPAN VLAN 900:

```
Device(config)# monitor session 1 source interface gigabitethernet1/0/1
Device(config)# monitor session 1 destination remote vlan 900
Device(config)# end
```

This example shows how to configure an RSPAN destination session 10 in the switch receiving the monitored traffic:

```
Device(config)# monitor session 10 source remote vlan 900
Device(config)# monitor session 10 destination interface gigabitethernet1/0/2
```

This example shows how to configure the destination port for ingress traffic on VLAN 5 by using a security device that supports IEEE 802.1Q encapsulation. Egress traffic replicates the source; ingress traffic uses IEEE 802.1Q encapsulation.

```
Device(config)# monitor session 2 destination interface gigabitethernet1/0/2 encapsulation
```

```
dot1q ingress dot1q vlan 5
```

This example shows how to configure the destination port for ingress traffic on VLAN 5 by using a security device that does not support encapsulation. Egress traffic and ingress traffic are untagged.

```
Device(config)# monitor session 2 destination interface gigabitethernet1/0/2 ingress untagged  
vlan 5
```

# monitor session filter

To start a new flow-based SPAN (FSPAN) session or flow-based RSPAN (FRSPAN) source or destination session, or to limit (filter) SPAN source traffic to specific VLANs, use the **monitor session filter** global configuration command. To remove filters from the SPAN or RSPAN session, use the **no** form of this command.

```
monitor session session-number filter {vlan vlan-id [, | -] }
no monitor session session-number filter {vlan vlan-id [, | -] }
```

<b>Syntax Description</b>	<p><i>session-number</i></p> <p><b>vlan</b> <i>vlan-id</i></p> <p>,</p> <p>-</p>	<p>The session number identified with the SPAN or RSPAN session.</p> <p>Specifies a list of VLANs as filters on trunk source ports to limit VLANs. The <i>vlan-id</i> range is 1 to 4094.</p> <p>(Optional) Specifies a series of VLANs, or separates a range of VLANs. Enter a space before and after the comma.</p> <p>(Optional) Specifies a range of VLANs. Enter a space before and after the hyphen (-).</p>
<b>Command Default</b>	No monitor sessions are configured.	
<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
<b>Usage Guidelines</b>	<p>You can set a combined maximum of two local SPAN sessions and RSPAN source sessions. You can have a total of 66 SPAN and RSPAN sessions on a switch or switch stack.</p> <p>You can monitor traffic on a single VLAN or on a series or range of ports or VLANs. You select a series or range of VLANs by using the [,   -] options.</p> <p>If you specify a series of VLANs, you must enter a space before and after the comma. If you specify a range of VLANs, you must enter a space before and after the hyphen (-).</p> <p>VLAN filtering refers to analyzing network traffic on a selected set of VLANs on trunk source ports. By default, all VLANs are monitored on trunk source ports. You can use the <b>monitor session session_number filter vlan</b> <i>vlan-id</i> command to limit SPAN traffic on trunk source ports to only the specified VLANs.</p> <p>VLAN monitoring and VLAN filtering are mutually exclusive. If a VLAN is a source, VLAN filtering cannot be enabled. If VLAN filtering is configured, a VLAN cannot become a source.</p> <p>You can verify your settings by entering the <b>show monitor</b> privileged EXEC command. You can display SPAN, RSPAN, FSPAN, and FRSPAN configuration on the switch by entering the <b>show running-config</b> privileged EXEC command. SPAN information appears near the end of the output.</p>	

## Examples

This example shows how to limit SPAN traffic in an existing session only to specific VLANs:

```
Switch(config)# monitor session 1 filter vlan 100 - 110
```

This example shows how to create a local SPAN session 1 to monitor both sent and received traffic on source port 1 on stack member 1 to destination port 2 on stack member 2 and to filter IPv4 traffic using access list number 122 in an FSPAN session:

```
Switch(config)# monitor session 1 source interface gigabitethernet1/0/1 both
Switch(config)# monitor session 1 destination interface gigabitethernet1/0/2
Switch(config)# monitor session 1 filter ip access-group 122
```

**monitor session source**

# monitor session source

To start a new Switched Port Analyzer (SPAN) session or Remote SPAN (RSPAN) source session, or to add or delete interfaces or VLANs to or from an existing SPAN or RSPAN session, use the **monitor session source** global configuration command. To remove the SPAN or RSPAN session or to remove source interfaces from the SPAN or RSPAN session, use the **no** form of this command.

```
monitor session session_number source {interface interface-id [, | -] [both | rx | tx] | [remote] vlan vlan-id [, | -] [both | rx | tx] }  
no monitor session session_number source {interface interface-id [, | -] [both | rx | tx] | [remote] vlan vlan-id [, | -] [both | rx | tx] }
```

---

<b>Syntax Description</b>	<p><b>session_number</b>      The session number identified with the SPAN or RSPAN session. The range is 1 to 66.</p> <p><b>interface interface-id</b>      Specifies the source interface for a SPAN or RSPAN session. Valid interfaces are physical ports (including type, stack member, module, and port number). For source interface, port channel is also a valid interface type, and the valid range is 1 to 48.</p> <p><b>,</b>      (Optional) Specifies a series of interfaces or VLANs, or separates a range of interfaces or VLANs from a previous range. Enter a space before and after the comma.</p> <p><b>-</b>      (Optional) Specifies a range of interfaces or VLANs. Enter a space before and after the hyphen.</p> <p><b>both   rx   tx</b>      (Optional) Specifies the traffic direction to monitor. If you do not specify a traffic direction, the source interface sends both transmitted and received traffic.</p> <p><b>remote</b>      (Optional) Specifies the remote VLAN for an RSPAN source or destination session. The range is 2 to 1001 and 1006 to 4094. The RSPAN VLAN cannot be VLAN 1 (the default VLAN) or VLAN IDs 1002 to 1005 (reserved for Token Ring and FDDI VLANs).</p> <p><b>vlan vlan-id</b>      When used with only the <b>ingress</b> keyword, sets default VLAN for ingress traffic.</p>				
<b>Command Default</b>	No monitor sessions are configured.				
	On a source interface, the default is to monitor both received and transmitted traffic.				
	On a trunk interface used as a source port, all VLANs are monitored.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

---

**Usage Guidelines**

Traffic that enters or leaves source ports or source VLANs can be monitored by using SPAN or RSPAN. Traffic routed to source ports or source VLANs cannot be monitored.

You can set a combined maximum of two local SPAN sessions and RSPAN source sessions. You can have a total of 66 SPAN and RSPAN sessions on a switch or switch stack.

A source can be a physical port, a port channel, or a VLAN.

Each session can include multiple ingress or egress source ports or VLANs, but you cannot combine source ports and source VLANs in a single session. Each session can include multiple destination ports.

When you use VLAN-based SPAN (VSPAN) to analyze network traffic in a VLAN or set of VLANs, all active ports in the source VLANs become source ports for the SPAN or RSPAN session. Trunk ports are included as source ports for VSPAN, and only packets with the monitored VLAN ID are sent to the destination port.

You can monitor traffic on a single port or VLAN or on a series or range of ports or VLANs. You select a series or range of interfaces or VLANs by using the [, | -] options.

If you specify a series of VLANs or interfaces, you must enter a space before and after the comma. If you specify a range of VLANs or interfaces, you must enter a space before and after the hyphen (-).

You can monitor individual ports while they participate in an EtherChannel, or you can monitor the entire EtherChannel bundle by specifying the **port-channel** number as the RSPAN source interface.

A port used as a destination port cannot be a SPAN or RSPAN source, nor can a port be a destination port for more than one session at a time.

You can enable IEEE 802.1x authentication on a SPAN or RSPAN source port.

You can verify your settings by entering the **show monitor** privileged EXEC command. You can display SPAN, RSPAN, FSPAN, and FRSPAN configuration on the switch by entering the **show running-config** privileged EXEC command. SPAN information appears near the end of the output.

**Examples**

This example shows how to create a local SPAN session 1 to monitor both sent and received traffic on source port 1 on stack member 1 to destination port 2 on stack member 2:

```
Switch(config)# monitor session 1 source interface gigabitethernet1/0/1 both
Switch(config)# monitor session 1 destination interface gigabitethernet1/0/2
```

This example shows how to configure RSPAN source session 1 to monitor multiple source interfaces and to configure the destination RSPAN VLAN 900.

```
Switch(config)# monitor session 1 source interface gigabitethernet1/0/1
Switch(config)# monitor session 1 source interface port-channel 2 tx
Switch(config)# monitor session 1 destination remote vlan 900
Switch(config)# end
```

**monitor session type**

# monitor session type

To configure a local Encapsulated Remote Switched Port Analyzer (ERSPAN) session, use the **monitor session type** command in global configuration mode. To remove the ERSPAN configuration, use the **no** form of this command.

```
monitor session span-session-number type {erspan-destination | erspan-source}
no monitor session span-session-number type {erspan-destination | erspan-source}
```

<b>Syntax Description</b>	<i>span-session-number</i> Number of the local ERSPAN session. Valid values are from 1 to 66.						
<b>Command Default</b>	ERSPAN source or destination session is not configured.						
<b>Command Modes</b>	Global configuration (config)						
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.1</td><td>This command was introduced.</td></tr> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td><td>The <b>erspan-destination</b> keyword was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.1	This command was introduced.	Cisco IOS XE Gibraltar 16.11.1	The <b>erspan-destination</b> keyword was introduced.
<b>Release</b>	<b>Modification</b>						
Cisco IOS XE Denali 16.3.1	This command was introduced.						
Cisco IOS XE Gibraltar 16.11.1	The <b>erspan-destination</b> keyword was introduced.						

**Usage Guidelines** The *span-session-number* and the session type cannot be changed once configured. Use the **no** form of this command to remove the session and then re-create the session with a new session ID or a new session type.

The ERSPAN source session destination IP address, which must be configured on an interface on the destination switch, is the source of traffic that an ERSPAN destination session sends to the destination ports. You can configure the same address in both the source and destination sessions with the **ip address** command in ERSPAN monitor destination session configuration mode.

The ERSPAN ID differentiates the ERSPAN traffic arriving at the same destination IP address from different ERSPAN source sessions.

The maximum local ERSPAN source session limit is 8.

## Examples

The following example shows how to configure an ERSPAN source session number:

```
Device(config)# monitor session 55 type erspan-source
Device(config-mon-erspan-src) #
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>monitor session type</b>	Creates an ERSPAN source or destination session number or enters the ERSPAN session configuration mode for the session.
	<b>show capability feature monitor</b>	Displays information about monitor features.
	<b>show monitor session</b>	Displays information about the ERSPAN, SPAN, and RSPAN sessions.

# mtu (ERSPAN)

To configure the maximum transmission unit (MTU) size for ERSPAN truncation, use the **mtu** command in ERSPAN monitor destination session configuration mode. To restore the MTU value to its original default value, use the **no** form of this command.

**mtu** *bytes*  
**no** **mtu**

<b>Syntax Description</b>	<b>bytes</b> MTU size, in bytes. The default value of MTU is 9000 bytes.
---------------------------	--

<b>Command Modes</b>	ERSPAN monitor destination session configuration mode (config-mon-erspan-src-dst)
----------------------	---

## Command History

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

## Examples

The following example shows how to specify an MTU of 1000 bytes:

```
Device(config)# monitor session 2 type erspan-source
Device(config-mon-erspan-src)# destination
Device(config-mon-erspan-src-dst)# mtu 1000
```

## Related Commands

<b>Command</b>	<b>Description</b>
<b>destination</b>	Configures an ERSPAN destination session and specifies destination properties.
<b>monitor session type</b>	Configures a local ERSPAN source or destination session.

# origin

To configure the IP address used as the source of the Encapsulated Remote Switched Port Analyzer (ERSPAN) traffic, use the **origin** command in ERSPAN monitor destination session configuration mode. To remove the configuration, use the **no** form of this command.

```
origin ip-address
no origin ip-address
```

<b>Syntax Description</b>	<i>ip-address</i> Specifies the ERSPAN source session destination IP address.				
<b>Command Default</b>	Source IP address is not configured.				
<b>Command Modes</b>	ERSPAN monitor destination session configuration mode (config-mon-erspan-src-dst)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.1</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.3.1	This command was introduced.
Release	Modification				
Cisco IOS XE Denali 16.3.1	This command was introduced.				
<b>Usage Guidelines</b>	ERSPAN source session on a switch can use different source IP addresses using the <b>origin</b> command.				
<b>Examples</b>	The following example shows how to configure an IP address for an ERSPAN source session:				
	<pre>Switch(config)# monitor session 2 type erspan-source Switch(config-mon-erspan-src)# destination Switch(config-mon-erspan-src-dst)# origin ip-address 203.0.113.2</pre>				
	The following sample output from the <b>show monitor session all</b> command displays ERSPAN source sessions with different source IP addresses:				
	<pre>Session 3 ----- Type : ERSPAN Source Session Status : Admin Enabled Source Ports : Both : Gi1/0/13 Destination IP Address : 10.10.10.10 Origin IP Address : 10.10.10.10  Session 4 ----- Type : ERSPAN Source Session Status : Admin Enabled Destination IP Address : 192.0.2.1 Origin IP Address : 203.0.113.2</pre>				

Related Commands	Command	Description
	<b>destination</b>	Configures an ERSPAN destination session and specifies destination properties.
	<b>monitor session type erspan-source</b>	Configures a local ERSPAN source session.

**retry count**

# retry count

To set the number of retries to transfer a file, if the file transfer is not successful, use the **retry count** command in auto-deploy configuration mode. To remove the configuration, use the **no** form of this command.

```
retry count retry-count interval interval-duration
no retry count retry-count interval interval-duration
```

<b>Syntax Description</b>	<i>retry-count</i>	Number of retries to transfer a file, if file transfer is not successful. Valid values are from 1 to 3.				
	<b>interval</b> <i>interval-duration</i>	Specifies the interval between retries. Valid values are from 2 to 4 minutes.				
<b>Command Default</b>	The default is zero.					
<b>Command Modes</b>	Auto-deploy configuration (config-auto-deploy)					
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.6.1</td><td>This command was introduced.</td></tr> </tbody> </table>		<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.6.1	This command was introduced.
<b>Release</b>	<b>Modification</b>					
Cisco IOS XE Everest 16.6.1	This command was introduced.					

## Example

The following example shows how to set the retry count for files that are not transferred successfully:

```
Device(config)# event manager auto-deploy name deploy1
Device(config-auto-deploy)# retry count 3 interval 3
```

Related Commands	Command	Description
	<b>event-manager auto-deploy</b>	Configures an EEM auto-deployment profile.

# schedule start-in

To schedule the provisioning of policies, use the **schedule start-in** command in auto-deploy configuration mode. To remove the scheduling, use the **no** form of this command.

```
schedule start-in hours hours minutes minutes {oneshot | recurring {days days | hours hours}}
no schedule start-in hours hours minutes minutes {oneshot | recurring {days days | hours hours}}
```

Syntax Description						
	<b>hours hours</b>	Specifies the time in hours, when the policy provisioning should start. Valid values are from 0 to 23.				
	<b>minutes minutes</b>	Specifies the time in minutes, when the policy provisioning should start. Valid values are from 0 to 59.				
	<b>oneshot</b>	Schedules the policy provisioning to be done only once.				
	<b>recurring</b>	Schedules the policy provisioning repeatedly.				
	<b>days days</b>	Specifies the time in days, when the policy provisioning should repeat. Valid values are from 1 to 30.				
	<b>hours hours</b>	Specifies the time in hours, when the policy provisioning should repeat. Valid values are from 12 to 168.				
<b>Command Default</b>	Scheduling of policy provisioning is not enabled.					
<b>Command Modes</b>	Auto-deploy configuration (config-auto-deploy)					
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.6.1</td><td>This command was introduced.</td></tr> </tbody> </table>		Release	Modification	Cisco IOS XE Everest 16.6.1	This command was introduced.
Release	Modification					
Cisco IOS XE Everest 16.6.1	This command was introduced.					

## Usage Guidelines

### Example

The following example shows how to schedule policy provisioning to be done only once:

```
Device(config)# event manager auto-deploy name deploy1
Device(config-auto-deploy)# schedule start-in hours 2 minutes 30 oneshot
```

The following example shows how to schedule a recurring policy provisioning:

```
Device(config)# event manager auto-deploy name deploy1
Device(config-auto-deploy)# schedule start-in hours 2 minutes 30 recurring days 2
```

schedule start-in

**Related Commands**

Command	Description
<b>event-manager auto-deploy</b>	Configures an EEM auto-deployment profile.

# show capability feature monitor

To display information about monitor features, use the **show capability feature monitor** command in privileged EXEC mode.

**show capability feature monitor {erspan-destination | erspan-source}**

<b>Syntax Description</b>	<b>erspan-destination</b> Displays information about the configured Encapsulated Remote Switched Port Analyzer (ERSPAN) source sessions.  <b>erspan-source</b> Displays all the configured global built-in templates.
---------------------------	---

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

<b>Examples</b>	The following is sample output from the <b>show capability feature monitor erspan-source</b> command:
-----------------	---

```
Switch# show capability feature monitor erspan-source

ERSPAN Source Session Supported: true
No of Rx ERSPAN source session: 8
No of Tx ERSPAN source session: 8
ERSPAN Header Type supported: II
ACL filter Supported: true
Fragmentation Supported: true
Truncation Supported: false
Sequence number Supported: false
QOS Supported: true
```

The following is sample output from the **show capability feature monitor erspan-destination** command:

```
Switch# show capability feature monitor erspan-destination

ERSPAN Destination Session Supported: false
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>monitor session type erspan-source</b>	Creates an ERSPAN source session number or enters the ERSPAN session configuration mode for the session.

show class-map type control subscriber

# show class-map type control subscriber

To display class map statistics for the configured control policies, use the **show class-map type control subscriber** command in privileged EXEC mode.

**show class-map type control subscriber {all | name *control-class-name*}**

<b>Syntax Description</b>	<b>all</b> <b>name <i>control-class-name</i></b>	Displays class map statistics for all control policies. Displays class map statistics for the specified control policy.
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Everest 16.6.1	<b>Modification</b> This command was introduced.

## Examples

The following is a sample output of the **show class-map type control subscriber name *control-class-name*** command:

```
Device# show class-map type control subscriber name platform

Class-map                                Action                               Exec  Hit   Miss  Comp
-----                                -----                               ----  ---  ----  ----
match-all platform           match platform-type C9xxx      0     0     0     0
Key:
  "Exec" - The number of times this line was executed
  "Hit"  - The number of times this line evaluated to TRUE
  "Miss" - The number of times this line evaluated to FALSE
  "Comp" - The number of times this line completed the execution of its
            condition without a need to continue on to the end
```

# show event manager auto-deploy summary

To display a summary of the auto-deployment profile information, use the **show event manager auto-deploy summary** command in privileged EXEC mode.

**show event manager auto-deploy summary**

This command has no arguments or keywords.

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.6.1	This command was modified.

## Usage Guidelines

### Example

The following is sample output from the **show event manager auto-deploy summary** command:

```
Device# show event manager auto-deploy summary
EEM Auto-Deploy Profile details:

  Profile Name   : test
  Status         : Enabled
  Running        : Yes
  Status Syslog  : No
  Schedule       : start in 0 hours 5 mins oneshot
  Window         : 5
  Manifest URL  : tftp://10.106.16.20/folder1/123.xml
  Log URL        : tftp://10.106.16.20/folder1/EEM
```

The table below lists the significant fields shown in the display.

**Table 37: show event manager auto-deploy summary Field Descriptions**

<b>Field</b>	<b>Description</b>
Profile Name	Name specified for the profile.
Status	Status of the profile provisioning; whether enabled or disabled.
Running	The enabled profile is running or not.
Schedule	Policy provisioning schedule
Window	Window duration added to the policy provisioning time. Policy provisioning will happen at a random time, between the policy provisioning time and the configured window duration in minutes.
Manifest URL	Location of the manifest file.

```
show event manager auto-deploy summary
```

Field	Description
Log URL	Location where the debug logs are stored.

**Related Commands**

Command	Description
<b>event-manager auto-deploy</b>	Configures an EEM auto-deployment profile.

# show ip sla statistics

To display current or aggregated operational status and statistics of all Cisco IOS IP Service Level Agreement (SLA) operations or a specified operation, use the **show ip sla statistics** command in user EXEC or privileged EXEC mode.

```
show ip sla statistics [operation-number [details] | aggregated [operation-number | details] | details]
```

<b>Syntax Description</b>	<i>operation-number</i> (Optional) Number of the operation for which operational status and statistics are displayed. Accepted values are from 1 to 2147483647. <i>details</i> (Optional) Specifies detailed output. <i>aggregated</i> (Optional) Specifies the IP SLA aggregated statistics.
---------------------------	---

**Command Default** Displays output for all running IP SLA operations.

**Command Modes** User EXEC

Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Use the **show ip sla statistics** to display the current state of IP SLA operations, including how much life the operation has left, whether the operation is active, and the completion time. The output also includes the monitoring data returned for the last (most recently completed) operation. This generated operation ID is displayed when you use the **show ip sla** configuration command for the base multicast operation, and as part of the summary statistics for the entire operation.

Enter the **show** command for a specific operation ID to display details for that one responder.

## Examples

The following is sample output from the **show ip sla statistics** command:

```
Device# show ip sla statistics

Current Operational State
Entry Number: 3
Modification Time: *22:15:43.000 UTC Sun Feb 11 2001
Diagnostics Text:
Last Time this Entry was Reset: Never
Number of Octets in use by this Entry: 1332
Number of Operations Attempted: 2
Current Seconds Left in Life: 3511
Operational State of Entry: active
Latest Completion Time (milliseconds): 544
Latest Operation Start Time: *22:16:43.000 UTC Sun Feb 11 2001
Latest Oper Sense: ok
Latest Sense Description: 200 OK
```

```
show ip sla statistics
```

```
Total RTT: 544
DNS RTT: 12
TCP Connection RTT: 28
HTTP Transaction RTT: 504
HTTP Message Size: 9707
```

# show monitor

To display information about all Switched Port Analyzer (SPAN) and Remote SPAN (RSPAN) sessions, use the **show monitor** command in EXEC mode.

```
show monitor [session {session_number | all | local | range list | remote} [detail]]
```

<b>Syntax Description</b>	<b>session</b> (Optional) Displays information about specified SPAN sessions. <b>session_number</b> The session number identified with the SPAN or RSPAN session. The range is 1 to 66. <b>all</b> (Optional) Displays all SPAN sessions. <b>local</b> (Optional) Displays only local SPAN sessions. <b>range list</b> (Optional) Displays a range of SPAN sessions, where <i>list</i> is the range of valid sessions. The range is either a single session or a range of sessions described by two numbers, the lower one first, separated by a hyphen. Do not enter any spaces between comma-separated parameters or in hyphen-specified ranges. <b>Note</b> This keyword is available only in privileged EXEC mode.
<b>remote</b>	(Optional) Displays only remote SPAN sessions.
<b>detail</b>	(Optional) Displays detailed information about the specified sessions.

**Command Modes** User EXEC

Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The output is the same for the **show monitor** command and the **show monitor session all** command.

Maximum number of SPAN source sessions: 2 (applies to source and local sessions)

## Examples

This is an example of output for the **show monitor** user EXEC command:

```
Device# show monitor
Session 1
```

**show monitor**

```
-----
Type : Local Session
Source Ports :
RX Only : Gi4/0/1
Both : Gi4/0/2-3,Gi4/0/5-6
Destination Ports : Gi4/0/20
Encapsulation : Replicate
Ingress : Disabled
Session 2
-----
Type : Remote Source Session
Source VLANs :
TX Only : 10
Both : 1-9
Dest RSPAN VLAN : 105
```

This is an example of output for the **show monitor** user EXEC command for local SPAN source session 1:

```
Device# show monitor session 1
Session 1
-----
Type : Local Session
Source Ports :
RX Only : Gi4/0/1
Both : Gi4/0/2-3,Gi4/0/5-6
Destination Ports : Gi4/0/20
Encapsulation : Replicate
Ingress : Disabled
```

This is an example of output for the **show monitor session all** user EXEC command when ingress traffic forwarding is enabled:

```
Device# show monitor session all
Session 1
-----
Type : Local Session
Source Ports :
Both : Gi4/0/2
Destination Ports : Gi4/0/3
Encapsulation : Native
Ingress : Enabled, default VLAN = 5
Ingress encaps : DOT1Q
Session 2
-----
Type : Local Session
Source Ports :
Both : Gi4/0/8
Destination Ports : Gi4/0/12
Encapsulation : Replicate
Ingress : Enabled, default VLAN = 4
Ingress encaps : Untagged
```

# show monitor capture

To display monitor capture (Wireshark) content, use the **show monitor capture file** command in privileged EXEC mode.

```
show monitor capture [capture-name [ buffer ] | file file-location : file-name ] [ brief | detailed | display-filter display-filter-string ]
```

Syntax Description					
<b>capture-name</b>	(Optional) Specifies the name of the capture to be displayed.				
<b>buffer</b>	(Optional) Specifies that a buffer associated with the named capture is to be displayed.				
<b>file</b> file-location : file-name	(Optional) Specifies the file location and name of the capture storage file to be displayed.				
<b>brief</b>	(Optional) Specifies the display content in brief.				
<b>detailed</b>	(Optional) Specifies detailed display content.				
<b>display-filter</b> display-filter-string	Filters the display content according to the <i>display-filter-string</i> .				
<b>Command Default</b>	Displays all capture content.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.3SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.3SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.3SE	This command was introduced.				
<b>Usage Guidelines</b>	none				

## Example

To display the capture for a capture called mycap:

```
Device# show monitor capture mycap

Status Information for Capture mycap
  Target Type:
  Interface: CAPWAP,
    Ingress:
    0
    Egress:
    0
    Status : Active
    Filter Details:
      Capture all packets
    Buffer Details:
      Buffer Type: LINEAR (default)
    File Details:
      Associated file name: flash:mycap.pcap
      Size of buffer(in MB): 1
```

```
show monitor capture
```

```
Limit Details:  
Number of Packets to capture: 0 (no limit)  
Packet Capture duration: 0 (no limit)  
Packet Size to capture: 0 (no limit)  
Packets per second: 0 (no limit)  
Packet sampling rate: 0 (no sampling)
```

# show monitor session

To display information about Switched Port Analyzer (SPAN), Remote SPAN (RSPAN), and Encapsulated Remote Switched Port Analyzer (ERSPAN) sessions, use the **show monitor session** command in EXEC mode.

```
show monitor session {session_number | all | erspan-destination | erspan-source | local | range list | remote} [detail]
```

Syntax Description		
<i>session_number</i>		The session number identified with this command.
<b>all</b>		Displays all SPAN sessions.
<b>erspan-source</b>		Displays only source ERSPAN sessions.
<b>erspan-destination</b>		Displays only destination ERSPAN sessions.
<b>local</b>		Displays only local SPAN sessions.
<b>range list</b>		Displays a range of SPAN sessions or of sessions described by two numbers separated by commas.
<b>remote</b>		Displays only remote SPAN sessions.
<b>detail</b>		(Optional) Displays detailed information about the session.

Command Modes	User EXEC (>)
	Privileged EXEC(#)

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.
	Cisco IOS XE Gibraltar 16.11.1	The <b>erspan-destination</b> command was introduced.

Usage Guidelines	The maximum local ERSPAN source session limit is 8.
------------------	---

## Examples

The following is sample output from the **show monitor session** command for local SPAN source session 1:

```
Device# show monitor session 1
Session 1
-----
Type : Local Session
Source Ports :
```

**show monitor session**

```
RX Only : Gi4/0/1
Both : Gi4/0/2-3,Gi4/0/5-6
Destination Ports : Gi4/0/20
Encapsulation : Replicate
Ingress : Disabled
```

The following is sample output from the **show monitor session all** command when ingress traffic forwarding is enabled:

```
Device# show monitor session all
Session 1
-----
Type : Local Session
Source Ports :
Both : Gi4/0/2
Destination Ports : Gi4/0/3
Encapsulation : Native
Ingress : Enabled, default VLAN = 5
Ingress encap : DOT1Q
Session 2
-----
Type : Local Session
Source Ports :
Both : Gi4/0/8
Destination Ports : Gi4/0/12
Encapsulation : Replicate
Ingress : Enabled, default VLAN = 4
Ingress encap : Untagged
```

The following is sample output from the **show monitor session erspan-source** command:

```
Device# show monitor session erspan-source
Type : ERSPAN Source Session
Status : Admin Enabled
Source Ports :
RX Only : Gi1/4/33
Destination IP Address : 20.20.163.20
Destination ERSPAN ID : 110
Origin IP Address : 10.10.10.216
IPv6 Flow Label : None
```

The following is sample output from the **show monitor session erspan-destination** command:

```
Device# show monitor session erspan-destination
```

Type	:	ERSPAN Destination Session
Status	:	Admin Enabled
Source IP Address	:	10.10.10.210
Source ERSPAN ID	:	40

# show parameter-map type subscriber attribute-to-service

To display parameter map statistics, use the **show parameter-map type subscriber attribute-to-service** command in privileged EXEC mode.

**show parameter-map type subscriber attribute-to-service {all | name *parameter-map-name*}**

Syntax Description	<b>all</b>	Displays statistics for all parameter maps.
	<b>name <i>parameter-map-name</i></b>	Displays statistics for the specified parameter map.
Command Modes	Privileged EXEC (#)	
Command History	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.6.1	This command was introduced.

## Examples

The following is a sample output of the **show parameter-map type subscriber attribute-to-service name *parameter-map-name*** command:

```
Device# show parameter-map type subscriber attribute-to-service name platform

Parameter-map name: platform
Map: 10 platform-type regex "C9xxx"
Action(s):
    10 interface-template critical
```

**show platform software fed switch ip wccp**

## show platform software fed switch ip wccp

To display platform-dependent Web Cache Communication Protocol (WCCP) information, use the **show platform software fed switch ip wccp** privileged EXEC command.

```
show platform software fed switch{switch-number|active|standby}ip
wccp{cache-engines | interfaces | service-groups}
```

---

### Syntax Description

**switch{switch\_num|active|standby}** The device for which you want to display information.

- **switch\_num**—Enter the switch ID. Displays information for the specified switch.
- **active**—Displays information for the active switch.
- **standby**—Displays information for the standby switch, if available.

---

<b>cache-engines</b>	Displays WCCP cache engines.
----------------------	------------------------------

<b>interfaces</b>	Displays WCCP interfaces.
-------------------	---------------------------

<b>service-groups</b>	Displays WCCP service groups.
-----------------------	-------------------------------

---



---

### Command Modes

Privileged EXEC

---

### Command History

<b>Release</b>	<b>Modification</b>
----------------	---------------------

Cisco IOS XE Everest 16.5.1a	This command was introduced.
------------------------------	------------------------------

---



---

### Usage Guidelines

Use this command only when you are working directly with a technical support representative while troubleshooting a problem. Do not use this command unless a technical support representative asks you to do so.

This command is available only if your device is running the IP Services feature set.

The following example displays WCCP interfaces:

```
Device# show platform software fed switch 1 ip wccp interfaces
WCCP Interface Info
=====
***** WCCP Interface: Port-channel13 iif_id: 000000000000007c (#SG:3), VRF: 0 Ingress WCCP
*****
port_handle:0x20000f9

List of Service Groups on this interface:
* Service group id:90 vrf_id:0 (ref count:24)
  type: Dynamic      Open service      prot: PROT_TCP      14_type: Dest ports      priority: 35
  Promiscuous mode (no ports).
```

```
* Service group id:70 vrf_id:0 (ref count:24)
type: Dynamic      Open service      prot: PROT_TCP      14_type: Dest ports      priority: 35
Promiscuous mode (no ports).

* Service group id:60 vrf_id:0 (ref count:24)
type: Dynamic      Open service      prot: PROT_TCP      14_type: Dest ports      priority: 35
Promiscuous mode (no ports).

**** WCCP Interface: Port-channel14 iif_id: 0000000000000007e (#SG:3), VRF: 0 Ingress WCCP
*****
port_handle:0x880000fa

List of Service Groups on this interface:
* Service group id:90 vrf_id:0 (ref count:24)
type: Dynamic      Open service      prot: PROT_TCP      14_type: Dest ports      priority: 35
Promiscuous mode (no ports).

* Service group id:70 vrf_id:0 (ref count:24)
type: Dynamic      Open service      prot: PROT_TCP      14_type: Dest ports      priority: 35
Promiscuous mode (no ports).
<output truncated>
```

**show platform software swspan**

# show platform software swspan

To display switched port analyzer (SPAN) information, use the **show platform software swspan** command in privileged EXEC mode.

```
show platform software swspan {switch} {{F0 | FP active} counters} | R0 | RP active} {destination sess-id session-ID | source sess-id session-ID}
```

<b>Syntax Description</b>	
<b>switch</b>	Displays information about the switch.
<b>F0</b>	Displays information about the Embedded Service Processor (ESP) slot 0.
<b>FP</b>	Displays information about the ESP.
<b>active</b>	Displays information about the active instance of the ESP or the Route Processor (RP).
<b>counters</b>	Displays the SWSPAN message counters.
<b>R0</b>	Displays information about the RP slot 0.
<b>RP</b>	Displays information the RP.
<b>destination sess-id session-ID</b>	Displays information about the specified destination session.
<b>source sess-id session-ID</b>	Displays information about the specified source session.

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced in a release prior to Cisco IOS XE Denali 16.1.1.

<b>Usage Guidelines</b>	If the session number does not exist or if the SPAN session is a remote destination session, the command output will display the following message "% Error: No Information Available."
-------------------------	---

<b>Examples</b>	The following is sample output from the <b>show platform software swspan FP active source</b> command:
-----------------	--

```
Switch# show platform software swspan FP active source sess-id 0
Showing SPAN source detail info

Session ID : 0
Intf Type : PORT
Port dpidx : 30
PD Sess ID : 1
Session Type : Local
Direction : Ingress
Filter Enabled : No
ACL Configured : No
AOM Object id : 579
AOM Object Status : Done
```

```
Parent AOM object Id : 118
Parent AOM object Status : Done

Session ID : 9
Intf Type : PORT
Port dpidx : 8
PD Sess ID : 0
Session Type : Local
Direction : Ingress
Filter Enabled : No
ACL Configured : No
AOM Object id : 578
AOM Object Status : Done
Parent AOM object Id : 70
Parent AOM object Status : Done
```

The following is sample output from the **show platform software swwspan RP active destination** command:

```
Switch# show platform software swwspan RP active destination

Showing SPAN destination table summary info

Sess-id IF-type IF-id Sess-type
-----
1 PORT 19 Remote
```

**snmp-server enable traps**

## snmp-server enable traps

To enable the device to send Simple Network Management Protocol (SNMP) notifications for various traps or inform requests to the network management system (NMS), use the **snmp-server enable traps** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps [auth-framework [sec-violation] | bridge | call-home | cluster | config | config-copy | config-ctid | copy-config | cpu | dot1x | energywise | entity | envmon | errdisable | event-manager | flash | fru-ctrl | license | mac-notification | port-security | power-ethernet | rep | snmp | stackwise | storm-control | stpx | syslog | transceiver | tty | vlan-membership | wlancreate | wlandelete | vstack | vtp ]  
no snmp-server enable traps [auth-framework [sec-violation] | bridge | call-home | cluster | config | config-copy | config-ctid | copy-config | cpu | dot1x | energywise | entity | envmon | errdisable | event-manager | flash | fru-ctrl | license | mac-notification | port-security | power-ethernet | rep | snmp | stackwise | storm-control | stpx | syslog | transceiver | tty | vlan-membership | wlancreate | wlandelete | vstack | vtp ]
```

Syntax Description	
<b>auth-framework</b>	(Optional) Enables SNMP CISCO-AUTH-FRAMEWORK-MIB traps.
<b>sec-violation</b>	(Optional) Enables SNMP camSecurityViolationNotif notifications.
<b>bridge</b>	(Optional) Enables SNMP STP Bridge MIB traps.*
<b>call-home</b>	(Optional) Enables SNMP CISCO-CALLHOME-MIB traps.*
<b>cluster</b>	(Optional) Enables SNMP cluster traps.
<b>config</b>	(Optional) Enables SNMP configuration traps.
<b>config-copy</b>	(Optional) Enables SNMP configuration copy traps.
<b>config-ctid</b>	(Optional) Enables SNMP configuration CTID traps.
<b>copy-config</b>	(Optional) Enables SNMP copy-configuration traps.
<b>cpu</b>	(Optional) Enables CPU notification traps.*
<b>dot1x</b>	(Optional) Enables SNMP dot1x traps.*
<b>energywise</b>	(Optional) Enables SNMP energywise traps.*
<b>entity</b>	(Optional) Enables SNMP entity traps.
<b>envmon</b>	(Optional) Enables SNMP environmental monitor traps.*
<b>errdisable</b>	(Optional) Enables SNMP errdisable notification traps.*
<b>event-manager</b>	(Optional) Enables SNMP Embedded Event Manager traps.
<b>flash</b>	(Optional) Enables SNMP FLASH notification traps.*

<b>fru-ctrl</b>	(Optional) Generates entity field-replaceable unit (FRU) control traps. In a device stack, this trap refers to the insertion or removal of a device in the stack.				
<b>license</b>	(Optional) Enables license traps.*				
<b>mac-notification</b>	(Optional) Enables SNMP MAC Notification traps.*				
<b>port-security</b>	(Optional) Enables SNMP port security traps.*				
<b>power-ethernet</b>	(Optional) Enables SNMP power Ethernet traps.*				
<b>rep</b>	(Optional) Enables SNMP Resilient Ethernet Protocol traps.				
<b>snmp</b>	(Optional) Enables SNMP traps.*				
<b>stackwise</b>	(Optional) Enables SNMP stackwise traps.*				
<b>storm-control</b>	(Optional) Enables SNMP storm-control trap parameters.*				
<b>stpx</b>	(Optional) Enables SNMP STPX MIB traps.*				
<b>syslog</b>	(Optional) Enables SNMP syslog traps.				
<b>transceiver</b>	(Optional) Enables SNMP transceiver traps.*				
<b>tty</b>	(Optional) Sends TCP connection traps. This is enabled by default.				
<b>vlan-membership</b>	(Optional) Enables SNMP VLAN membership traps.				
<b>vlancreate</b>	(Optional) Enables SNMP VLAN-created traps.				
<b>vlandelete</b>	(Optional) Enables SNMP VLAN-deleted traps.				
<b>vstack</b>	(Optional) Enables SNMP Smart Install traps.*				
<b>ftp</b>	(Optional) Enables VLAN Trunking Protocol (VTP) traps.				
<b>Command Default</b>	The sending of SNMP traps is disabled.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="0"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>The command options marked with an asterisk in the table above have subcommands. For more information on these subcommands, see the Related Commands section below.</p> <p>Specify the host (NMS) that receives the traps by using the <b>snmp-server host</b> global configuration command. If no trap types are specified, all trap types are sent.</p> <p>When supported, use the <b>snmp-server enable traps</b> command to enable sending of traps or informs.</p>				

**snmp-server enable traps****Note**

Though visible in the command-line help strings, the **fru-ctrl**, **insertion**, and **removal** keywords are not supported on the device. The **snmp-server enable informs** global configuration command is not supported. To enable the sending of SNMP inform notifications, use the **snmp-server enable traps** global configuration command combined with the **snmp-server host host-addr informs** global configuration command.

**Note**

Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

**Examples**

This example shows how to enable more than one type of SNMP trap:

```
Device(config)# snmp-server enable traps cluster
Device(config)# snmp-server enable traps config
Device(config)# snmp-server enable traps vtp
```

# snmp-server enable traps bridge

To generate STP bridge MIB traps, use the **snmp-server enable traps bridge** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps bridge [newroot] [topologychange]
no snmp-server enable traps bridge [newroot] [topologychange]
```

## Syntax Description

**newroot** (Optional) Enables SNMP STP bridge MIB new root traps.

**topologychange** (Optional) Enables SNMP STP bridge MIB topology change traps.

## Command Default

The sending of bridge SNMP traps is disabled.

## Command Modes

Global configuration

## Command History

### Release

Cisco IOS XE 3.2SE

### Modification

This command was introduced.

## Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

## Examples

This example shows how to send bridge new root traps to the NMS:

```
Device(config)# snmp-server enable traps bridge newroot
```

**snmp-server enable traps bulkstat**

## snmp-server enable traps bulkstat

To enable data-collection-MIB traps, use the **snmp-server enable traps bulkstat** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps bulkstat [collection | transfer]
no snmp-server enable traps bulkstat [collection | transfer]
```

### Syntax Description

**collection** (Optional) Enables data-collection-MIB collection traps.

**transfer** (Optional) Enables data-collection-MIB transfer traps.

### Command Default

The sending of data-collection-MIB traps is disabled.

### Command Modes

Global configuration

### Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

### Examples

This example shows how to generate data-collection-MIB collection traps:

```
Device(config)# snmp-server enable traps bulkstat collection
```

# snmp-server enable traps call-home

To enable SNMP CISCO-CALLHOME-MIB traps, use the **snmp-server enable traps call-home** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps call-home [message-send-fail | server-fail]  
no snmp-server enable traps call-home [message-send-fail | server-fail]
```

## Syntax Description

**message-send-fail** (Optional) Enables SNMP message-send-fail traps.

**server-fail** (Optional) Enables SNMP server-fail traps.

## Command Default

The sending of SNMP CISCO-CALLHOME-MIB traps is disabled.

## Command Modes

Global configuration

## Command History

### Release

Cisco IOS XE 3.2SE

### Modification

This command was introduced.

## Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

## Examples

This example shows how to generate SNMP message-send-fail traps:

```
Device(config)# snmp-server enable traps call-home message-send-fail
```

**snmp-server enable traps cef**

## snmp-server enable traps cef

To enable SNMP Cisco Express Forwarding (CEF) traps, use the **snmp-server enable traps cef** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps cef [inconsistency | peer-fib-state-change | peer-state-change | resource-failure]
no snmp-server enable traps cef [inconsistency | peer-fib-state-change | peer-state-change | resource-failure]
```

<b>Syntax Description</b>	<b>inconsistency</b> (Optional) Enables SNMP CEF Inconsistency traps. <b>peer-fib-state-change</b> (Optional) Enables SNMP CEF Peer FIB State change traps. <b>peer-state-change</b> (Optional) Enables SNMP CEF Peer state change traps. <b>resource-failure</b> (Optional) Enables SNMP CEF Resource Failure traps.
---------------------------	--

**Command Default** The sending of SNMP CEF traps is disabled.

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

**Examples** This example shows how to generate SNMP CEF inconsistency traps:

```
Device(config)# snmp-server enable traps cef inconsistency
```

# snmp-server enable traps cpu

To enable CPU notifications, use the **snmp-server enable traps cpu** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps cpu [threshold]
no snmp-server enable traps cpu [threshold]
```

---

**Syntax Description**

**threshold** (Optional) Enables CPU threshold notification.

---

**Command Default**

The sending of CPU notifications is disabled.

**Command Modes**

Global configuration

---

**Command History**

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

---

**Usage Guidelines**

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



---

**Note** Informs are not supported in SNMPv1.

---

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

**Examples**

This example shows how to generate CPU threshold notifications:

```
Device(config)# snmp-server enable traps cpu threshold
```

**snmp-server enable traps envmon**

## snmp-server enable traps envmon

To enable SNMP environmental traps, use the **snmp-server enable traps envmon** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps envmon [ fan ] [ shutdown ] [ status ] [ supply ] [ temperature ]
]
no snmp-server enable traps envmon [ fan ] [ shutdown ] [ status ] [ supply ] [ temperature ]
```

### Syntax Description

<b>fan</b>	(Optional) Enables fan traps.
<b>shutdown</b>	(Optional) Enables environmental monitor shutdown traps.
<b>status</b>	(Optional) Enables SNMP environmental status-change traps.
<b>supply</b>	(Optional) Enables environmental monitor power-supply traps.
<b>temperature</b>	(Optional) Enables environmental monitor temperature traps.

### Command Default

The sending of environmental SNMP traps is disabled.

### Command Modes

Global configuration

### Command History

	<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE		This command was introduced.

### Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

### Examples

This example shows how to generate fan traps:

```
Device(config)# snmp-server enable traps envmon fan
```

### Examples

This example shows how to generate status-change traps:

```
Device(config)# snmp-server enable traps envmon status
```

# snmp-server enable traps errdisable

To enable SNMP notifications of error-disabling, use the **snmp-server enable traps errdisable** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps errdisable [notification-rate number-of-notifications]
no snmp-server enable traps errdisable [notification-rate number-of-notifications]
```

<b>Syntax Description</b>	<b>notification-rate</b> <i>number-of-notifications</i>	(Optional) Specifies number of notifications per minute as the notification rate. Accepted values are from 0 to 10000.
<b>Command Default</b>	The sending of SNMP notifications of error-disabling is disabled.	
<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

<b>Examples</b>	This example shows how to set the number SNMP notifications of error-disabling to 2:
	<pre>Device(config)# snmp-server enable traps errdisable notification-rate 2</pre>

**snmp-server enable traps flash**

## snmp-server enable traps flash

To enable SNMP flash notifications, use the **snmp-server enable traps flash** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps flash [insertion] [removal]
no snmp-server enable traps flash [insertion] [removal]
```

### Syntax Description

**insertion** (Optional) Enables SNMP flash insertion notifications.

**removal** (Optional) Enables SNMP flash removal notifications.

### Command Default

The sending of SNMP flash notifications is disabled.

### Command Modes

Global configuration

### Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

### Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

### Examples

This example shows how to generate SNMP flash insertion notifications:

```
Device(config)# snmp-server enable traps flash insertion
```

# snmp-server enable traps isis

To enable intermediate system-to-intermediate system (IS-IS) link-state routing protocol traps, use the **snmp-server enable traps isis** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps isis [errors | state-change]
no snmp-server enable traps isis [errors | state-change]
```

<b>Syntax Description</b>	<b>errors</b> (Optional) Enables IS-IS error traps. <b>state-change</b> (Optional) Enables IS-IS state change traps.				
<b>Command Default</b>	The sending of IS-IS traps is disabled.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	Specify the host (NMS) that receives the traps by using the <b>snmp-server host</b> global configuration command. If no trap types are specified, all trap types are sent.				
 <b>Note</b>	Informs are not supported in SNMPv1.				
	To enable more than one type of trap, you must enter a separate <b>snmp-server enable traps</b> command for each trap type.				
<b>Examples</b>	This example shows how to generate IS-IS error traps:				

```
Device(config)# snmp-server enable traps isis errors
```

**snmp-server enable traps license**

## snmp-server enable traps license

To enable license traps, use the **snmp-server enable traps license** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps license [deploy] [error] [usage]
no snmp-server enable traps license [deploy] [error] [usage]
```

### Syntax Description

**deploy** (Optional) Enables license deployment traps.  
**error** (Optional) Enables license error traps.  
**usage** (Optional) Enables license usage traps.

### Command Default

The sending of license traps is disabled.

### Command Modes

Global configuration

### Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

### Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

### Examples

This example shows how to generate license deployment traps:

```
Device(config)# snmp-server enable traps license deploy
```

# snmp-server enable traps mac-notification

To enable SNMP MAC notification traps, use the **snmp-server enable traps mac-notification** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps mac-notification [change] [move] [threshold]
no snmp-server enable traps mac-notification [change] [move] [threshold]
```

## Syntax Description

**change** (Optional) Enables SNMP MAC change traps.

**move** (Optional) Enables SNMP MAC move traps.

**threshold** (Optional) Enables SNMP MAC threshold traps.

## Command Default

The sending of SNMP MAC notification traps is disabled.

## Command Modes

Global configuration

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE	This command was introduced.
--------------------	------------------------------

## Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

## Examples

This example shows how to generate SNMP MAC notification change traps:

```
Device(config)# snmp-server enable traps mac-notification change
```

**snmp-server enable traps ospf**

## snmp-server enable traps ospf

To enable SNMP Open Shortest Path First (OSPF) traps, use the **snmp-server enable traps ospf** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps ospf [cisco-specific | errors | lsa | rate-limit rate-limit-time
max-number-of-traps | retransmit | state-change]
no snmp-server enable traps ospf [cisco-specific | errors | lsa | rate-limit rate-limit-time
max-number-of-traps | retransmit | state-change]
```

Syntax Description	<b>cisco-specific</b> (Optional) Enables Cisco-specific traps. <b>errors</b> (Optional) Enables error traps. <b>lsa</b> (Optional) Enables link-state advertisement (LSA) traps. <b>rate-limit</b> (Optional) Enables rate-limit traps. <b>rate-limit-time</b> (Optional) Specifies window of time in seconds for rate-limit traps. Accepted values are 2 to 60. <b>max-number-of-traps</b> (Optional) Specifies maximum number of rate-limit traps to be sent in window time. <b>retransmit</b> (Optional) Enables packet-retransmit traps. <b>state-change</b> (Optional) Enables state-change traps.				
Command Default	The sending of OSPF SNMP traps is disabled.				
Command Modes	Global configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				
Usage Guidelines	Specify the host (NMS) that receives the traps by using the <b>snmp-server host</b> global configuration command. If no trap types are specified, all trap types are sent.				
 <b>Note</b> Informs are not supported in SNMPv1.					
To enable more than one type of trap, you must enter a separate <b>snmp-server enable traps</b> command for each trap type.					
Examples	This example shows how to enable LSA traps:				

```
Device(config)# snmp-server enable traps ospf lsa
```

# snmp-server enable traps pim

To enable SNMP Protocol-Independent Multicast (PIM) traps, use the **snmp-server enable traps pim** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps pim [invalid-pim-message] [neighbor-change] [rp-mapping-change]
no snmp-server enable traps pim [invalid-pim-message] [neighbor-change] [rp-mapping-change]
```

## Syntax Description

**invalid-pim-message** (Optional) Enables invalid PIM message traps.

**neighbor-change** (Optional) Enables PIM neighbor-change traps.

**rp-mapping-change** (Optional) Enables rendezvous point (RP)-mapping change traps.

## Command Default

The sending of PIM SNMP traps is disabled.

## Command Modes

Global configuration

## Command History

	Release	Modification
Cisco IOS XE 3.2SE		This command was introduced.

## Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

## Examples

This example shows how to enable invalid PIM message traps:

```
Device(config)# snmp-server enable traps pim invalid-pim-message
```

**snmp-server enable traps port-security**

## snmp-server enable traps port-security

To enable SNMP port security traps, use the **snmp-server enable traps port-security** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps port-security [trap-rate value]
no snmp-server enable traps port-security [trap-rate value]
```

<b>Syntax Description</b>	<b>trap-rate</b> (Optional) Sets the maximum number of port-security traps sent per second. The range is <i>value</i> from 0 to 1000; the default is 0 (no limit imposed; a trap is sent at every occurrence).				
<b>Command Default</b>	The sending of port security SNMP traps is disabled.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

### Examples

This example shows how to enable port-security traps at a rate of 200 per second:

```
Device(config)# snmp-server enable traps port-security trap-rate 200
```

# snmp-server enable traps power-ethernet

To enable SNMP power-over-Ethernet (PoE) traps, use the **snmp-server enable traps power-ethernet** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps power-ethernet {group number | police}
no snmp-server enable traps power-ethernet {group number | police}
```

## Syntax Description

<b>group</b>	Enables inline power group-based traps for the specified group number. Accepted values are <i>number</i> from 1 to 9.
<b>police</b>	Enables inline power policing traps.

## Command Default

The sending of power-over-Ethernet SNMP traps is disabled.

## Command Modes

Global configuration

## Command History

	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

## Examples

This example shows how to enable power-over-Ethernet traps for group 1:

```
Device(config)# snmp-server enable traps power-over-ethernet group 1
```

**snmp-server enable traps snmp**

## snmp-server enable traps snmp

To enable SNMP traps, use the **snmp-server enable traps snmp** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps snmp [authentication] [coldstart] [linkdown] [linkup] [warmstart]
no snmp-server enable traps snmp [authentication] [coldstart] [linkdown] [linkup]
] [warmstart]
```

### Syntax Description

<b>authentication</b>	(Optional) Enables authentication traps.
<b>coldstart</b>	(Optional) Enables cold start traps.
<b>linkdown</b>	(Optional) Enables linkdown traps.
<b>linkup</b>	(Optional) Enables linkup traps.
<b>warmstart</b>	(Optional) Enables warmstart traps.

### Command Default

The sending of SNMP traps is disabled.

### Command Modes

Global configuration

### Command History

	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

### Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

### Examples

This example shows how to enable a warmstart SNMP trap:

```
Device(config)# snmp-server enable traps snmp warmstart
```

# snmp-server enable traps stackwise

To enable SNMP StackWise traps, use the **snmp-server enable traps stackwise** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps stackwise [GLS] [ILS] [SRLS]
[insufficient-power] [invalid-input-current]
[invalid-output-current] [member-removed] [member-upgrade-notification]
[new-master] [new-member] [port-change] [power-budget-warning] [power-invalid-topology]
[power-link-status-changed] [power-oper-status-changed]
[power-priority-conflict] [power-version-mismatch] [ring-redundant]
[stack-mismatch] [unbalanced-power-supplies] [under-budget] [under-voltage]
no snmp-server enable traps stackwise [GLS] [ILS] [SRLS]
[insufficient-power] [invalid-input-current]
[invalid-output-current] [member-removed] [member-upgrade-notification]
[new-master] [new-member] [port-change] [power-budget-warning] [power-invalid-topology]
[power-link-status-changed] [power-oper-status-changed]
[power-priority-conflict] [power-version-mismatch] [ring-redundant]
[stack-mismatch] [unbalanced-power-supplies] [under-budget] [under-voltage]
```

Syntax Description	
<b>GLS</b>	(Optional) Enables StackWise stack power GLS trap.
<b>ILS</b>	(Optional) Enables StackWise stack power ILS trap.
<b>SRLS</b>	(Optional) Enables StackWise stack power SRLS trap.
<b>insufficient-power</b>	(Optional) Enables StackWise stack power unbalanced power supplies trap.
<b>invalid-input-current</b>	(Optional) Enables StackWise stack power invalid input current trap.
<b>invalid-output-current</b>	(Optional) Enables StackWise stack power invalid output current trap.
<b>member-removed</b>	(Optional) Enables StackWise stack member removed trap.
<b>member-upgrade-notification</b>	(Optional) Enables StackWise member to be reloaded for upgrade trap.
<b>new-master</b>	(Optional) Enables StackWise new active trap.
<b>new-member</b>	(Optional) Enables StackWise stack new member trap.
<b>port-change</b>	(Optional) Enables StackWise stack port change trap.
<b>power-budget-warning</b>	(Optional) Enables StackWise stack power budget warning trap.
<b>power-invalid-topology</b>	(Optional) Enables StackWise stack power invalid topology trap.
<b>power-link-status-changed</b>	(Optional) Enables StackWise stack power link status changed trap.
<b>power-oper-status-changed</b>	(Optional) Enables StackWise stack power port oper status changed trap.
<b>power-priority-conflict</b>	(Optional) Enables StackWise stack power priority conflict trap.

**snmp-server enable traps stackwise**

<b>power-version-mismatch</b>	(Optional) Enables StackWise stack power version mismatch discovered trap.
<b>ring-redundant</b>	(Optional) Enables StackWise stack ring redundant trap.
<b>stack-mismatch</b>	(Optional) Enables StackWise stack mismatch trap.
<b>unbalanced-power-supplies</b>	(Optional) Enables StackWise stack power unbalanced power supplies trap.
<b>under-budget</b>	(Optional) Enables StackWise stack power under budget trap.
<b>under-voltage</b>	(Optional) Enables StackWise stack power under voltage trap.

**Command Default** The sending of SNMP StackWise traps is disabled.

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

**Examples** This example shows how to generate StackWise stack power GLS traps:

```
Device(config)# snmp-server enable traps stackwise GLS
```

# snmp-server enable traps storm-control

To enable SNMP storm-control trap parameters, use the **snmp-server enable traps storm-control** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps storm-control {trap-rate number-of-minutes}  
no snmp-server enable traps storm-control {trap-rate}
```

Syntax Description	<b>trap-rate</b> <i>number-of-minutes</i> (Optional) Specifies the SNMP storm-control trap rate in minutes. Accepted values are from 0 to 1000. The default is 0.  Value 0 indicates that no limit is imposed and a trap is sent at every occurrence. When configured, <b>show run all</b> command output displays <b>no snmp-server enable traps storm-control</b> .				
Command Default	The sending of SNMP storm-control trap parameters is disabled.				
Command Modes	Global configuration				
Command History	<table border="1"><thead><tr><th>Release</th><th>Modification</th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

## Examples

This example shows how to set the SNMP storm-control trap rate to 10 traps per minute:

```
Device(config)# snmp-server enable traps storm-control trap-rate 10
```

**snmp-server enable traps stpx**

## snmp-server enable traps stpx

To enable SNMP STPX MIB traps, use the **snmp-server enable traps stpx** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps stpx [inconsistency] [loop-inconsistency] [root-inconsistency]
no snmp-server enable traps stpx [inconsistency] [loop-inconsistency] [root-inconsistency]
```

### Syntax Description

**inconsistency** (Optional) Enables SNMP STPX MIB inconsistency update traps.

**loop-inconsistency** (Optional) Enables SNMP STPX MIB loop inconsistency update traps.

**root-inconsistency** (Optional) Enables SNMP STPX MIB root inconsistency update traps.

### Command Default

The sending of SNMP STPX MIB traps is disabled.

### Command Modes

Global configuration

### Command History

Release	Modification
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Cisco IOS XE 3.2SE	This command was introduced.
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### Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



#### Note

Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

### Examples

This example shows how to generate SNMP STPX MIB inconsistency update traps:

```
Device(config)# snmp-server enable traps stpx inconsistency
```

# snmp-server enable traps transceiver

To enable SNMP transceiver traps, use the **snmp-server enable traps transceiver** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps transceiver {all}  
no snmp-server enable traps transceiver {all}
```

<b>Syntax Description</b>	<b>a</b> (Optional) Enables all SNMP transceiver traps.
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<b>Command Default</b>	The sending of SNMP transceiver traps is disabled.
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<b>Command Modes</b>	Global configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	Specify the host (NMS) that receives the traps by using the <b>snmp-server host</b> global configuration command. If no trap types are specified, all trap types are sent.
-------------------------	--



<b>Note</b>	Informs are not supported in SNMPv1.
-------------	--------------------------------------

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

<b>Examples</b>	This example shows how to set all SNMP transceiver traps:
-----------------	---

```
Device(config)# snmp-server enable traps transceiver all
```

**snmp-server enable traps vrfmib**

## snmp-server enable traps vrfmib

To allow SNMP vrfmib traps, use the **snmp-server enable traps vrfmib** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps vrfmib [vnet-trunk-down | vnet-trunk-up | vrf-down | vrf-up]
no snmp-server enable traps vrfmib [vnet-trunk-down | vnet-trunk-up | vrf-down | vrf-up]
```

### Syntax Description

<b>vnet-trunk-down</b>	(Optional) Enables vrfmib trunk down traps.
<b>vnet-trunk-up</b>	(Optional) Enables vrfmib trunk up traps.
<b>vrf-down</b>	(Optional) Enables vrfmib vrf down traps.
<b>vrf-up</b>	(Optional) Enables vrfmib vrf up traps.

### Command Default

The sending of SNMP vrfmib traps is disabled.

### Command Modes

Global configuration

### Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

### Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

### Examples

This example shows how to generate vrfmib trunk down traps:

```
Device(config)# snmp-server enable traps vrfmib vnet-trunk-down
```

# snmp-server enable traps vstack

To enable SNMP smart install traps, use the **snmp-server enable traps vstack** command in global configuration mode. Use the **no** form of this command to return to the default setting.

```
snmp-server enable traps vstack [addition] [failure] [lost] [operation]
no snmp-server enable traps vstack [addition] [failure] [lost] [operation]
```

## Syntax Description

**addition** (Optional) Enables client added traps.

**failure** (Optional) Enables file upload and download failure traps.

**lost** (Optional) Enables client lost trap.

**operation** (Optional) Enables operation mode change traps.

## Command Default

The sending of SNMP smart install traps is disabled.

## Command Modes

Global configuration

## Command History

### Release

Cisco IOS XE 3.2SE

### Modification

This command was introduced.

## Usage Guidelines

Specify the host (NMS) that receives the traps by using the **snmp-server host** global configuration command. If no trap types are specified, all trap types are sent.



**Note** Informs are not supported in SNMPv1.

To enable more than one type of trap, you must enter a separate **snmp-server enable traps** command for each trap type.

## Examples

This example shows how to generate SNMP Smart Install client-added traps:

```
Device(config)# snmp-server enable traps vstack addition
```

# snmp-server engineID

To configure a name for either the local or remote copy of SNMP, use the **snmp-server engineID** command in global configuration mode.

```
snmp-server engineID {local engineid-string | remote ip-address [udp-port port-number]
engineid-string}
```

<b>Syntax Description</b>	<b>local</b> <i>engineid-string</i> Specifies a 24-character ID string with the name of the copy of SNMP. You need not specify the entire 24-character engine ID if it has trailing zeros. Specify only the portion of the engine ID up to the point where only zeros remain in the value.				
	<b>remote</b> <i>ip-address</i> Specifies the remote SNMP copy. Specify the <i>ip-address</i> of the device that contains the remote copy of SNMP.				
	<b>udp-port</b> <i>port-number</i> (Optional) Specifies the User Datagram Protocol (UDP) port on the remote device. The default is 162.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	None				

## Examples

The following example configures a local engine ID of 123400000000000000000000:

```
Device(config)# snmp-server engineID local 1234
```

# snmp-server host

To specify the recipient (host) of a Simple Network Management Protocol (SNMP) notification operation, use the **snmp-server host** global configuration command on the device. Use the **no** form of this command to remove the specified host.

```
snmp-server host {host-addr} [vrf vrf-instance] [informs | traps] [version {1 | 2c | 3
{auth | noauth | priv}}] {community-string [notification-type]}
```

```
no snmp-server host {host-addr} [vrf vrf-instance] [informs | traps] [version {1 | 2c | 3
{auth | noauth | priv}}] {community-string [notification-type]}
```

## Syntax Description

<i>host-addr</i>	Name or Internet address of the host (the targeted recipient).
<b>vrf</b> <i>vrf-instance</i>	(Optional) Specifies the virtual private network (VPN) routing instance and name for this host.
<b>informs   traps</b>	(Optional) Sends SNMP traps or informs to this host.
<b>version 1   2c   3</b>	(Optional) Specifies the version of the SNMP used to send the traps.
1	—SNMPv1. This option is not available with informs.
2c	—SNMPv2C.
3	—SNMPv3. One of the authorization keywords (see next table row) must follow the Version 3 keyword.
<b>auth   noauth</b> <i>auth</i>	(Optional)—Enables Message Digest 5 (MD5) and Secure Hash Algorithm (SHA) packet authentication.
<b>auth   noauth</b> <i>priv</i>	(Optional)—Enables Data Encryption Standard (DES) packet encryption (also called privacy).
<b>noauth</b>	(Default)—The noAuthNoPriv security level. This is the default if the <b>auth   noauth   priv</b> keyword choice is not specified.
<b>priv</b>	(Optional)—Enables Data Encryption Standard (DES) packet encryption (also called privacy).
<i>community-string</i>	Password-like community string sent with the notification operation. Though you can set this string by using the <b>snmp-server host</b> command, we recommend that you define this string by using the <b>snmp-server community</b> global configuration command before using the <b>snmp-server host</b> command.
<b>Note</b>	The @ symbol is used for delimiting the context information. Avoid using the @ symbol as part of the SNMP community string when configuring this command.

---

*notification-type* (Optional) Type of notification to be sent to the host. If no type is specified, all notifications are sent. The notification type can be one or more of the these keywords:

- **auth-framework**—Sends SNMP CISCO-AUTH-FRAMEWORK-MIB traps.
  - **bridge**—Sends SNMP Spanning Tree Protocol (STP) bridge MIB traps.
  - **bulkstat**—Sends Data-Collection-MIB Collection notification traps.
  - **call-home**—Sends SNMP CISCO-CALLHOME-MIB traps.
  - **cef**—Sends SNMP CEF traps.
  - **config**—Sends SNMP configuration traps.
  - **config-copy**—Sends SNMP config-copy traps.
  - **config-ctid**—Sends SNMP config-ctid traps.
  - **copy-config**—Sends SNMP copy configuration traps.
  - **cpu**—Sends CPU notification traps.
  - **cpu threshold**—Sends CPU threshold notification traps.
  - **eigrp**—Sends SNMP EIGRP traps.
  - **entity**—Sends SNMP entity traps.
- 
- **envmon**—Sends environmental monitor traps.
  - **errdisable**—Sends SNMP errdisable notification traps.
  - **event-manager**—Sends SNMP Embedded Event Manager traps.
  - **flash**—Sends SNMP FLASH notifications.
  - **flowmon**—Sends SNMP flowmon notification traps.
  - **ipmulticast**—Sends SNMP IP multicast routing traps.
  - **ipsla**—Sends SNMP IP SLA traps.
  - **isis**—Sends IS-IS traps.
  - **license**—Sends license traps.
  - **local-auth**—Sends SNMP local auth traps.
  - **mac-notification**—Sends SNMP MAC notification traps.
  - **ospf**—Sends Open Shortest Path First (OSPF) traps.
  - **pim**—Sends SNMP Protocol-Independent Multicast (PIM) traps.
  - **port-security**—Sends SNMP port-security traps.
  - **power-ethernet**—Sends SNMP power Ethernet traps.
  - **snmp**—Sends SNMP-type traps.
  - **storm-control**—Sends SNMP storm-control traps.
  - **stpx**—Sends SNMP STP extended MIB traps.
  - **syslog**—Sends SNMP syslog traps.
  - **transceiver**—Sends SNMP transceiver traps.
  - **tty**—Sends TCP connection traps.
  - **vlan-membership**—Sends SNMP VLAN membership traps.
  - **vlancreate**—Sends SNMP VLAN-created traps.
  - **vlandelete**—Sends SNMP VLAN-deleted traps.
  - **vrfmib**—Sends SNMP vrfmib traps.
  - **vstack**—Sends SNMP Smart Install traps.
  - **vtp**—Sends SNMP VLAN Trunking Protocol (VTP) traps.

**Command Default**


---

This command is disabled by default. No notifications are sent.

If you enter this command with no keywords, the default is to send all trap types to the host. No informs are sent to this host.

If no **version** keyword is present, the default is Version 1.

If Version 3 is selected and no authentication keyword is entered, the default is the **noauth** (noAuthNoPriv) security level.



**Note** Though visible in the command-line help strings, the **fru-ctrl** keyword is not supported.

<b>Command Modes</b>	Global configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	SNMP notifications can be sent as traps or inform requests. Traps are unreliable because the receiver does not send acknowledgments when it receives traps. The sender cannot determine if the traps were received. However, an SNMP entity that receives an inform request acknowledges the message with an SNMP response PDU. If the sender never receives the response, the inform request can be sent again, so that informs are more likely to reach their intended destinations.
-------------------------	--

However, informs consume more resources in the agent and in the network. Unlike a trap, which is discarded as soon as it is sent, an inform request must be held in memory until a response is received or the request times out. Traps are also sent only once, but an inform might be retried several times. The retries increase traffic and contribute to a higher overhead on the network.

If you do not enter an **snmp-server host** command, no notifications are sent. To configure the device to send SNMP notifications, you must enter at least one **snmp-server host** command. If you enter the command with no keywords, all trap types are enabled for the host. To enable multiple hosts, you must enter a separate **snmp-server host** command for each host. You can specify multiple notification types in the command for each host.

If a local user is not associated with a remote host, the device does not send informs for the **auth** (authNoPriv) and the **priv** (authPriv) authentication levels.

When multiple **snmp-server host** commands are given for the same host and kind of notification (trap or inform), each succeeding command overwrites the previous command. Only the last **snmp-server host** command is in effect. For example, if you enter an **snmp-server host inform** command for a host and then enter another **snmp-server host inform** command for the same host, the second command replaces the first.

The **snmp-server host** command is used with the **snmp-server enable traps** global configuration command. Use the **snmp-server enable traps** command to specify which SNMP notifications are sent globally. For a host to receive most notifications, at least one **snmp-server enable traps** command and the **snmp-server host** command for that host must be enabled. Some notification types cannot be controlled with the **snmp-server enable traps** command. For example, some notification types are always enabled. Other notification types are enabled by a different command.

The **no snmp-server host** command with no keywords disables traps, but not informs, to the host. To disable informs, use the **no snmp-server host informs** command.

**snmp-server host****Examples**

This example shows how to configure a unique SNMP community string named comaccess for traps and prevent SNMP polling access with this string through access-list 10:

```
Device(config)# snmp-server community comaccess ro 10
Device(config)# snmp-server host 172.20.2.160 comaccess
Device(config)# access-list 10 deny any
```

This example shows how to send the SNMP traps to the host specified by the name myhost.cisco.com. The community string is defined as comaccess:

```
Device(config)# snmp-server enable traps
Device(config)# snmp-server host myhost.cisco.com comaccess snmp
```

This example shows how to enable the device to send all traps to the host myhost.cisco.com by using the community string public:

```
Device(config)# snmp-server enable traps
Device(config)# snmp-server host myhost.cisco.com public
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

# source (ERSPAN)

To configure the Encapsulated Remote Switched Port Analyzer (ERSPAN) source interface or VLAN, and the traffic direction to be monitored, use the **source** command in ERSPAN monitor source session configuration mode. To disable the configuration, use the **no** form of this command.

```
source {interface type number | vlan vlan-ID}{[{| - | both | rx | tx]}
```

## Syntax Description

<b>interface</b> <i>type number</i>	Specifies an interface type and number.
<b>vlan</b> <i>vlan-ID</i>	Associates the ERSPAN source session number with VLANs. Valid values are from 1 to 4094.
,	(Optional) Specifies another interface.
-	(Optional) Specifies a range of interfaces.
<b>both</b>	(Optional) Monitors both received and transmitted ERSPAN traffic.
<b>rx</b>	(Optional) Monitors only received traffic.
<b>tx</b>	(Optional) Monitors only transmitted traffic.

## Command Default

Source interface or VLAN is not configured.

## Command Modes

ERSPAN monitor source session configuration mode (config-mon-erspan-src)

## Command History

Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.

## Usage Guidelines

You cannot include source VLANs and filter VLANs in the same session.

## Examples

The following example shows how to configure ERSPAN source session properties:

```
Switch(config)# monitor session 2 type erspan-source
Switch(config-mon-erspan-src)# source interface fastethernet 0/1 rx
```

## Related Commands

Command	Description
<b>monitor session type erspan-source</b>	Configures a local ERSPAN source session.

**status syslog**

# status syslog

To send the status of provisioning policies to the syslog, use the **status syslog** command in auto-deploy configuration mode. To disable the configuration, use the **no** form of this command.

```
status syslog
no status syslog
```

This command has no arguments or keywords.

**Command Default** Sylog debugging is not enabled.

**Command Modes** Auto-deploy configuration (config-auto-deploy)

Command History	Release	Modification
	Cisco IOS XE Everest 16.6.1	This command was introduced.

## Usage Guidelines

### Example

The following example shows how to enable syslog debugging:

```
Device(config)# event manager auto-deploy name deploy1
Device(config-auto-deploy)# status syslog
```

## Related Commands

Command	Description
<b>event-manager auto-deploy</b>	Configures an EEM auto-deployment profile.

# switchport mode access

To sets the interface as a nontrunking nontagged single-VLAN Ethernet interface , use the **switchport mode access** command in template configuration mode. Use the **no** form of this command to return to the default setting.

```
switchport mode access
no switchport mode access
```

<b>Syntax Description</b>	<b>switchport mode access</b> Sets the interface as a nontrunking nontagged single-VLAN Ethernet interface.				
<b>Command Default</b>	An access port can carry traffic in one VLAN only. By default, an access port carries traffic for VLAN1.				
<b>Command Modes</b>	Template configuration				
<b>Command History</b>	<table><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.3SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.3SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.3SE	This command was introduced.				
<b>Examples</b>	This example shows how to set a single-VLAN interface				

```
Device(config-template)# switchport mode access
```

**switchport voice vlan**

## switchport voice vlan

To specify to forward all voice traffic through the specified VLAN, use the **switchport voice vlan** command in template configuration mode. Use the **no** form of this command to return to the default setting.

**switchport voice vlan***vlan\_id*  
**no switchport voice vlan**

---

### Syntax Description

**switchport voice vlan***vlan\_id* Specifies to forward all voice traffic through the specified VLAN.

---

### Command Default

You can specify a value from 1 to 4094.

### Command Modes

Template configuration

### Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.3SE Cisco IOS XE Fuji 16.9.1 This command was introduced.

---

### Examples

This example shows how to specify to forward all voice traffic through the specified VLAN.

```
Device(config-template)# switchport voice vlan 20
```

# window

To set a random time for profile provisioning to be triggered, use the **window** command in auto-deploy configuration mode. To remove the configuration, use the **no** form of this command.

**window minutes**  
**no window minutes**

<b>Syntax Description</b>	<i>minutes</i>	Time in minutes. Valid values are from 1 to 60.				
<b>Command Default</b>	Policy provisioning window is not enabled.					
<b>Command Modes</b>	Auto-deploy configuration (config-auto-deploy)					
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.6.1</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Everest 16.6.1	This command was introduced.	
Release	Modification					
Cisco IOS XE Everest 16.6.1	This command was introduced.					

**Usage Guidelines** The window duration is added to the time configured by the **schedule start-in** command. Profile provisioning is triggered at random time between the specified schedule and the configured window duration.

## Example

The following example shows how to set a random time for policy provisioning. In this example, the scheduled start time for policy provisioning is 2 hours and 30 minutes. When the window duration of 10 minutes is configured, this time is added to 2 hours and 30 minutes. Policy provisioning will start any time after 2 hour and 30 minutes; but within the 10 minutes specified as the window duration.

```
Device(config)# event manager auto-deploy name deploy1
Device(config-auto-deploy)# schedule start-in hours 2 minutes 30 oneshot
Device(config-auto-deploy)# window 10
```

Related Commands	Command	Description
	<b>event-manager auto-deploy</b>	Configures an EEM auto-deployment profile.

■ window

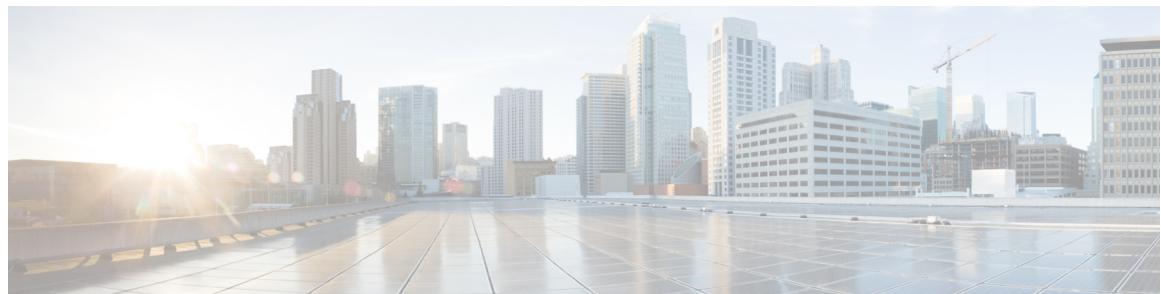


PART **IX**

## **Network Powered Lighting**

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# Network Powered Lighting Commands

---

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# clear coap database

To clear the CoAP database, use the **clear coap database** command in user EXEC or privileged EXEC mode.

## clear coap database

**Command Default** This command has no arguments or keywords.

**Command Modes** User EXEC (>)

Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

## Example

This example shows how to clear the coap database:

```
Device(config)# clear coap database
```

# clear macro auto configuration

To remove the macro applied configuration from the interfaces, use the **clear macro auto configuration** command.



**Note** Before executing the **clear macro auto configuration** command, you must disable Auto SmartPorts on the switch.

**clear macro auto configuration {all | interface [interface-id]}**

<b>Syntax Description</b>	<b>all</b>	Removes macro applied configuration from all the interfaces.
---------------------------	------------	--

<b>interface [interface-id]</b>	Removes macro applied configuration from an interface.
---------------------------------	--

<b>Command Default</b>	This command has no default setting.
------------------------	--------------------------------------

<b>Command Modes</b>	User EXEC (>)
----------------------	---------------

<b>Command History</b>	<b>Release</b> Cisco IOS XE Everest 16.5.1a	<b>Modification</b> This command was introduced.
------------------------	--	---

<b>Usage Guidelines</b>	Use the command to remove configuration applied by macros from all the interfaces or a particular interface on the switch.
-------------------------	--

You can verify your settings by entering the **show macro auto interface** command in privileged EXEC mode.

## Example

This example shows how to remove the configuration from all the switch interfaces:

```
Device(config)# clear macro auto configuration all
```

# coap endpoint (coap-proxy configuration)

To configure the COAP Proxy to support multiple IPv4/IPv6 static-endpoints, use the **coap endpoint** command in coap-proxy configuration mode. To return to the default settings, use the **no** form of the command.

```
coap endpoint {ipv4 | ipv6}[ip-address]
no coap endpoint {ipv4 | ipv6}[ip-address]
```

Syntax Description		
<b>ipv4 ip-address</b>		Specifies IPv4 static endpoint.
<b>ipv6 ip-address</b>		Specifies IPv6 static endpoint.
<b>Command Modes</b>		
<b>coap-proxy configuration (config-coap-proxy)</b>		
Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

## Example

This example show how to configure IPv4 static endpoint

```
Device(config)# endpoint ipv4 1.1.1.1
Device(config-coap-proxy)# transport tcp
```

# debug coap

To enable debugging of the coap configurations, use the **debug coap** command in privileged EXEC mode.

**debug coap {all | database | errors | events | packet | trace | warnings}**

<b>Syntax Description</b>	<b>all</b> Displays all coap debug messages. <b>database</b> Displays coap database debug messages. <b>errors</b> Displays coap error debug messages. <b>events</b> Displays coap event debug messages. <b>packet</b> Displays coap packet debug messages. <b>trace</b> Displays coap trace debug messages. <b>warnings</b> Displays coap warning debug messages				
<b>Command Default</b>	This command has no arguments or keywords.				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				

## Example

The example shows how to enable debugging for coap database:

```
Device# debug coap database
```

# device classifier

To enable the device classifier, use the **device classifier** command in global configuration mode. Use the **no** form of this command to disable the device classifier.

## device classifier

### no device classifier

**Command Default** This command is disabled by default.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

**Usage Guidelines** Use the **no device classifier** command, in global configuration mode, to disable the device classifier. You cannot disable the device classifier while it is being used by features such as Auto SmartPorts (ASP).

## Example

This example shows how to enable the ASP device classifier on a switch:

```
Device(config)# device classifier  
Device(config)# end
```

# list (coap-proxy configuration)

To restrict the IP address range where the lights and their resources can be learnt, use the **list** command in coap-proxy configuration mode. To return to the default settings, use the **no** form of the command.

A maximum of five ip-lists can be configured, irrespective of ipv4 or ipv6, using the **list** command.

```
list {ipv4 | ipv6}[list-name]
no list {ipv4 | ipv6}[list-name]
```

<b>Syntax Description</b>	<b>ipv4</b> <i>list-name</i>	Specifies IPv4 list name.
	<b>ipv6</b> <i>list-name</i>	Specifies IPv6 list name.
<b>Command Modes</b>	coap-proxy configuration (config-coap-proxy)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Usage Guidelines</b>	To access coap-proxy configuration mode, enter the <b>coap proxy</b> command in global configuration mode.	

## Example

This example shows how to restrict the IPv4 address range using a list name.

```
Device(config)# coap proxy
Device(config-coap-proxy)# list ipv4 trial_list
```

# macro

To apply a macro to an interface or to apply and debug a macro on an interface, use the **macro** command in interface configuration mode.

**macro {apply | trace}macro-name [parameter {value}][parameter {value}][parameter {value}]**

<b>Syntax Description</b>	<b>apply</b> Applies a macro to an interface. <b>trace</b> Applies a macro to an interface and then debugs it. <b>macro-name</b> Specifies the name of the macro. <b>parameter value</b> (Optional) Specifies unique parameter values that are specific to the interface. You can enter up to three keyword-value pairs. Parameter keyword matching is case sensitive. All matching occurrences of the keyword are replaced with the corresponding value.				
<b>Command Default</b>	This command has no default setting.				
<b>Command Modes</b>	Interface configuration (config-if)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				
<b>Usage Guidelines</b>	<p>You can use the <b>macro apply macro-name</b> command to apply and show the macros running on an interface.</p> <p>You can use the <b>macro trace macro-name</b> command to apply and then debug the macro to find any syntax or configuration errors.</p> <p>If a command fails because of a syntax error or a configuration error when you apply a macro, the macro continues to apply the remaining commands to the interface.</p> <p>When creating a macro that requires the assignment of unique values, use the <b>parameter value</b> keywords to designate values specific to the interface.</p> <p>Keyword matching is case sensitive. All matching occurrences of the keyword are replaced with the corresponding value. Any full match of a keyword, even if it is part of a larger string, is considered a match and is replaced by the corresponding value.</p> <p>Some macros might contain keywords that require a parameter value. You can use the <b>macro apply macro-name ?</b> command to display a list of any required values in the macro. If you apply a macro without entering the keyword values, the commands are invalid and are not applied.</p> <p>There are Cisco-default SmartPorts macros embedded in the switch software. You can display these macros and the commands that they contain by using the <b>show parser macro</b> command in user EXEC mode.</p> <p>Follow these guidelines when you apply a Cisco-default SmartPorts macro on an interface:</p>				

- Display all macros on the switch by using the **show parser macro** command in user EXEC mode. Display the contents of a specific macro by using the **show parser macro *macro-name*** command in user EXEC mode.
- Keywords that begin with \$ mean that a unique parameter value is required. Append the Cisco-default macro with the required values by using the **parameter *value*** keywords.

The Cisco-default macros use the \$ character to identify required keywords. You can use the \$ character to define keywords when you create a macro.

When you apply a macro to an interface, the macro name is automatically added to the interface. You can display the applied commands and macro names by using the **show running-config interface *interface-id*** command in user EXEC mode.

A macro applied to an interface range behaves the same way as a macro applied to a single interface. When you use an interface range, the macro is applied sequentially to each interface within the range. If a macro command fails on one interface, it is still applied to the remaining interfaces.

You can delete a macro-applied configuration on an interface by entering the **default interface *interface-id*** command in interface configuration mode.

### Example

After you use the **macro name** command, in interface configuration mode, you can apply it to an interface. This example shows how to apply a user-created macro called duplex to an interface:

```
Device(config-if)# macro apply duplex
```

To debug a macro, use the **macro trace** command, in interface configuration mode, to find any syntax or configuration errors in the macro as it is applied to an interface.

```
Device(config-if)# macro trace duplex
Applying command...`duplex auto'
%Error Unknown error.
Applying command...`speed nonegotiate'
```

This example shows how to display the Cisco-default cisco-desktop macro and how to apply the macro and set the access VLAN ID to 25 on an interface:

```
Device# show parser macro cisco-desktop
-----
Macro name : cisco-desktop
Macro type : default
# Basic interface - Enable data VLAN only
# Recommended value for access vlan (AVID) should not be 1
switchport access vlan $AVID
switchport mode access
# Enable port security limiting port to a single
# MAC address -- that of desktop
switchport port-security
switchport port-security maximum 1
# Ensure port-security age is greater than one minute
# and use inactivity timer
switchport port-security violation restrict
switchport port-security aging time 2
switchport port-security aging type inactivity
# Configure port as an edge network port
spanning-tree portfast
```

```
spanning-tree bpduguard enable
-----
Device#
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# interface gigabitethernet1/0/4
Device(config-if)# macro apply cisco-desktop $AVID 25
```

# macro auto

To configure and apply a global macro using the CLI, use the **macro auto** command in privileged EXEC mode.

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

**macro auto {apply | config} *macro-name***

Syntax Description	apply	Applies the macro.
	<b>config</b>	Enters the macro parameters.
	<i>macro-name</i>	Specifies the macro name.

**Command Default** No macros are applied to the switch.

---

## Command Modes

---

#### **Command History**

## Modification

---

Cisco IOS XE Everest 16.5.1a

This command was introduced

To remove the macro from the switch, enter the **no** forms of the macro commands.

If you enter the **macro auto config** *macro-name* command, you are prompted to enter values for all the macro parameters.

Use the exact text string when entering the macro-name. The entries are case sensitive.

The user-defined values appear only in the **show macro auto** or **show running-config** command output.

## Example

This example shows how to display global macros:

Device# macro auto apply ?	
CISCO_SWITCH_AAA_ACCOUNTING	Configure aaa accounting parameters
CISCO_SWITCH_AAA_AUTHENTICATION	Configure aaa authentication parameters
CISCO_SWITCH_AAA_AUTHORIZATION	Configure aaa authorization parameters
CISCO_SWITCH_AUTO_IP_CONFIG	Configure the ip parameters
CISCO_SWITCH_AUTO_PCI_CONFIG	Configure PCI compliant parameters
CISCO_SWITCH_DOMAIN_NAME_CONFIG	Configure domain name
CISCO_SWITCH_ETHERCHANNEL_CONFIG	Configure the etherchannel parameters
CISCO_SWITCH_HOSTNAME_CONFIG	Configure hostname
CISCO_SWITCH_HTTP_SERVER_CONFIG	Configure http server
CISCO_SWITCH_LOGGING_SERVER_CONFIG	Configure logging server
CISCO_SWITCH_MGMT_VLAN_CONFIG	Configure management vlan parameters
CISCO_SWITCH_NAME_SERVER_CONFIG	Configure name server parameters
CISCO_SWITCH_NTP_SERVER_CONFIG	Configure NTP server
CISCO_SWITCH_RADIUS_SERVER_CONFIG	Configure radius server
CISCO_SWITCH_SETUP_SNMP_TRAPS	Configure SNMP trap parameters
CISCO_SWITCH_SETUP_USR_CONFIG	Configure the user parameters
CISCO_SWITCH_SNMP_SOURCE_CONFIG	Configure snmp source interface

CISCO_SWITCH_TACACS_SERVER_CONFIG	Configure tacacs server
CISCO_SWITCH_USER_PASS_CONFIG	Configure username and password
Device# <b>macro auto config ?</b>	
CISCO_SWITCH_AAA_ACCOUNTING	Configure aaa accounting parameters
CISCO_SWITCH_AAA_AUTHENTICATION	Configure aaa authentication parameters
CISCO_SWITCH_AAA_AUTHORIZATION	Configure aaa authorization parameters
CISCO_SWITCH_AUTO_IP_CONFIG	Configure the ip parameters
CISCO_SWITCH_AUTO_PCI_CONFIG	Configure PCI compliant parameters
CISCO_SWITCH_DOMAIN_NAME_CONFIG	Configure domain name
CISCO_SWITCH_ETHERCHANNEL_CONFIG	Configure the etherchannel parameters
CISCO_SWITCH_HOSTNAME_CONFIG	Configure hostname
CISCO_SWITCH_HTTP_SERVER_CONFIG	Configure http server
CISCO_SWITCH_LOGGING_SERVER_CONFIG	Configure logging server
CISCO_SWITCH_MGMT_VLAN_CONFIG	Configure management vlan parameters
CISCO_SWITCH_NAME_SERVER_CONFIG	Configure name server parameters
CISCO_SWITCH_NTP_SERVER_CONFIG	Configure NTP server
CISCO_SWITCH_RADIUS_SERVER_CONFIG	Configure radius server
CISCO_SWITCH_SETUP_SNMP_TRAPS	Configure SNMP trap parameters
CISCO_SWITCH_SETUP_USR_CONFIG	Configure the user parameters
CISCO_SWITCH_SNMP_SOURCE_CONFIG	Configure snmp source interface
CISCO_SWITCH_TACACS_SERVER_CONFIG	Configure tacacs server
CISCO_SWITCH_USER_PASS_CONFIG	Configure username and password

This example shows how to display the parameters for a specific macro:

```
Device# macro auto config CISCO_SWITCH_AUTO_IP_CONFIG ?
CISCO_SWITCH_DOMAIN_NAME_CONFIG      domain name parameters
CISCO_SWITCH_LOGGING_SERVER_CONFIG   logging host parameters
CISCO_SWITCH_NAME_SERVER_CONFIG     name server parameters
CISCO_SWITCH_NTP_SERVER_CONFIG      ntp server parameters
LINE                                Provide parameters of form [Parameters
                                         name=value]
<cr>

Device# macro auto config CISCO_SWITCH_AUTO_PCI_CONFIG ?
CISCO_SWITCH_AAA_ACCOUNTING        aaa accounting parameters
CISCO_SWITCH_AAA_AUTHENTICATION    aaa authentication parameters
CISCO_SWITCH_AAA_AUTHORIZATION     aaa authorization parameters
CISCO_SWITCH_HTTP_SERVER_CONFIG    http server parameters
CISCO_SWITCH_RADIUS_SERVER_CONFIG  radius server parameters
CISCO_SWITCH_TACACS_SERVER_CONFIG  tacacs server parameters
LINE                                Provide parameters of form [Parameters
                                         name=value]
<cr>

Device# macro auto config CISCO_SWITCH_SETUP_SNMP_TRAPS ?
CISCO_SWITCH_SNMP_SOURCE_CONFIG    snmp source parameters
LINE                                Provide parameters of form [Parameters
                                         name=value]
<cr>

Device# macro auto config CISCO_SWITCH_SETUP_USR_CONFIG ?CISCO_AUTO_TIMEZONE_CONFIG timezone
parameters                          parameters
CISCO_SWITCH_HOSTNAME_CONFIG       hostname parameter
LINE                                Provide parameters of form [Parameters
                                         name=value]
<cr>
```

This example shows how to set macro parameters and apply the macro using the CLI:

**macro auto**

```
Device# macro auto config CISCO_SWITCH_ETHERCHANNEL_CONFIG
Enter the port channel id[1-48] for 3K & 2350,[1-6] for 2K: 2
Enter the port channel type, Layer:[2-3(L3 not supported on 2K)]: 2
Enter etherchannel mode for the interface[auto/desirable/on/active/passive]: active
Enter the channel protocol[lacp/none]: lacp
Enter the number of interfaces to join the etherchannel[8-PAGP/MODE:ON,16-LACP]: 7
Enter interface name[GigabitEthernet3/0/3]: gigabitehernet1/0/1
Enter interface name[GigabitEthernet3/0/3]: gigabitehernet1/0/2
Enter interface name[GigabitEthernet3/0/3]: gigabitehernet1/0/3
Enter interface name[GigabitEthernet3/0/3]: gigabitehernet1/0/4
Enter interface name[GigabitEthernet3/0/3]: gigabitehernet1/0/5
Enter interface name[GigabitEthernet3/0/3]: gigabitehernet1/0/6
Enter interface name[GigabitEthernet3/0/3]: gigabitehernet1/0/7
Do you want to apply the parameters? [yes/no]: yes
Enter configuration commands, one per line. End with CNTL/Z.
Enter configuration commands, one per line. End with CNTL/Z.
Enter configuration commands, one per line. End with CNTL/Z.
Enter configuration commands, one per line. End with CNTL/Z.
Enter configuration commands, one per line. End with CNTL/Z.
Enter configuration commands, one per line. End with CNTL/Z.
Enter configuration commands, one per line. End with CNTL/Z.
Device# macro auto apply CISCO_SWITCH_ETHERCHANNEL_CONFIG
Enter configuration commands, one per line. End with CNTL/Z.
Device#
```

# macro auto apply (Cisco IOS shell scripting capability)

To configure and apply a global macro using the Cisco IOS shell scripting capability, use the **macro auto apply** command in privileged EXEC mode. Use the **no** form of this command to return to the default setting.

**macro auto apply** *macro-name*

<b>Syntax Description</b>	<b>apply</b> <i>macro-name</i>	Applies the macro. Specifies the macro name.
<b>Command Default</b>	No macros are applied to the switch.	
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Everest 16.5.1a	<b>Modification</b> This command was introduced.

<b>Usage Guidelines</b>	To remove the macro from the switch, enter the <b>no</b> forms of the macro commands. Use the exact text string when entering the <i>macro-name</i> . The entries are case sensitive. The user-defined values appear only in the <b>show macro auto</b> or <b>show running-config</b> command output. You can also use the Cisco IOS shell scripting capability to set the parameters. For examples, see the “Configuring and Applying Global Macros” section in the “Configuring Auto Smartports and Static Smartports Macros” chapter.
-------------------------	---

## Example

This example shows how to display global macros:

```
Device# macro auto apply ?

CISCO_SWITCH_AAA_ACCOUNTING          Configure aaa accounting parameters
CISCO_SWITCH_AAA_AUTHENTICATION        Configure aaa authentication parameters
CISCO_SWITCH_AAA_AUTHORIZATION         Configure aaa authorization parameters
CISCO_SWITCH_AUTO_IP_CONFIG           Configure the ip parameters
CISCO_SWITCH_AUTO_PCI_CONFIG          Configure PCI compliant parameters
CISCO_SWITCH_DOMAIN_NAME_CONFIG       Configure domain name
CISCO_SWITCH_ETHERCHANNEL_CONFIG      Configure the etherchannel parameters
CISCO_SWITCH_HOSTNAME_CONFIG          Configure hostname
CISCO_SWITCH_HTTP_SERVER_CONFIG       Configure http server
CISCO_SWITCH_LOGGING_SERVER_CONFIG    Configure logging server
CISCO_SWITCH_MGMT_VLAN_CONFIG        Configure management vlan parameters
CISCO_SWITCH_NAME_SERVER_CONFIG       Configure name server parameters
CISCO_SWITCH_NTP_SERVER_CONFIG        Configure NTP server
CISCO_SWITCH_RADIUS_SERVER_CONFIG    Configure radius server
CISCO_SWITCH_SETUP_SNMP_TRAPS        Configure SNMP trap parameters
CISCO_SWITCH_SETUP_USR_CONFIG        Configure the user parameters
CISCO_SWITCH_SNMP_SOURCE_CONFIG      Configure snmp source interface
```

**macro auto apply (Cisco IOS shell scripting capability)**

CISCO_SWITCH_TACACS_SERVER_CONFIG	Configure tacacs server
CISCO_SWITCH_USER_PASS_CONFIG	Configure username and password

# macro auto config (Cisco IOS shell scripting capability)

To configure and apply a global macro, use the **macro auto config** command in privileged EXEC mode. Use the **no** form of this command to return to the default setting.

**macro auto config** *macro-name* [*parameter=value* [*parameter=value*]...]

<b>Syntax Description</b>	<b>config</b> Enters the macro parameters. <b>macro-name</b> Specifies the macro name. <i>parameter=value</i> [ <i>parameter=value</i> ...] <i>parameter=value</i> —Replaces values for global macro parameter values. Enter values in the form of name value pair separated by a space: <name1>=<value1> [<name2>=<value2>...]				
<b>Command Default</b>	No macros are applied to the switch.				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				

<b>Usage Guidelines</b>	To remove the macro from the switch, enter the <b>no</b> forms of the macro commands.  If you enter the <b>macro auto config</b> <i>macro-name</i> command, you are prompted to enter values for all the macro parameters.  Use the exact text string when entering the <i>macro-name</i> and <i>parameters</i> . The entries are case sensitive. The user-defined values appear only in the <b>show macro auto</b> or <b>show running-config</b> command output.  You can also use the Cisco IOS shell scripting capability to set the parameters. For examples, see the “Configuring and Applying Global Macros” section in the “Configuring Auto Smartports and Static Smartports Macros” chapter.
-------------------------	--

## macro auto control

To specify when the switch applies an Auto Smartports macro based on the detection method, device type, or trigger (referred to as event trigger control), use the **macro auto control** command in interface configuration mode. Use the **no** form of this command to disable trigger-to-macro mapping. The switch then does not apply macros based on event triggers.

```
macro auto control {detection [cdp] [lldp] [mac-address] | device [ip-camera] [media-player] [phone]
[lightweight-ap] [access-point] [router] [switch] | trigger [last-resort]}
no macro auto control {detection [cdp] [lldp] [mac-address] | device [ip-camera] [media-player]
[phone] [lightweight-ap] [access-point] [router] [switch] | trigger [last-resort]}
```

---

<b>Syntax Description</b>	<b>detection [cdp] [lldp] [mac-address]</b>	detection—Sets one or more of these as an event trigger: <ul style="list-style-type: none"> <li>• (Optional) <b>cdp</b>—CDP messages</li> <li>• (Optional) <b>lldp</b>—LLDP messages</li> <li>• (Optional) <b>mac-address</b>—User-defined MAC address groups</li> </ul>
	<b>device [access-point] [ip-camera] [lightweight-ap]</b> <b>[media-player] [phone] [router] [switch]</b>	device—Sets one or more of these devices as an event trigger: <ul style="list-style-type: none"> <li>• (Optional) <b>access-point</b>—Autonomous access point</li> <li>• (Optional) <b>ip-camera</b>—Cisco IP video surveillance camera</li> <li>• (Optional) <b>lightweight-ap</b>—Lightweight access point</li> <li>• (Optional) <b>media-player</b>—Digital media player</li> <li>• (Optional) <b>phone</b>—Cisco IP phone</li> <li>• (Optional) <b>router</b>—Cisco router</li> <li>• (Optional) <b>switch</b>—Cisco switch</li> </ul>
	<b>trigger [last-resort]</b>	trigger—Sets a specific event trigger. <ul style="list-style-type: none"> <li>• (Optional) <b>last-resort</b>—Last-resort trigger.</li> </ul>

---

<b>Command Default</b>	The switch uses the device type as the event trigger. If the switch cannot determine the device type, it uses MAC address groups, MAB messages, 802.1x authentication messages, and LLDP messages in random order.				
<b>Command Modes</b>	Interface configuration (config-if)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Everest 16.5.1a	This command was introduced.
Release	Modification				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				

<b>Usage Guidelines</b>	If you do not set event triggers, the switch uses the device type as the event trigger. If the switch cannot determine the device type, it uses MAC address groups, MAB messages, 802.1x authentication messages, and LLDP messages in random order.
	To verify that a macro is applied to an interface, use the <b>show macro auto interface</b> command in user EXEC mode.

### Example

This example shows how to set LLDP messages and MAC address groups as event triggers:

```
Device(config)# interface gigabitethernet 5/0/2
Device(config-if)# macro auto control detection lldp mac-address
Device(config-if)# exit
Device(config)# end
```

This example shows how to set access points, video surveillance cameras, and digital media players as event triggers:



**Note** The switch applies a built-in macro only when it detects an access point, video surveillance camera, or digital media player.

```
Device(config)# interface gigabitethernet 5/0/1
Device(config-if)# macro auto control device access-point ip-camera media-player
Device(config-if)# exit
Device(config)# end
```

## macro auto execute

To replace built-in macro default values and to configure mapping from an event trigger to a built-in or user-defined macro, use the **macro auto execute** command in global configuration mode.

```
macro auto execute event trigger {builtin built-in macro | remote url} {parameter=value} {function contents}  

no macro auto execute event trigger {builtin built-in macro | remote url} {parameter=value} {function contents}
```

---

Syntax Description		
	<i>event trigger</i>	<p>Defines mapping from an event trigger to a built-in macro.</p> <p>Specifies an event trigger:</p> <ul style="list-style-type: none"> <li>• CISCO_CUSTOM_EVENT</li> <li>• CISCO_DMP_EVENT</li> <li>• CISCO_IPVSC_EVENT</li> <li>• CISCO_LAST_RESORT_EVENT</li> <li>• CISCO_PHONE_EVENT</li> <li>• CISCO_ROUTER_EVENT</li> <li>• CISCO_SWITCH_EVENT</li> <li>• CISCO_WIRELESS_AP_EVENT</li> <li>• CISCO_WIRELESS_LIGHTWEIGHT_AP_EVENT</li> <li>• WORD—Apply a user-defined event trigger such as a MAC address group</li> </ul>

---

---

<b>builtin built-in macro name</b>	(Optional) Specifies a builtin built-in macro name: <ul style="list-style-type: none"><li>• CISCO_AP_AUTO_SMARTPORT Specify the parameter value: NATIVE_VLAN=1.</li><li>• CISCO_DMP_AUTO_SMARTPORT Specify the parameter value: ACCESS_VLAN=1.</li><li>• CISCO_IPVSC_AUTO_SMARTPORT Specify the parameter value: ACCESS_VLAN=1.</li><li>• CISCO_LWAP_AUTO_SMARTPORT Specify the parameter value: ACCESS_VLAN=1.</li><li>• CISCO_PHONE_AUTO_SMARTPORT Specify the parameter values: ACCESS_VLAN=1 and VOICE_VLAN=2.</li><li>• CISCO_ROUTER_AUTO_SMARTPORT Specify the parameter value: NATIVE_VLAN=1.</li><li>• CISCO_SWITCH_AUTO_SMARTPORT Specify the parameter value: NATIVE_VLAN=1.</li></ul>
<i>parameter=value</i>	(Optional) <i>parameter=value</i> —Replaces default values for parameter values shown for the <i>builtin-macro name</i> , for example, ACCESS_VLAN=1. Enter new values in the form of name value pair separated by a space: [<name1>=<value1><name2>=<value2>...].
{ <i>function contents</i> }	(Optional) { <i>function contents</i> }—Specifies a user-defined macro to associate with the trigger. Enter the macro contents within braces. Begin the Cisco IOS shell commands with the left brace and end the command grouping with the right brace.

---

---

<b>remote url</b>	(Optional) Specifies a remote server location: <ul style="list-style-type: none"> <li>The syntax for the local flash file system on the standalone switch or the stack's active switch: <b>flash</b>:</li> </ul> The syntax for the local flash file system on a stack member: <b>flash member number</b> : The syntax for the FTP: <b>ftp:[//username[:password]@location]/directory]/filename</b> The syntax for an HTTP server: <b>http://[[username:password]@]{hostname   host-ip}[/directory]/filename</b> The syntax for a secure HTTP server: <b>https://[[username:password]@]{hostname   host-ip}[/directory]/filename</b> The syntax for the NVRAM: <b>nvram://[[username:password]@][/directory]/filename</b> The syntax for the Remote Copy Protocol (RCP): <b>rcp:[//username@location]/directory]/filename</b> The syntax for the Secure Copy Protocol (SCP): <b>scp:[//username@location]/directory]/filename</b> The syntax for the TFTP: <b>tftp:[//location]/directory]/filename</b>
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<b>Command Default</b>	None				
<b>Command Modes</b>	Global configuration (config)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				
<b>Usage Guidelines</b>	<p>Use the <b>macro auto execute</b> command to replace the built-in macro default values with values that are specific to your switch.</p> <p>The switch automatically maps from event triggers to built-in macros. The built-in macros are system-defined macros in the software image. You can also create user-defined macros by using the Cisco IOS shell scripting capability.</p> <p>You can create new event triggers by using the <b>shell trigger</b> commands in global configuration mode. Use the <b>show shell triggers</b> command in privileged EXEC to display the contents of the user-defined triggers and macros.</p> <p>You can use the <b>macro auto mac-address-group</b> command in global configuration mode to create event triggers for devices that do not support Cisco Discovery Protocol (CDP) or Link Layer Discovery Protocol (LLDP).</p>				

You can use the remote macro feature to store macros in a central location for designated network switches to use. You can then maintain and update the macro files for use by multiple switches. Use **remote url** to configure the remote server location and macro path information. There are no specific file extension requirements for saved macro files.

Auto Smartports macros and antimacros (the antimacro is the portion of the applied macro that removes it at link down) have these guidelines and limitations:

- You can delete or change the built-in macros. However, you can override a built-in macro by creating a user-defined macro with the same name. To restore the original built-in macro, delete the user-defined macro.
- If you enable both the **macro auto device** and the **macro auto execute** commands, the parameters specified in the command last executed are applied to the switch. Only one command is active on the switch.
- To avoid system conflicts when macros are applied, remove all port configurations except for 802.1x authentication.
- Do not configure port security when enabling Auto SmartPorts on the switch.
- If the macro conflicts with the original configuration, either the macro does not apply some of the original configuration commands, or the antimacro does not remove them. (The antimacro is the portion of the applied macro that removes the macro at a link-down event.)
- For example, if 802.1x authentication is enabled, you cannot remove the switchport-mode access configuration. Remove the 802.1x authentication before removing the switchport mode configuration.
- A port cannot be a member of an EtherChannel when you apply Auto SmartPorts macros.
- The built-in-macro default data VLAN is VLAN 1. The default voice VLAN is VLAN 2. If your switch uses different access, native, or voice VLANs, use the **macro auto device** or the **macro auto execute** commands to configure the values.
- For 802.1x authentication or MAC authentication bypass (MAB), to detect non-Cisco devices, configure the RADIUS server to support the Cisco attribute-value pair **auto-smart-port=event trigger**.
- The switch supports Auto SmartPort macros only on directly connected devices. Multiple device connections, such as hubs, are not supported.
- If authentication is enabled on a port, the switch ignores a MAC address trigger if authentication fails.
- The order of CLI commands within the macro and the corresponding antimacro can be different.

### Example

This example shows how to use two built-in macros for connecting Cisco switches and Cisco IP phones to the switch. This example modifies the default voice VLAN, access VLAN, and native VLAN for the trunk interface:

```
Device(config)# !!! the next command modifies the access and voice vlans
Device(config)# !!! for the built in Cisco IP phone auto smartport macro
Device(config)# macro auto execute CISCO_PHONE_EVENT builtin CISCO_PHONE_AUTO_SMARTPORT
ACCESS_VLAN=10 VOICE_VLAN=20
Device(config)# !!! the next command modifies the Native vlan used for inter switch trunks
```

**macro auto execute**

```

Device(config)# macro auto execute CISCO_SWITCH_EVENT builtin CISCO_SWITCH_AUTO_SMARTPORT
NATIVE_VLAN=10
Device(config)# !!! the next command enables auto smart ports globally
Device(config)# macro auto global processing
Device(config)# exit
Device# !!! here is the running configuration of the interface connected
Device# !!! to another Cisco Switch after the Macro is applied
Device# show running-config interface gigabitethernet1/0/1
Building configuration...

Current configuration : 284 bytes
!
interface GigabitEthernet1/0/1
switchport trunk encapsulation dot1q
switchport trunk native vlan 10
switchport mode trunk
srr-queue bandwidth share 10 10 60 20
queue-set 2
priority-queue out
mls qos trust cos
auto qos voip trust
macro description CISCO_SWITCH_EVENT
end

```

This example shows how to map a user-defined event trigger called media player to a user-defined macro

1. Connect the media player to an 802.1x- or MAB-enabled switch port.
2. On the RADIUS server, set the attribute-value pair to auto-smart-port=DMP\_EVENT
3. On the switch, create the event trigger DMP\_EVENT, and enter the user-defined macro commands.
4. The switch recognizes the attribute-value pair=DMP\_EVENT response from the RADIUS server and applies the macro associated with this event trigger.

```

Device(config)# shell trigger DMP_EVENT mediaplayer
Device(config)# macro auto execute DMP_EVENT {
if [[ $LINKUP == YES ]]; then
conf t
    interface $INTERFACE
        macro description $TRIGGER
        switchport access vlan 1
        switchport mode access
        switchport port-security
        switchport port-security maximum 1
        switchport port-security violation restrict
        switchport port-security aging time 2
        switchport port-security aging type inactivity
        spanning-tree portfast
        spanning-tree bpduguard enable
        exit
fi
if [[ $LINKUP == NO ]]; then
conf t
    interface $INTERFACE
        no macro description $TRIGGER
        no switchport access vlan 1
        if [[ $AUTH_ENABLED == NO ]]; then
            no switchport mode access
fi

```

```

no switchport port-security
no switchport port-security maximum 1
no switchport port-security violation restrict
no switchport port-security aging time 2
no switchport port-security aging type inactivity
no spanning-tree portfast
no spanning-tree bpduguard enable
exit
fi

```

**Table 38: Supported Cisco IOS Shell Keywords**

<b>Command</b>	<b>Description</b>
{	Begin the command grouping.
}	End the command grouping.
[[	Use as a conditional construct.
]]	Use as a conditional construct.
else	Use as a conditional construct.
==	Use as a conditional construct.
fi	Use as a conditional construct.
if	Use as a conditional construct.
then	Use as a conditional construct.
-z	Use as a conditional construct.
\$	Variables that begin with the \$ character are replaced with a parameter value.
#	Use the # character to enter comment text.

**Table 39: Unsupported Cisco IOS Shell Reserved Keywords**

<b>Command</b>	<b>Description</b>
	Pipeline.
case	Conditional construct.
esac	Conditional construct.
for	Looping construct.
function	Shell function.
in	Conditional construct.
select	Conditional construct.

**macro auto execute**

Command	Description
time	Pipeline.
until	Looping construct.
while	Looping construct.

# macro auto global control

To specify when the switch applies an Auto Smartports macro based on the device type or trigger (referred to as event trigger control), use the **macro auto global control** command in global configuration mode. Use the **no** form of this command to disable trigger-to-macro mapping.

```
macro auto global control {detection [cdp] [lldp][mac-address] | device [access-point] [ip-camera]
[lightweight-ap] [media-player] [phone] [router] [switch] | trigger [last-resort]}
no macro auto global control {detection [cdp] [lldp] [mac-address] | device [access-point] [ip-camera]
[lightweight-ap] [media-player] [phone] [router] [switch] | trigger [last-resort]}
```

<b>Syntax Description</b>	<b>detection [cdp] [lldp] [mac-address]</b>	<b>detection</b> —Sets one or more of these as an event trigger: <ul style="list-style-type: none"> <li>• (Optional) <b>cdp</b>—CDP messages</li> <li>• (Optional) <b>lldp</b>—LLDP messages</li> <li>• (Optional) <b>mac-address</b>—User-defined MAC address groups</li> </ul>
	<b>device [access-point] [ip-camera] [lightweight-ap] [media-player] [phone] [router] [switch]</b>	<b>device</b> —Sets one or more of these devices as an event trigger: <ul style="list-style-type: none"> <li>• (Optional) <b>access-point</b>—Autonomous access point</li> <li>• (Optional) <b>ip-camera</b>—Cisco IP video surveillance camera</li> <li>• (Optional) <b>lightweight-ap</b>—Lightweight access point</li> <li>• (Optional) <b>media-player</b>—Digital media player</li> <li>• (Optional) <b>phone</b>—Cisco IP phone</li> <li>• (Optional) <b>router</b>—Cisco router</li> <li>• (Optional) <b>switch</b>—Cisco switch</li> </ul>
	<b>trigger [last-resort]</b>	<b>trigger</b> —Sets a specific event trigger. <ul style="list-style-type: none"> <li>• (Optional) <b>last-resort</b>—Last-resort trigger.</li> </ul>

**Command Default** The switch uses the device type as the event trigger. If the switch cannot determine the device type, it uses MAC address groups, MAB messages, 802.1x authentication messages, and LLDP messages in random order.

<b>Command Modes</b>	Global configuration (config)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

**Usage Guidelines** If you do not set event triggers, the switch uses the device type as the event trigger. If the switch cannot determine the device type, it uses MAC address groups, MAB messages, 802.1x authentication messages, and LLDP messages in random order.

To verify that a macro is applied to a switch, use the **show macro auto global** command in user EXEC mode.

### Example

This example shows how to set CDP messages, LLDP messages and MAC address groups as event triggers:

```
Device(config)# macro auto global control detection cdp lldp mac-address
Device(config)# end
```

This example shows how to set autonomous access points, lightweight access points, and IP phones:

```
Device(config)# macro auto global control device access-point lightweight-ap phone
Device(config)# end
```

# macro auto global processing

To enable Auto SmartPorts macros on the switch, use the **macro auto global processing** command in global configuration mode. Use the **no** form of this command to disable the macros.

**macro auto global processing**

**no macro auto global processing**

**Command Default** Auto Smartports is disabled.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

**Usage Guidelines** Use the **macro auto global processing** command to globally enable macros on the switch. To disable macros on a specific port, use the **no macro auto processing** command in interface mode.

When using 802.1x or MAB authentication, you need to configure the RADIUS server to support the Cisco attribute-value pair **auto-smart-port=event trigger**. If authentication fails, the macro is not applied. If the 802.1x or MAB authentication fails on the interface, the switch does not use the fallback CDP event trigger.

When CDP-identified devices advertise multiple capabilities, the switch chooses a capability first by switch and then by router.

To verify that a macro is applied to an interface, use the **show macro auto interface** command in privileged EXEC mode.

## Example

This example shows how to enable Auto SmartPorts on the switch and to disable the feature on a specific interface:

```
Device(config)# macro auto global processing
Device(config)# interface gigabitethernet 0/1
Device(config-if)# no macro auto processing
Device(config-if)# exit
Device(config)#

```

---

macro auto mac-address-group

# macro auto mac-address-group

To create an event trigger for devices that do not support Cisco Discovery Protocol (CDP) or Link Layer Discover Protocol (LLDP), use the **macro auto mac-address-group** command in global configuration mode. Use the **no** form of this command to delete the group.

```
macro auto mac-address-group name {mac-address list list | oui {list list | range start-value size number}}
no macro auto mac-address-group name {mac-address list list | oui {list list | range start-value size number}}
```

Syntax Description	<b>name</b> Specifies the group name. <b>ui</b> (Optional) Specifies an operationally unique identifier (OUI) <b>list</b> or <b>range</b> . <ul style="list-style-type: none"> <li>• <b>list</b>—Enter an OUI list in hexadecimal format separated by spaces.</li> <li>• <b>range</b>—Enter the starting OUI hexadecimal value (<i>start-value</i>).</li> <li>• <b>size</b>—Enter the length of the range (number) from 1 to 5 to create a list of sequential addresses.</li> </ul>				
<b>mac-address list list</b>	(Optional) Configures a list of MAC addresses separated by a space.				
<b>Command Default</b>	No groups are defined.				
<b>Command Modes</b>	Group configuration (config-addr-grp-mac)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Everest 16.5.1a	This command was introduced.
Release	Modification				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				
<b>Usage Guidelines</b>	<p>Use the <b>macro auto mac-address-group</b> command to create an event trigger for devices that do not support CDP or LLDP. Use the MAC address group as a trigger to map to a built-in or user-defined macro by using the <b>macro auto execute</b> command. At link-up the switch detects the device type and applies the specified macro.</p> <p>The switch supports up to ten MAC address groups. Each group can have up to 32 OUI and 32 MAC configured addresses.</p>				

## Example

This example shows how to create a MAC-address-group event trigger called *address\_trigger* and how to verify your entries:

```
Device(config)# macro auto mac-address-group mac address_trigger
Device(config-addr-grp-mac)# mac-address list 2222.3333.3334 22.33.44 a.b.c
Device(config-addr-grp-mac)# oui list 455555 233244
```

```
Device(config-addr-grp-mac)# oui range 333333 size 2
Device(config-addr-grp-mac)# exit
Device(config)# end
Device# show running configuration
!
!macro auto mac-address-group address_trigger
oui list 333334
oui list 333333
oui list 233244
oui list 455555
mac-address list 000A.000B.000C
mac-address list 0022.0033.0044
mac-address list 2222.3333.3334
!
<output truncated>
```

# macro auto processing

To enable Auto SmartPorts macros on an interface, use the **macro auto processing** command in interface configuration mode. Use the no form of this command to disable the macros.

**macro auto processing**

**no macro auto processing**

<b>Command Default</b>	Auto SmartPorts is disabled.				
<b>Command Modes</b>	Interface configuration (config-if)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				

**Usage Guidelines** Use the **macro auto processing** command, in interface configuration mode, to enable macros on a specific interface. To disable macros on a specific interface, use the **no macro auto processing** command, in interface configuration mode.

A port cannot be a member of an EtherChannel when you apply Auto SmartPorts macros. If you use EtherChannels, disable Auto SmartPorts on the EtherChannel interface by using the **no macro auto processing** command. The EtherChannel interface applies the configuration to the member interfaces.

To verify that a macro is applied to an interface, use the **show macro auto interface** command in privileged EXEC mode.

## Example

This example shows how to enable Auto SmartPorts on the switch and to disable the feature on a specific interface:

```
Device(config)# interface gigabitethernet 0/1
Device(config-if)# no macro auto processing
Device(config-if)# exit
Device(config)# macro auto global processing
```

# macro auto sticky

To configure macros to remain active after a link-down event, referred to as macro persistence, use the **macro auto sticky** command in global configuration mode. Use the **no** form of this command to disable the macro persistence.

**macro auto sticky**  
**no macro auto sticky**

**Command Default** Macro persistence is disabled.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

**Usage Guidelines** Use the **macro auto sticky** command so that macros remain active after a link-down event.

## Example

This example shows how to enable macro persistence on an interface:

```
Device(config)# interface gigabitethernet 5/0/2
Device(config-if)# macro auto port sticky
Device(config-if)# exit
Device(config)# end
```

# macro auto trigger

To enter the configure-macro-trigger mode and define a trigger for a device that has no built-in trigger and associate the trigger with a device or profile, use the **macro auto trigger** command in global configuration mode. To remove the user-defined trigger, use the **no** form of this command.

```
macro auto trigger trigger_name {device | exit | no | profile}
no macro auto trigger trigger_name {device | exit | no | profile}
```

<b>Syntax Description</b>	<table border="0"> <tr> <td><i>trigger_name</i></td><td>Specifies a trigger to be associated with the device type or profile name.</td></tr> <tr> <td><b>device</b></td><td>Specifies a device name to map to the named trigger.</td></tr> <tr> <td><b>exit</b></td><td>Exits device group configuration mode.</td></tr> <tr> <td><b>no</b></td><td>Removes any configured device.</td></tr> <tr> <td><b>profile</b></td><td>Specifies a profile name to map to the named trigger.</td></tr> </table>	<i>trigger_name</i>	Specifies a trigger to be associated with the device type or profile name.	<b>device</b>	Specifies a device name to map to the named trigger.	<b>exit</b>	Exits device group configuration mode.	<b>no</b>	Removes any configured device.	<b>profile</b>	Specifies a profile name to map to the named trigger.
<i>trigger_name</i>	Specifies a trigger to be associated with the device type or profile name.										
<b>device</b>	Specifies a device name to map to the named trigger.										
<b>exit</b>	Exits device group configuration mode.										
<b>no</b>	Removes any configured device.										
<b>profile</b>	Specifies a profile name to map to the named trigger.										
<b>Command Default</b>	No user-defined triggers are configured.										
<b>Command Modes</b>	Global configuration (config)										
<b>Command History</b>	<table border="0"> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> <tr> <td>Cisco IOS XE Everest 16.5.1a</td> <td>This command was introduced.</td> </tr> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.5.1a	This command was introduced.						
<b>Release</b>	<b>Modification</b>										
Cisco IOS XE Everest 16.5.1a	This command was introduced.										

**Usage Guidelines** If a device is classified by the Device Classifier, but does not have a built-in trigger defined, use the **macro auto trigger** command, in global configuration mode, to define a trigger based on a device name or a profile name. After you enter the command, the switch is in the configure-macro-trigger mode and the **device**, **exit**, **no**, and **profile** keywords are visible. In this mode, you can provide a device name or a profile name to map to the trigger. It is not necessary to map the trigger to both a device name and a profile name. If you map the trigger to both names, the trigger-to-profile name mapping has preference for macro application.

You must use this command to configure a trigger when you configure a user-defined macro. The trigger name is required for the custom macro configuration.

After the device is profiled, you must add the complete string to the device-group database.

## Example

This example shows how to configure a user-defined trigger for a profile called DMP\_EVENT mediaplayer for use with a media player that has no built-in trigger:

```
Device(config)# macro auto trigger DMP
Device(config-macro-trigger)# profile mediaplayer-DMP
Device(config-macro-trigger)# exit
```

# macro description

To enter a description about which macros are applied to an interface, use the **macro description** command in interface configuration mode. Use the **no** form of this command to remove the description. This command is mandatory for Auto SmartPorts to work.

**macro description** *text*  
**no macro description** *text*

<b>Syntax Description</b>	<b>description</b> <i>text</i>	Enters a description about the macros that are applied to the specified interface.
<b>Command Default</b>	This command has no default setting.	
<b>Command Modes</b>	Interface configuration (config-if)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

**Usage Guidelines** Use the **description** keyword to associate comment text or the macro name with an interface. When multiple macros are applied on a single interface, the description text is from the last applied macro.  
You can verify your settings by entering the **show parser macro description** command in privileged EXEC mode.

## Example

This example shows how to add a description to an interface:

```
Device(config-if)# macro description duplex settings
```

# macro global

To apply a macro to a switch or to apply and debug a macro on a switch, use the **macro global** command in global configuration mode.

**macro global {apply | trace} *macro-name* [parameter {value}] [parameter {value}] [parameter {value}]**  
parameter

Syntax Description					
<b>apply</b>	Applies a macro to the switch.				
<b>trace</b>	Applies a macro to a switch and debugs the macro.				
<i>macro-name</i>	Specifies the name of the macro.				
<b>parameter value</b>	(Optional) Specifies unique parameter values that are specific to the switch. You can enter up to three keyword-value pairs. Parameter keyword matching is case sensitive. All matching occurrences of the keyword are replaced with the corresponding value.				
<b>Command Default</b>	This command has no default setting.				
<b>Command Modes</b>	Global configuration (config)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Everest 16.5.1a	This command was introduced.
Release	Modification				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				
<b>Usage Guidelines</b>					



**Note** You can delete a global macro-applied configuration on a switch only by entering the no version of each command in the macro.

Use the **macro global apply *macro-name*** command to apply the macro to an interface.

Use the **macro global trace *macro-name*** command to apply and then debug the macro to find any syntax or configuration errors.

If a command fails when you apply a macro because of a syntax error or a configuration error, the macro continues to apply the remaining commands to the switch.

When creating a macro that requires the assignment of unique values, use the **parameter value** keywords to designate values specific to the switch.

Keyword matching is case sensitive. All matching occurrences of the keyword are replaced with the corresponding value. Any full match of a keyword, even if it is part of a larger string, is considered a match and is replaced by the corresponding value.

Some macros might contain keywords that require a parameter value. You can use the **macro global apply *macro-name* ?** command to display a list of any required values in the macro. If you apply a macro without entering the keyword values, the commands are invalid and are not applied.

There are Cisco-default Smartports macros embedded in the switch software. You can display these macros and the commands they contain by using the **show parser macro** command in user EXEC mode.

Follow these guidelines when you apply a Cisco-default Smartports macro on a switch:

- Display all macros on the switch by using the **show parser macro** command. Display the contents of a specific macro by using the **show parser macro name macro-name** command.
- Keywords that begin with \$ mean that a unique parameter value is required. Append the Cisco-default macro with the required values by using the **parameter value** keywords.

The Cisco-default macros use the \$ character to help identify required keywords. There is no restriction on using the \$ character to define keywords when you create a macro.

When you apply a macro to a switch, the macro name is automatically added to the switch. You can display the applied commands and macro names by using the **show running-config** command.

### Example

After you have created a new macro by using the **macro auto execute** command, you can apply it to a switch. This example shows how to view the **snmp** macro, how to apply the macro, set the hostname to test-server, and set the IP precedence value to 7:

```
Device# show parser macro name snmp
Macro name : snmp
Macro type : customizable

#enable port security, linkup, and linkdown traps
snmp-server enable traps port-security
snmp-server enable traps linkup
snmp-server enable traps linkdown
#set snmp-server host
snmp-server host ADDRESS
#set SNMP trap notifications precedence
snmp-server ip precedence VALUE

-----
Switch(config)# macro global apply snmp ADDRESS test-server VALUE 7
```

To debug a macro, use the **macro global trace** command to find any syntax or configuration errors in the macro when you apply it to a switch. In this example, the **ADDRESS** parameter value was not entered, the **snmp-server host** command failed, and the remainder of the macro is applied to the switch:

```
Device(config)# macro global trace snmp VALUE 7
Applying command... 'snmp-server enable traps port-security'
Applying command... 'snmp-server enable traps linkup'
Applying command... 'snmp-server enable traps linkdown'
Applying command... 'snmp-server host'
%Error Unknown error.
Applying command... 'snmp-server ip precedence 7'
```

# macro global description

To enter a description about the macros that are applied to a switch, use the **macro global description** command in global configuration mode. Use the **no** form of this command to remove the description.

**macro global description** *text*

**no macro global description** *text*

<b>Syntax Description</b>	<b>description</b> <i>text</i>	Enters a description about the macros that are applied to the switch.
<b>Command Default</b>	This command has no default setting.	
<b>Command Modes</b>	Global configuration (config)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Usage Guidelines</b>	<p>Use the <b>description</b> keyword to associate comment text or the macro name with a switch. When multiple macros are applied on a switch, the description text is from the last applied macro.</p> <p>You can verify your settings by entering the <b>show parser macro description</b> command in privileged EXEC mode.</p>	

## Example

This example shows how to add a description to a switch:

```
Device(config)# macro global description udld aggressive mode enabled
```

# max-endpoints (coap-proxy configuration)

To specify the maximum number of endpoints that can be learnt on the device, use the **max-endpoints** command in coap-proxy configuration mode. To return to the default settings, use the **no** form of the command.

**max-endpoints** *number*  
**no max-endpoints**

<b>Syntax Description</b>	<i>number</i>	Range is from 1 to 500
<b>Command Default</b>	The default number of endpoints is 10.	
<b>Command Modes</b>	coap-proxy configuration (config-coap-proxy)	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Everest 16.5.1a	<b>Modification</b> This command was introduced.
<b>Usage Guidelines</b>	To access coap-proxy configuration mode, enter the <b>coap proxy</b> command in global configuration mode.	

## Example

This example shows how to specify maximum endpoints as 12 that can be learnt on the device.

```
Device(config)# coap proxy  
Device(config-coap-proxy)# max-endpoints 12
```

# port-dtls (coap-proxy configuration)

To configure a Datagram Transport Layer Security (DTLS) port, use the **port-dtls** command in coap-proxy configuration mode. To return to the default settings, use the **no** form of the command.

**port-dtls** *number*  
**no port-dtls**

<b>Syntax Description</b>	<i>number</i>	Range is from 1 to 65000.
<b>Command Default</b>	The default port is 5683.	
<b>Command Modes</b>	coap-proxy configuration (config-coap-proxy)	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Everest 16.5.1a	<b>Modification</b> This command was introduced.
<b>Usage Guidelines</b>	To access coap-proxy configuration mode, enter the <b>coap proxy</b> command in global configuration mode.	

## Example

This example shows how to configure a dtls port .

```
Device(config)# coap proxy
Device(config-coap-proxy)# port-dtls 5899
```

# port-unsecure (coap-proxy configuration)

To configure a port, use the **port-unsecure** command in coap-proxy configuration mode. To return to the default settings, use the **no** form of the command.

**port-unsecure** *number*  
**no port-dtls**

<b>Syntax Description</b>	<i>number</i>	Range is from 1 to 65000.
<b>Command Default</b>	The default port is 5683.	
<b>Command Modes</b>	coap-proxy configuration (config-coap-proxy)	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Everest 16.5.1a	<b>Modification</b> This command was introduced.
<b>Usage Guidelines</b>	To access coap-proxy configuration mode, enter the <b>coap proxy</b> command in global configuration mode.	

## Example

This example shows how to configure a port .

```
Device(config)# coap proxy
Device(config-coap-proxy)# port-unsecure 5899
```

# resource directory (coap-proxy configuration)

To unicast upstream resource directory server to which the switch can act as a COAP client, use the **resource directory** command in coap-proxy configuration mode. To return to the default settings, use the **no** form of the command.

A maximum of five ip-lists can be configured, for each ipv4 or ipv6, using the resource directory command.

```
resource directory {ipv4 | ipv6}[ip-address]
no resource directory
```

<b>Syntax Description</b>	<b>ipv4 ip-address</b>	Specifies IPv4 address.
	<b>ipv6 ip-address</b>	Specifies IPv6 address.
<b>Command Modes</b>		
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Usage Guidelines</b>		
	To access coap-proxy configuration mode, enter the <b>coap proxy</b> command in global configuration mode.	

## Example

This example shows how to unicast upstream resource directory server to which the switch can act as a COAP client.

```
Device(config)# coap proxy
Device(config-coap-proxy)# resource-directory ipv4 192.168.1.1
```

# security (coap-proxy configuration)

To configure CoAP security features, use the **security** command in coap-proxy configuration mode. To return to the default settings, use the **no** form of the command.

```
security {none [{ipv4 { ip-address ip-mask/prefix} | ipv6{ ip-address ip-mask/prefix} | list{ipv4-list-name
ipv6-list-name}}]} | dtls {[id-trustpoint {identity-trustpoint label}][verification-trustpoint {
verification-trustpoint}]} | [{ipv4 { ip-address ip-mask/prefix} | ipv6{ ip-address ip-mask/prefix} |
list{ipv4-list-name ipv6-list-name}}]}
no security
```

<b>Syntax Description</b>	<p><b>none</b> Indicates no security on that port.</p> <p><b>Note</b> A maximum of five ipv4 and five ipv6 addresses can be associated.</p>				
<b>dtls</b>	The DTLS security takes RSA trustpoint and Verification trustpoint which are optional. Without 1.1.0.0 255.255.0.0 Verification trustpoint it does the normal Public Key Exchange.				
	<p><b>Note</b> A maximum of five ipv4 and five ipv6 addresses can be associated.</p>				
<b>Command Modes</b>	coap-proxy configuration (config-coap-proxy)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				
<b>Usage Guidelines</b>	To access coap-proxy configuration mode, enter the <b>coap proxy</b> command in global configuration mode.				

## Example

This example shows how to configure no security on the port.

```
Device(config)# coap proxy
Device(config-coap-proxy)# security none ipv4 1.1.0.0 255.255.0.0
```

# shell trigger

To create an event trigger, use the **shell trigger** command in global configuration mode. Use the **no** form of this command to delete the trigger.

**shell trigger identifier description**

**no shell trigger identifier description**

<b>Syntax Description</b>	<i>identifier</i> Specifies the event trigger identifier. The identifier should have no spaces or hyphens between words. <i>description</i> Specifies the event trigger description text.
---------------------------	--

**Command Default** System-defined event triggers:

- CISCO\_DMP\_EVENT
- CISCO\_IPVSC\_AUTO\_EVENT
- CISCO\_PHONE\_EVENT
- CISCO\_SWITCH\_EVENT
- CISCO\_ROUTER\_EVENT
- CISCO\_WIRELESS\_AP\_EVENT
- CISCO\_WIRELESS\_LIGHTWEIGHT\_AP\_EVENT

**Command Modes** Global configuration (config)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

**Usage Guidelines** Use this command to create user-defined event triggers for use with the **macro auto device** and the **macro auto execute** commands.

To support dynamic device discovery when using IEEE 802.1x authentication, you need to configure the RADIUS authentication server to support the Cisco attribute-value pair: **auto-smart-port=event trigger**.

## Example

This example shows how to create a user-defined event trigger called RADIUS\_MAB\_EVENT:

```
Device(config)# shell trigger RADIUS_MAB_EVENT MAC_AuthBypass Event
Device(config)# end
```

# show coap dtls endpoints

To display the CoAP dtls endpoints, use the **show coap dtls endpoints** command in user EXEC or privileged EXEC mode.

## show coap dtls endpoints

**Command Default** This command has no arguments or keywords.

**Command Modes** User EXEC (>)

Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

## Example

This example shows how to display the CoAP dtls endpoint:

```
Device# show coap dtls endpoints
#      Index StateString StateValue  Port IP
-----
```

**show coap endpoints**

# show coap endpoints

To display the CoAP endpoints, use the **show coap endpoints** command in user EXEC or privileged EXEC mode.

## show coap endpoints

<b>Command Default</b>	This command has no arguments or keywords.	
<b>Command Modes</b>	User EXEC (>) Privileged EXEC (#)	
Command History	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

## Example

This example shows how to display the CoAP endpoint

```
Device# show coap endpoints
List of all endpoints :

Code : D - Discovered , N - New
#      Status   Age(s)    LastWKC(s)     IP
-----
Endpoints - Total : 0 Discovered : 0 New : 0
```

# show coap globals

To display the CoAP globals, use the **show coap globals** command in user EXEC or privileged EXEC mode.

## show coap globals

**Command Default** This command has no arguments or keywords.

**Command Modes** User EXEC (>)

Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

## Example

The following is sample output from the **show coap globals** command:

This example shows how to display the CoAP configuration:

```
Device# show coap dtls globals
Coap System Timer Values :
  Discovery    : 120 sec
  Cache Exp    : 5 sec
  Keep Alive   : 120 sec
  Client DB    : 5 sec
  Query Queue  : 500 ms
  Ack delay    : 500 ms
  Timeout      : 5 sec
  Ageout       : 300 sec

  Max Endpoints      : 10

  Max DTLS Endpoints : 20
  Resource Disc Mode : POST
```

**show coap resources**

# show coap resources

To display the CoAP resources, use the **show coap resources** command in user EXEC or privileged EXEC mode.

## show coap resources

<b>Command Default</b>	This command has no arguments or keywords.				
<b>Command Modes</b>	User EXEC (> Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.5.1a	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Everest 16.5.1a	This command was introduced.				

## Example

This example shows how to display the CoAP resources:

```
Device# show coap resources
Link format data =
</>
</cisco/flood>
</cisco/context>
</cisco/showtech>
</cisco/discover>
</cisco/sleep>
</cisco/lldp>
```

# show coap stats

To display the CoAP stats, use the **show coap stats** command in user EXEC or privileged EXEC mode.

## show coap stats

<b>Command Default</b>	This command has no arguments or keywords.
------------------------	--

<b>Command Modes</b>	User EXEC (>) Privileged EXEC (#)
----------------------	--------------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

## Example

This example shows how to display the CoAP stats:

```
Device# show coap stats
Coap Stats :
Endpoints      : 0
Requests       : 20
Ext Queries   : 0
New Endpoints: 0
```

**show coap version**

# show coap version

To display the CoAP version, use the **show coap version** command in user EXEC or privileged EXEC mode.

## show coap version

---

**Command Default** This command has no arguments or keywords.**Command Modes** User EXEC (>)  
Privileged EXEC (#)

---

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

---

## Example

This example shows how to display the CoAP version:

```
Device# show coap version
CoAP version 1.0.5
RFC 7252
```

# show device classifier attached

To display the devices connected to a switch and their associated properties, use the **show device classifier attached** command in user EXEC mode.

**show device classifier attached [{detail | interface *interface\_id* | mac-address *mac\_address*}]**

<b>Syntax Description</b>	<b>detail</b> <b>interface <i>interface_id</i></b> <b>mac <i>mac_address</i></b>	Displays detailed device classifier information. Displays information about devices attached to the specified interface. Displays device information for the specified endpoint.
---------------------------	--	--

**Command Modes** User EXEC (>)

Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

**Usage Guidelines** Use this command to display the devices connected to a switch. Use the **show device classifier attached** command in privileged EXEC mode to display the configurable parameters for a device.

## Example

This example shows how to use the **show device classifier attached** command with no optional keywords to view the devices connected to the switch:

```
Device# show device classifier attached
MAC_Address      Port_Id      Profile Name
=====
000a.b8c6.1e07  Gi1/0/2      Cisco-Device
001f.9e90.1250  Gi1/0/4      Cisco-AP-Aironet-1130
=====
```

This example shows how to use the **show device classifier attached** command in privileged EXEC mode with the optional **mac-address** keyword to view summary information about the connected device with the specified MAC address:

```
Device# show device classifier attached mac-address 001f.9e90.1250
MAC_Address      Port_Id      Profile Name
=====
001f.9e90.1250  Gi1/0/4      Cisco-AP-Aironet-1130
=====
```

This example shows how to use the **show device classifier attached** command in privileged EXEC mode with the optional **mac-address** and **detail** keywords to view detailed information about the connected device with the specified MAC address:

## show device classifier attached

```
Device# show device classifier attached mac-address 001f.9e90.1250 detail
MAC_Address      Port_Id      Certainty Parent    ProfileType     Profile Name
Device_Name
=====
=====
001f.9e90.1250   Gi1/0/4      40          2           Built-in       Cisco-AP-Aironet-1130
cisco AIR-LAP1131AG-E-K9
=====
```

This example shows how to use the **show device classifier attached** command in privileged EXEC mode with the optional **interface** keyword to view summary information about the device connected to the specified interface:

```
Device# show device classifier attached interface gi 1/0/2
MAC_Address      Port_Id      Profile Name
=====
000a.b8c6.1e07   Gi1/0/2      Cisco-Device
=====
```

This example shows how to use the **show device classifier attached** command in privileged EXEC mode with the optional **interface** and **detail** keywords to view detailed information about the device connected to the specified interface:

```
Device# show device classifier attached interface gi 1/0/2 detail
MAC_Address      Port_Id      Certainty Parent    ProfileType     Profile Name
Device_Name
=====
=====
000a.b8c6.1e07   Gi1/0/2      10          0           Default        Cisco-Device      cisco
WS-C2960-48TT-L
=====
```

# show device classifier clients

To display the clients using the device classifier facility on the switch, use the **show device classifier clients** command in user EXEC mode.

## show device classifier clients

**Command Default** This command has no arguments or keywords.

**Command Modes** User EXEC (>)

Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

**Usage Guidelines** Device classifier (DC) is enabled by default when you enable a client application (for example, Auto SmartPorts) that uses its functionality. Use the **show device classifier clients** command to display the clients that are using the DC feature on the switch.

As long as any clients are using the DC, you cannot disable it by using the **no device classifier** command. If you attempt to disable the DC while a client is using it, an error message appears.

## Example

This example shows how to use the **show device classifier clients** command to view the clients using the DC on the switch:

```
Device# show device classifier clients
Client Name
=====
Auto Smart Ports
```

This example shows the error message that appears when you attempt to disable DC while a client is using it:

```
Switch(config)# no device classifier
These subsystems should be disabled before disabling Device classifier
Auto Smart Ports

% Error - device classifier is not disabled
```

show device classifier profile type

# show device classifier profile type

To display all the device types recognized by the device classifier, use the **show device classifier profile type** command in user EXEC mode.

**show device classifier profile type [ {table [{built-in default}] | string filter\_string}]**

<b>Syntax Description</b>	<table> <tr> <td><b>table</b></td><td>Displays device classification in a table.</td></tr> <tr> <td><i>built-in</i></td><td>Displays device classification information from the built-in device table.</td></tr> <tr> <td><i>default</i></td><td>Displays device classification information from the default device table.</td></tr> <tr> <td><b>filter string</b></td><td>Displays information for devices that match the filter.</td></tr> </table>	<b>table</b>	Displays device classification in a table.	<i>built-in</i>	Displays device classification information from the built-in device table.	<i>default</i>	Displays device classification information from the default device table.	<b>filter string</b>	Displays information for devices that match the filter.
<b>table</b>	Displays device classification in a table.								
<i>built-in</i>	Displays device classification information from the built-in device table.								
<i>default</i>	Displays device classification information from the default device table.								
<b>filter string</b>	Displays information for devices that match the filter.								
<b>Command Modes</b>	User EXEC (>) Privileged EXEC (#)								
<b>Command History</b>	<table> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.5.1a</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.5.1a	This command was introduced.				
<b>Release</b>	<b>Modification</b>								
Cisco IOS XE Everest 16.5.1a	This command was introduced.								

**Usage Guidelines** This command displays all the device types recognized by the device classification engine. The number of available device types is the number of profiles stored on the switch. Because the number of profiles can be very large, you can use the **filter** keyword to limit the command output.

## Example

This example shows how to use the **show device classifier profile type** command in privileged EXEC mode with no optional keywords to view the devices recognized by the device classifier:

```
Device# show device classifier profile type table
  Valid      Type      Profile Name          min Conf   ID
  ======  ======  ====== =====
  Valid      Default    Apple-Device           10      0
  Valid      Default    Aruba-Device          10      1
  Valid      Default    Avaya-Device          10      2
  Valid      Default    Avaya-IP-Phone        20      3
  Valid      Default    BlackBerry             20      4
  Valid      Default    Cisco-Device          10      5
  Valid      Default    Cisco-IP-Phone         20      6
  Valid      Default    Cisco-IP-Phone-7902     70      7
  Valid      Default    Cisco-IP-Phone-7905     70      8
  Valid      Default    Cisco-IP-Phone-7906     70      9
  Valid      Default    Cisco-IP-Phone-7910     70     10
  Valid      Default    Cisco-IP-Phone-7911     70     11
  Valid      Default    Cisco-IP-Phone-7912     70     12
  Valid      Default    Cisco-IP-Phone-7940     70     13
  Valid      Default    Cisco-IP-Phone-7941     70     14
  Valid      Default    Cisco-IP-Phone-7942     70     15
```

Valid	Default	Cisco-IP-Phone-7945	70	16
Valid	Default	Cisco-IP-Phone-7945G	70	17
Valid	Default	Cisco-IP-Phone-7960	70	18
Valid	Default	Cisco-IP-Phone-7961	70	19
Valid	Default	Cisco-IP-Phone-7962	70	20
Valid	Default	Cisco-IP-Phone-7965	70	21
Valid	Default	Cisco-IP-Phone-7970	70	22
Valid	Default	Cisco-IP-Phone-7971	70	23
Valid	Default	Cisco-IP-Phone-7975	70	24
Valid	Default	Cisco-IP-Phone-7985	70	25
Valid	Default	Cisco-IP-Phone-9971	70	26
Valid	Default	Cisco-WLC-2100-Series	40	27
Valid	Default	DLINK-Device	10	28
Valid	Default	Enterasys-Device	10	29
Valid	Default	HP-Device	10	30
Valid	Default	HP-JetDirect-Printer	30	31
Valid	Default	Lexmark-Device	10	32
Valid	Default	Lexmark-Printer-E260dn	30	33
Valid	Default	Microsoft-Device	10	34
Valid	Default	Netgear-Device	10	35
Valid	Default	NintendoWII	10	36
Valid	Default	Nortel-Device	10	37
Valid	Default	Nortel-IP-Phone-2000-Series	20	38
Valid	Default	SonyPS3	10	39
Valid	Default	XBOX360	20	40
Valid	Default	Xerox-Device	10	41
Valid	Default	Xerox-Printer-Phaser3250	30	42
Valid	Default	Aruba-AP	20	43
Valid	Default	Cisco-Access-Point	10	44
Valid	Default	Cisco-IP-Conference-Station-7935	70	45
Valid	Default	Cisco-IP-Conference-Station-7936	70	46
Valid	Default	Cisco-IP-Conference-Station-7937	70	47
Valid	Default	DLINK-DAP-1522	20	48
Valid	Default	Cisco-AP-Aironet-1130	30	49
Valid	Default	Cisco-AP-Aironet-1240	30	50
Valid	Default	Cisco-AP-Aironet-1250	30	51
Valid	Default	Cisco-AIR-LAP	25	52
Valid	Default	Cisco-AIR-LAP-1130	30	53
Valid	Default	Cisco-AIR-LAP-1240	50	54
Valid	Default	Cisco-AIR-LAP-1250	50	55
Valid	Default	Cisco-AIR-AP	25	56
Valid	Default	Cisco-AIR-AP-1130	30	57
Valid	Default	Cisco-AIR-AP-1240	50	58
Valid	Default	Cisco-AIR-AP-1250	50	59
Invalid	Default	Sun-Workstation	10	60
Valid	Default	Linksys-Device	20	61
Valid	Default	LinksysWAP54G-Device	30	62
Valid	Default	HTC-Device	10	63
Valid	Default	MotorolaMobile-Device	10	64
Valid	Default	VMWare-Device	10	65
Valid	Default	ISE-Appliance	10	66
Valid	Built-in	Cisco-Device	10	0
Valid	Built-in	Cisco-Router	10	1
Valid	Built-in	Router	10	2
Valid	Built-in	Cisco-IP-Camera	10	3
Valid	Built-in	Cisco-IP-Camera-2xxx	30	4
Valid	Built-in	Cisco-IP-Camera-2421	50	5
Valid	Built-in	Cisco-IP-Camera-2500	50	6
Valid	Built-in	Cisco-IP-Camera-2520	50	7
Valid	Built-in	Cisco-IP-Camera-2530	50	8
Valid	Built-in	Cisco-IP-Camera-4xxx	50	9
Valid	Built-in	Cisco-Transparent-Bridge	8	10
Valid	Built-in	Transparent-Bridge	8	11
Valid	Built-in	Cisco-Source-Bridge	10	12

```
show device classifier profile type
```

Valid	Built-in	Cisco-Switch	10	13
Valid	Built-in	Cisco-IP-Phone	20	14
Valid	Built-in	IP-Phone	20	15
Valid	Built-in	Cisco-DMP	10	16
Valid	Built-in	Cisco-DMP-4305G	70	17
Valid	Built-in	Cisco-DMP-4310G	70	18
Valid	Built-in	Cisco-DMP-4400G	70	19
Valid	Built-in	Cisco-WLC-2100-Series	40	20
Valid	Built-in	Cisco-Access-Point	10	21
Valid	Built-in	Cisco-AIR-LAP	30	22
Valid	Built-in	Cisco-AIR-AP	30	23
Valid	Built-in	Linksys-Device	20	24

# show macro auto

To display Auto Smartports macro information, use the **show macro auto** command in user EXEC mode.

```
show macro auto {address-group address-group-name | device [access-point] [ip-camera]
[lightweight-ap] [media-player] [phone] [router] [switch] | global [event_trigger] | interface
[interface_id]}
```

Syntax Description		
	<b>address-group</b> [ <i>address-group-name</i> ]	Displays address-group information.  (Optional) <i>address-group-name</i> —Displays information for the specified address group.
	<b>device</b> [ <i>access-point</i> ] [ <i>ip-camera</i> ] [ <i>lightweight-ap</i> ] [ <i>media-player</i> ] [ <i>phone</i> ] [ <i>router</i> ] [ <i>switch</i> ]	Displays device information about one or more devices. <ul style="list-style-type: none"> <li>• (Optional) <b>access-point</b>—Autonomous access point</li> <li>• (Optional) <b>ip-camera</b>—Cisco IP video surveillance camera</li> <li>• (Optional) <b>lightweight-ap</b>—Lightweight access point</li> <li>• (Optional) <b>media-player</b>—Digital media player</li> <li>• (Optional) <b>phone</b>—Cisco IP phone</li> <li>• (Optional) <b>router</b>—Cisco router</li> <li>• (Optional) <b>switch</b>—Cisco switch</li> </ul>
	<b>global</b> [ <i>event_trigger</i> ]	Displays Auto Smartports information about the switch.  (Optional) <i>event_trigger</i> —Displays information about the specified event trigger.
	<b>interface</b> [ <i>interface_id</i> ]	Displays interface status.  (Optional) <i>interface_id</i> —Displays information about the specified interface.
<b>Command Modes</b>	User EXEC (>)  Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>  Cisco IOS XE Everest 16.5.1a	<b>Modification</b>  This command was introduced.

**show macro auto**

## Usage Guidelines

Use this command to display the Auto SmartPorts information for the switch. Use the **show macro auto device** command to display the configurable parameters for a device.

### Example

This example shows how to use the **show macro auto device** to view the configuration on the switch:

```
Device# show macro auto device
Device:lightweight-ap
Default Macro:CISCO_LWAP_AUTO_SMARTPORT
Current Macro:CISCO_LWAP_AUTO_SMARTPORT
Configurable Parameters:ACCESS_VLAN
Defaults Parameters:ACCESS_VLAN=1
Current Parameters:ACCESS_VLAN=1

Device:access-point
Default Macro:CISCO_AP_AUTO_SMARTPORT
Current Macro:CISCO_AP_AUTO_SMARTPORT
Configurable Parameters:NATIVE_VLAN
Defaults Parameters:NATIVE_VLAN=1
Current Parameters:NATIVE_VLAN=1

Device:phone
Default Macro:CISCO_PHONE_AUTO_SMARTPORT
Current Macro:CISCO_PHONE_AUTO_SMARTPORT
Configurable Parameters:ACCESS_VLAN VOICE_VLAN
Defaults Parameters:ACCESS_VLAN=1 VOICE_VLAN=2
Current Parameters:ACCESS_VLAN=1 VOICE_VLAN=2

Device:router
Default Macro:CISCO_ROUTER_AUTO_SMARTPORT
Current Macro:CISCO_ROUTER_AUTO_SMARTPORT
Configurable Parameters:NATIVE_VLAN
Defaults Parameters:NATIVE_VLAN=1
Current Parameters:NATIVE_VLAN=1

Device:switch
Default Macro:CISCO_SWITCH_AUTO_SMARTPORT
Current Macro:CISCO_SWITCH_AUTO_SMARTPORT
Configurable Parameters:NATIVE_VLAN
Defaults Parameters:NATIVE_VLAN=1
Current Parameters:NATIVE_VLAN=1

Device:ip-camera
Default Macro:CISCO_IP_CAMERA_AUTO_SMARTPORT
Current Macro:CISCO_IP_CAMERA_AUTO_SMARTPORT
Configurable Parameters:ACCESS_VLAN
Defaults Parameters:ACCESS_VLAN=1
Current Parameters:ACCESS_VLAN=1

Device:media-player
Default Macro:CISCO_DMP_AUTO_SMARTPORT
Current Macro:CISCO_DMP_AUTO_SMARTPORT
Configurable Parameters:ACCESS_VLAN
Defaults Parameters:ACCESS_VLAN=1
Current Parameters:ACCESS_VLAN=1
```

This example shows how to use the **show macro auto address-group name** command to view the TEST3 address group configuration on the switch:

```
Device# show macro auto address-group TEST3MAC Address Group Configuration:
```

Group Name	OUI	MAC ADDRESS
TEST3	2233.33	0022.0022.0022
	2233.34	

# show parser macro

To display the parameters for all configured macros or for one macro on the switch, use the **show parser macro** command in user EXEC mode.

**show parser macro {brief | description [interface *interface-id*] | name *macro-name*}**

Syntax Description	<b>brief</b>	(Optional) Displays the name of each macro.
	<b>description [interface <i>interface-id</i>]</b>	(Optional) Displays all macro descriptions or the description of a specific interface.
	<b>name <i>macro-name</i></b>	(Optional) Displays information about a single macro identified by the macro name.
<b>Command Modes</b>		User EXEC (>)
		Privileged EXEC (#)
<b>Command History</b>		
Release	<b>Modification</b>	
Cisco IOS XE Everest 16.5.1a	This command was introduced.	

## Example

This is a partial output example from the **show parser macro** command. The output for the Cisco-default macros varies depending on the switch platform and the software image running on the switch:

```
Device# show parser macro
Total number of macros = 6
-----
Macro name : cisco-global
Macro type : default global
# Enable dynamic port error recovery for link state
# failures
errdisable recovery cause link-flap
errdisable recovery interval 60

<output truncated>

-----
Macro name : cisco-desktop
Macro type : default interface
# macro keywords $AVID
# Basic interface - Enable data VLAN only
# Recommended value for access vlan (AVID) should not be 1
switchport access vlan $AVID
switchport mode access

<output truncated>

-----
Macro name : cisco-phone
```

```

Macro type : default interface
# Cisco IP phone + desktop template
# macro keywords $AVID $VVID
# VoIP enabled interface - Enable data VLAN
# and voice VLAN (VVID)
# Recommended value for access vlan (AVID) should not be 1
switchport access vlan $AVID
switchport mode access

<output truncated>

-----
Macro name : cisco-switch
Macro type : default interface
# macro keywords $NVID
# Access Uplink to Distribution
# Do not apply to EtherChannel/Port Group
# Define unique Native VLAN on trunk ports
# Recommended value for native vlan (NVID) should not be 1
switchport trunk native vlan $NVID

<output truncated>

-----
Macro name : cisco-router
Macro type : default interface
# macro keywords $NVID
# Access Uplink to Distribution
# Define unique Native VLAN on trunk ports
# Recommended value for native vlan (NVID) should not be 1
switchport trunk native vlan $NVID

<output truncated>

-----
Macro name : snmp
Macro type : customizable

#enable port security, linkup, and linkdown traps
snmp-server enable traps port-security
snmp-server enable traps linkup
snmp-server enable traps linkdown
#set snmp-server host
snmp-server host ADDRESS
#set SNMP trap notifications precedence
snmp-server ip precedence VALUE

```

This example shows the output from the **show parser macro name** command:

```

Device# show parser macro name standard-switch10
Macro name : standard-switch10
Macro type : customizable
macro description standard-switch10
# Trust QoS settings on VOIP packets
auto qos voip trust
# Allow port channels to be automatically formed
channel-protocol pagp

```

This example shows the output from the **show parser macro brief** command:

**show parser macro**

```
Device# show parser macro brief
  default global    : cisco-global
  default interface: cisco-desktop
  default interface: cisco-phone
  default interface: cisco-switch
  default interface: cisco-router
  customizable      : snmp
```

This example shows the output from the **show parser macro description** command:

```
Device# show parser macro description
Global Macro(s): cisco-global
Interface      Macro Description(s)
-----
Gi1/0/1        standard-switch10
Gi1/0/2        this is test macro
-----
```

This example shows the output from the **show parser macro description interface** command:

```
Device# show parser macro description interface gigabitethernet1/0/2
Interface      Macro Description
-----
Gi1/0/2        this is test macro
-----
```

# show shell

To display shell information, use the **show shell** command in user EXEC mode.

**show shell [{environment | functions [{brief shell\_function}] | triggers}]**

<b>Syntax Description</b>	<b>environment</b>	(Optional) Displays shell environment information.
	<b>functions [brief  shell_function ]</b>	(Optional) Displays macro information. <ul style="list-style-type: none"> <li>• <b>brief</b>—Names of the shell functions.</li> <li>• <i>shell_function</i>—Name of a shell function</li> </ul>
	<b>triggers</b>	(Optional) Displays event trigger information.
<b>Command Modes</b>	User EXEC (>) Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

**Usage Guidelines** Use this command to display the shell information for the switch.

## Example

This example shows how to use the **show shell triggers** command to view the event triggers in the switch software:

```
Device# term shell
Device# show shell triggers
User defined triggers
-----
Built-in triggers
-----
Trigger Id: CISCO_CUSTOM_EVENT
Trigger description: Custom macroevent to apply user defined configuration
Trigger environment: User can define the macro
Trigger mapping function: CISCO_CUSTOM_AUTOSMARTPORT

Trigger Id: CISCO_DMP_EVENT
Trigger description: Digital media-player device event to apply port configuration
Trigger environment: Parameters that can be set in the shell - $ACCESS_VLAN=(1)
The value in the parenthesis is a default value
Trigger mapping function: CISCO_DMP_AUTO_SMARTPORT

Trigger Id: CISCO_IPVSC_EVENT
Trigger description: IP-camera device event to apply port configuration
Trigger environment: Parameters that can be set in the shell - $ACCESS_VLAN=(1)
The value in parenthesis is a default value
Trigger mapping function: CISCO_IP_CAMERA_AUTO_SMARTPORT
```

**show shell**

```

Trigger Id: CISCO_LAST_RESORT_EVENT
Trigger description: Last resort event to apply port configuration
Trigger environment: Parameters that can be set in the shell - $ACCESS_VLAN=(1)
    The value in the parenthesis is a default value
Trigger mapping function: CISCO_LAST_RESORT_SMARTPORT

Trigger Id: CISCO_PHONE_EVENT
Trigger description: IP-phone device event to apply port configuration
Trigger environment: Parameters that can be set in the shell - $ACCESS_VLAN=(1)
and $VOICE_VLAN=(2), The value in the parenthesis is a default value
Trigger mapping function: CISCO_PHONE_AUTO_SMARTPORT

Trigger Id: CISCO_ROUTER_EVENT
Trigger description: Router device event to apply port configuration
Trigger environment: Parameters that can be set in the shell - $NATIVE_VLAN=(1)
    The value in the parenthesis is a default value
Trigger mapping function: CISCO_ROUTER_AUTO_SMARTPORT

Trigger Id: CISCO_SWITCH_ETHERCHANNEL_CONFIG
Trigger description: etherchannel parameter
Trigger environment: $INTERFACE_LIST=(),$PORT CHANNEL_ID=(),
    $EC_MODE=(),$EC_PROTOCOLTYPE=(),
    PORT CHANNEL_TYPE=()
Trigger mapping function: CISCO_ETHERCHANNEL_AUTOSMARTPORT

Trigger Id: CISCO_SWITCH_EVENT
Trigger description: Switch device event to apply port configuration
Trigger environment: Parameters that can be set in the shell - $NATIVE_VLAN=(1)
    The value in the parenthesis is a default value
Trigger mapping function: CISCO_SWITCH_AUTO_SMARTPORT

Trigger Id: CISCO_WIRELESS_AP_EVENT
Trigger description: Autonomous ap device event to apply port configuration
Trigger environment: Parameters that can be set in the shell - $NATIVE_VLAN=(1)
    The value in the parenthesis is a default value
Trigger mapping function: CISCO_AP_AUTO_SMARTPORT

Trigger Id: CISCO_WIRELESS_LIGHTWEIGHT_AP_EVENT
Trigger description: Lightweight-ap device event to apply port configuration
Trigger environment: Parameters that can be set in the shell - $ACCESS_VLAN=(1)
    The value in the parenthesis is a default value
Trigger mapping function: CISCO_LWAP_AUTO_SMARTPORT

Trigger Id: word
Trigger description: word
Trigger environment:
Trigger mapping function:

```

This example shows how to use the **show shell functions** command to view the built-in macros in the switch software:

```

Device# show shell functions
#User defined functions:

#Built-in functions:
function CISCO_AP_AUTO_SMARTPORT () {
    if [[ $LINKUP == YES ]]; then
        conf t
        interface $INTERFACE
        macro description $trigger
        switchport trunk encapsulation dot1q
        switchport trunk native vlan $NATIVE_VLAN
        switchport trunk allowed vlan ALL
}

```

```
switchport mode trunk
switchport nonegotiate
auto qos voip trust
mls qos trust cos
if [[ $LIMIT == 0 ]]; then
    default srr-queue bandwidth limit
else
    srr-queue bandwidth limit $LIMIT
fi
if [[ $SW_POE == YES ]]; then
    if [[ $AP125X == AP125X ]]; then
        macro description AP125X
        macro auto port sticky
        power inline port maximum 20000
    fi
    fi
exit
end
fi
if [[ $LINKUP == NO ]]; then
    conf t
        interface $INTERFACE
            no macro description
            no switchport nonegotiate
            no switchport trunk native vlan $NATIVE_VLAN
            no switchport trunk allowed vlan ALL
            no auto qos voip trust
            no mls qos trust cos
            default srr-queue bandwidth limit
            if [[ $AUTH_ENABLED == NO ]]; then
                no switchport mode
                no switchport trunk encapsulation
            fi
            if [[ $STICKY == YES ]]; then
                if [[ $SW_POE == YES ]]; then
                    if [[ $AP125X == AP125X ]]; then
                        no macro auto port sticky
                        no power inline port maximum
                    fi
                fi
            fi
        exit
    end
fi
}
<output truncated>
```

# start (coap-proxy configuration)

To start CoAP on the switch, use the **start** command in coap-proxy configuration mode.

## start

<b>Command Modes</b>	coap-proxy configuration (config-coap-proxy)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>

Cisco IOS XE Everest 16.5.1a

This command was introduced.

<b>Usage Guidelines</b>	To access coap-proxy configuration mode, enter the <b>coap proxy</b> command in global configuration mode.
-------------------------	--

## Example

This example shows how to start CoAP on the switch.

```
Device(config)# coap proxy
Device(config-coap-proxy)# start
```

# stop (coap-proxy configuration)

To stop CoAP on the switch, use the **stop** command in coap-proxy configuration mode.

**stop**

<b>Command Modes</b>	coap-proxy configuration (config-coap-proxy)
----------------------	--

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

<b>Usage Guidelines</b>	To access coap-proxy configuration mode, enter the <b>coap proxy</b> command in global configuration mode.
-------------------------	--

## Example

This example shows how to stop CoAP on the switch.

```
Device(config)# coap proxy
Device(config-coap-proxy) # stop
```

# transport (coap-proxy configuration)

To configure transport protocol, use the **transport** command in coap-proxy configuration mode.

**transport{tcp | udp}**

<b>Syntax Description</b>	<b>tcp</b>	Specifies a TCP protocol.
	<b>udp</b>	Specifies a UDP protocol.
<b>Command Modes</b>	coap-proxy configuration (config-coap-proxy)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.5.1a	This command was introduced.

**Usage Guidelines** To access coap-proxy configuration mode, enter the **coap proxy** command in global configuration mode.

## Example

This is an example to configure tcp as transport protocol

```
Device(config)# coap proxy
Device(config-coap-proxy)# transport tcp
```

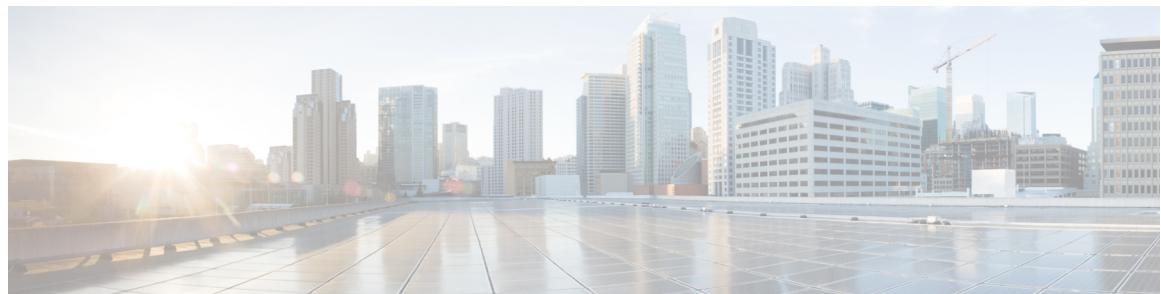


PART **X**

## **QoS**

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## QoS Commands

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# auto qos classify

To automatically configure quality of service (QoS) classification for untrusted devices within a QoS domain, use the **auto qos classify** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

```
auto qos classify [police]
no auto qos classify [police]
```

<b>Syntax Description</b>	police (Optional) Configure QoS policing for untrusted devices.	
<b>Command Default</b>	Auto-QoS classify is disabled on the port.	
<b>Command Modes</b>	Interface configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE This command was introduced.	

<b>Usage Guidelines</b>	Use this command to configure the QoS for trusted interfaces within the QoS domain. The QoS domain includes the device, the network interior, and edge devices that can classify incoming traffic for QoS. When auto-QoS is enabled, it uses the ingress packet label to categorize traffic, to assign packet labels, and to configure the ingress and egress queues.
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*Table 40: Auto-QoS Configuration for the Egress Queues*

Egress Queue	Queue Number	CoS-to-Queue Map	Queue Weight (Bandwidth)	Queue (Buffer) Size for Gigabit-Capable Ports	Queue (Buffer) Size for 10/100 Ethernet Ports
Priority (shaped)	1	4, 5	up to 100 percent	25 percent	15 percent
SRR shared	2	2, 3, 6,7	10 percent	25 percent	25 percent
SRR shared	3	0	60 percent	25 percent	40 percent
SRR shared	4	1	20 percent	25 percent	20 percent

Auto-QoS configures the device for connectivity with a trusted interface. The QoS labels of incoming packets are trusted. For nonrouted ports, the CoS value of the incoming packets is trusted. For routed ports, the DSCP value of the incoming packet is trusted.

To take advantage of the auto-QoS defaults, you should enable auto-QoS before you configure other QoS commands. You can fine-tune the auto-QoS configuration *after* you enable auto-QoS.

**Note**

The device applies the auto-QoS-generated commands as if the commands were entered from the command-line interface (CLI). An existing user configuration can cause the application of the generated commands to fail or to be overridden by the generated commands. These actions occur without warning. If all the generated commands are successfully applied, any user-entered configuration that was not overridden remains in the running configuration. Any user-entered configuration that was overridden can be retrieved by reloading the device without saving the current configuration to memory. If the generated commands fail to be applied, the previous running configuration is restored.

---

After auto-QoS is enabled, do not modify a policy map or aggregate policer that includes *AutoQoS* in its name. If you need to modify the policy map or aggregate policer, make a copy of it, and change the copied policy map or policer. To use the new policy map instead of the generated one, remove the generated policy map from the interface, and apply the new policy map.

To display the QoS configuration that is automatically generated when auto-QoS is enabled, enable debugging before you enable auto-QoS. Use the **debug auto qos** privileged EXEC command to enable auto-QoS debugging.

The following policy maps and class maps are created and applied when running the **auto qos classify** and **auto qos classify police** commands:

Policy maps (For the **auto qos classify police** command):

- AutoQos-4.0-Classify-Police-Input-Policy
- AutoQos-4.0-Output-Policy

Class maps:

- AutoQos-4.0-Multimedia-Conf-Class (match-any)
- AutoQos-4.0-Bulk-Data-Class (match-any)
- AutoQos-4.0-Transaction-Class (match-any)
- AutoQos-4.0-Scavenger-Class (match-any)
- AutoQos-4.0-Signaling-Class (match-any)
- AutoQos-4.0-Default-Class (match-any)
- class-default (match-any)
- AutoQos-4.0-Output-Priority-Queue (match-any)
- AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
- AutoQos-4.0-Output-Trans-Data-Queue (match-any)
- AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
- AutoQos-4.0-Output-Scavenger-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)

**auto qos classify**

To disable auto-QoS on a port, use the **no auto qos classify** interface configuration command. Only the auto-QoS-generated interface configuration commands for this port are removed. If this is the last port on which auto-QoS is enabled and you enter the **no auto qos classify** command, auto-QoS is considered disabled even though the auto-QoS-generated global configuration commands remain (to avoid disrupting traffic on other ports affected by the global configuration).

**Examples**

This example shows how to enable auto-QoS classification of an untrusted device and police traffic:

```
Device(config)# interface gigabitEthernet1/0/6
Device(config-if)# auto qos classify police
Device(config-if)# end
Device# show policy-map interface gigabitEthernet1/0/6

GigabitEthernet1/0/6

Service-policy input: AutoQos-4.0-Classify-Police-Input-Policy

Class-map: AutoQos-4.0-Multimedia-Conf-Class (match-any)
  0 packets
  Match: access-group name AutoQos-4.0-Acl-MultiEnhanced-Conf
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp af41
  police:
    cir 5000000 bps, bc 156250 bytes
    conformed 0 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      drop
    conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Bulk-Data-Class (match-any)
  0 packets
  Match: access-group name AutoQos-4.0-Acl-Bulk-Data
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp af11
  police:
    cir 10000000 bps, bc 312500 bytes
    conformed 0 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      set-dscp-transmit dscp table policed-dscp
    conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Transaction-Class (match-any)
  0 packets
  Match: access-group name AutoQos-4.0-Acl-Transactional-Data
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp af21
  police:
    cir 10000000 bps, bc 312500 bytes
    conformed 0 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      set-dscp-transmit dscp table policed-dscp
    conformed 0000 bps, exceed 0000 bps
```

```

Class-map: AutoQos-4.0-Scavenger-Class (match-any)
  0 packets
  Match: access-group name AutoQos-4.0-Acl-Scavenger
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp cs1
  police:
    cir 10000000 bps, bc 312500 bytes
    conformed 0 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      drop
    conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Signaling-Class (match-any)
  0 packets
  Match: access-group name AutoQos-4.0-Acl-Signaling
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp cs3
  police:
    cir 32000 bps, bc 8000 bytes
    conformed 0 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      drop
    conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Default-Class (match-any)
  0 packets
  Match: access-group name AutoQos-4.0-Acl-Default
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp default
  police:
    cir 10000000 bps, bc 312500 bytes
    conformed 0 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      set-dscp-transmit dscp table policed-dscp
    conformed 0000 bps, exceed 0000 bps

Class-map: class-default (match-any)
  0 packets
  Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps

Service-policy output: AutoQos-4.0-Output-Policy

queue stats for all priority classes:
  Queueing
  priority level 1

  (total drops) 0
  (bytes output) 0

Class-map: AutoQos-4.0-Output-Priority-Queue (match-any)
  0 packets
  Match: dscp cs4 (32) cs5 (40) ef (46)

```

**auto qos classify**

```

    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 5
    0 packets, 0 bytes
    5 minute rate 0 bps
Priority: 30% (300000 kbps), burst bytes 7500000,
Priority Level: 1

Class-map: AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
    0 packets
Match: dscp cs2 (16) cs3 (24) cs6 (48) cs7 (56)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing
queue-limit dscp 16 percent 80
queue-limit dscp 24 percent 90
queue-limit dscp 48 percent 100
queue-limit dscp 56 percent 100

(total drops) 0
(bytes output) 0
bandwidth remaining 10%

queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
    0 packets
Match: dscp af41 (34) af42 (36) af43 (38)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 4
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Trans-Data-Queue (match-any)
    0 packets
Match: dscp af21 (18) af22 (20) af23 (22)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 2
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
    0 packets
Match: dscp af11 (10) af12 (12) af13 (14)
    0 packets, 0 bytes
    5 minute rate 0 bps

```

```
Match: cos 1
  0 packets, 0 bytes
  5 minute rate 0 bps
Queueing

  (total drops) 0
  (bytes output) 0
bandwidth remaining 4%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Scavenger-Queue (match-any)
  0 packets
  Match: dscp cs1 (8)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

  (total drops) 0
  (bytes output) 0
bandwidth remaining 1%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)
  0 packets
  Match: dscp af31 (26) af32 (28) af33 (30)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

  (total drops) 0
  (bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: class-default (match-any)
  0 packets
  Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

  (total drops) 0
  (bytes output) 0
bandwidth remaining 25%
queue-buffers ratio 25
```

You can verify your settings by entering the **show auto qos interface *interface-id*** privileged EXEC command.

## auto qos trust

To automatically configure quality of service (QoS) for trusted interfaces within a QoS domain, use the **auto qos trust** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

```
auto qos trust {cos | dscp}
no auto qos trust {cos | dscp}
```

### Syntax Description

**cos** Trusts the CoS packet classification.

**dscp** Trusts the DSCP packet classification.

### Command Default

Auto-QoS trust is disabled on the port.

### Command Modes

Interface configuration

### Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

### Usage Guidelines

Use this command to configure the QoS for trusted interfaces within the QoS domain. The QoS domain includes the device, the network interior, and edge devices that can classify incoming traffic for QoS. When auto-QoS is enabled, it uses the ingress packet label to categorize traffic, to assign packet labels, and to configure the ingress and egress queues.

*Table 41: Traffic Types, Packet Labels, and Queues*

	VOIP Data Traffic	VOIP Control Traffic	Routing Protocol Traffic	STP <sup>3</sup> BPDU <sup>4</sup> Traffic	Real-Time Video Traffic	All Other Traffic
DSCP <sup>5</sup>	46	24, 26	48	56	34	—
CoS <sup>6</sup>	5	3	6	7	3	—
CoS-to-egress queue map	4, 5 (queue 1)	2, 3, 6, 7 (queue 2)			0 (queue 3)	2 (queue 3) 0, 1 (queue 4)

<sup>3</sup> STP = Spanning Tree Protocol

<sup>4</sup> BPDU = bridge protocol data unit

<sup>5</sup> DSCP = Differentiated Services Code Point

<sup>6</sup> CoS = class of service

**Table 42: Auto-QoS Configuration for the Egress Queues**

Egress Queue	Queue Number	CoS-to-Queue Map	Queue Weight (Bandwidth)	Queue (Buffer) Size for Gigabit-Capable Ports	Queue (Buffer) Size for 10/100 Ethernet Ports
Priority (shaped)	1	4, 5	Up to 100 percent	25 percent	15 percent
SRR shared	2	2, 3, 6, 7	10 percent	25 percent	25 percent
SRR shared	3	0	60 percent	25 percent	40 percent
SRR shared	4	1	20 percent	25 percent	20 percent



**Note** The device applies the auto-QoS-generated commands as if the commands were entered from the command-line interface (CLI). An existing user configuration can cause the application of the generated commands to fail or to be overridden by the generated commands. These actions occur without warning. If all the generated commands are successfully applied, any user-entered configuration that was not overridden remains in the running configuration. Any user-entered configuration that was overridden can be retrieved by reloading the device without saving the current configuration to memory. If the generated commands fail to be applied, the previous running configuration is restored.

After auto-QoS is enabled, do not modify a policy map or aggregate policer that includes *AutoQoS* in its name. If you need to modify the policy map or aggregate policer, make a copy of it, and change the copied policy map or policer. To use the new policy map instead of the generated one, remove the generated policy map from the interface, and apply the new policy map.

To display the QoS configuration that is automatically generated when auto-QoS is enabled, enable debugging before you enable auto-QoS. Use the **debug auto qos** privileged EXEC command to enable auto-QoS debugging.

The following policy maps and class maps are created and applied when running the **auto qos trust cos** command.

Policy maps:

- AutoQos-4.0-Trust-Cos-Input-Policy
- AutoQos-4.0-Output-Policy

Class maps:

- class-default (match-any)
- AutoQos-4.0-Output-Priority-Queue (match-any)
- AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
- AutoQos-4.0-Output-Trans-Data-Queue (match-any)
- AutoQos-4.0-Output-Bulk-Data-Queue (match-any)

**auto qos trust**

- AutoQos-4.0-Output-Scavenger-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)

The following policy maps and class maps are created and applied when running the **auto qos trust dscp** command:

Policy maps:

- AutoQos-4.0-Trust-Dscp-Input-Policy
- AutoQos-4.0-Output-Policy

Class maps:

- class-default (match-any)
- AutoQos-4.0-Output-Priority-Queue (match-any)
- AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
- AutoQos-4.0-Output-Trans-Data-Queue (match-any)
- AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
- AutoQos-4.0-Output-Scavenger-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)

To disable auto-QoS on a port, use the **no auto qos trust** interface configuration command. Only the auto-QoS-generated interface configuration commands for this port are removed. If this is the last port on which auto-QoS is enabled and you enter the **no auto qos trust** command, auto-QoS is considered disabled even though the auto-QoS-generated global configuration commands remain (to avoid disrupting traffic on other ports affected by the global configuration).

**Examples**

This example shows how to enable auto-QoS for a trusted interface with specific CoS classification.

```
Device(config)# interface gigabitEthernet1/0/17
Device(config-if)# auto qos trust cos
Device(config-if)# end
Device# show policy-map interface GigabitEthernet1/0/17

GigabitEthernet1/0/17

Service-policy input: AutoQos-4.0-Trust-Cos-Input-Policy

Class-map: class-default (match-any)
  0 packets
  Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    cos cos table AutoQos-4.0-Trust-Cos-Table

Service-policy output: AutoQos-4.0-Output-Policy

queue stats for all priority classes:
```

```

Queueing
priority level 1

(total drops) 0
(bytes output) 0

Class-map: AutoQos-4.0-Output-Priority-Queue (match-any)
0 packets
Match: dscp cs4 (32) cs5 (40) ef (46)
0 packets, 0 bytes
5 minute rate 0 bps
Match: cos 5
0 packets, 0 bytes
5 minute rate 0 bps
Priority: 30% (300000 kbps), burst bytes 7500000,
Priority Level: 1

Class-map: AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
0 packets
Match: dscp cs2 (16) cs3 (24) cs6 (48) cs7 (56)
0 packets, 0 bytes
5 minute rate 0 bps
Match: cos 3
0 packets, 0 bytes
5 minute rate 0 bps
Queueing
queue-limit dscp 16 percent 80
queue-limit dscp 24 percent 90
queue-limit dscp 48 percent 100
queue-limit dscp 56 percent 100

(total drops) 0
(bytes output) 0
bandwidth remaining 10%

queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
0 packets
Match: dscp af41 (34) af42 (36) af43 (38)
0 packets, 0 bytes
5 minute rate 0 bps
Match: cos 4
0 packets, 0 bytes
5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Trans-Data-Queue (match-any)
0 packets
Match: dscp af21 (18) af22 (20) af23 (22)
0 packets, 0 bytes
5 minute rate 0 bps
Match: cos 2
0 packets, 0 bytes
5 minute rate 0 bps
Queueing

(total drops) 0

```

**auto qos trust**

```

(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
0 packets
Match: dscp af11 (10) af12 (12) af13 (14)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 1
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 4%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Scavenger-Queue (match-any)
0 packets
Match: dscp cs1 (8)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 1%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)
0 packets
Match: dscp af31 (26) af32 (28) af33 (30)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: class-default (match-any)
0 packets
Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 25%
queue-buffers ratio 25

```

This example shows how to enable auto-QoS for a trusted interface with specific DSCP classification.

```

Device(config)# interface GigabitEthernet1/0/18
Device(config-if)# auto qos trust dscp
Device(config-if)# end
Device#show policy-map interface GigabitEthernet1/0/18

```

```

GigabitEthernet1/0/18

Service-policy input: AutoQos-4.0-Trust-Dscp-Input-Policy

Class-map: class-default (match-any)
  0 packets
  Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp dscp table AutoQos-4.0-Trust-Dscp-Table

Service-policy output: AutoQos-4.0-Output-Policy

queue stats for all priority classes:
  Queueing
    priority level 1

  (total drops) 0
  (bytes output) 0

Class-map: AutoQos-4.0-Output-Priority-Queue (match-any)
  0 packets
  Match: dscp cs4 (32) cs5 (40) ef (46)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 5
    0 packets, 0 bytes
    5 minute rate 0 bps
  Priority: 30% (300000 kbps), burst bytes 7500000,
    Priority Level: 1

Class-map: AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
  0 packets
  Match: dscp cs2 (16) cs3 (24) cs6 (48) cs7 (56)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing
    queue-limit dscp 16 percent 80
    queue-limit dscp 24 percent 90
    queue-limit dscp 48 percent 100
    queue-limit dscp 56 percent 100

  (total drops) 0
  (bytes output) 0
  bandwidth remaining 10%

  queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
  0 packets
  Match: dscp af41 (34) af42 (36) af43 (38)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 4
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing

  (total drops) 0

```

**auto qos trust**

```

(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Trans-Data-Queue (match-any)
0 packets
Match: dscp af21 (18) af22 (20) af23 (22)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 2
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
0 packets
Match: dscp af11 (10) af12 (12) af13 (14)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 1
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 4%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Scavenger-Queue (match-any)
0 packets
Match: dscp cs1 (8)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 1%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)
0 packets
Match: dscp af31 (26) af32 (28) af33 (30)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: class-default (match-any)
0 packets
Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

```

```
(total drops) 0  
(bytes output) 0  
bandwidth remaining 25%  
queue-buffers ratio 25
```

You can verify your settings by entering the **show auto qos interface *interface-id*** privileged EXEC command.

# auto qos video

To automatically configure quality of service (QoS) for video within a QoS domain, use the **auto qos video** command in interface configuration mode. Use the **no** form of this command to return to the default setting.

```
auto qos video {cts | ip-camera | media-player}
no auto qos video {cts | ip-camera | media-player}
```

<b>Syntax Description</b>	<b>cts</b> Specifies a port connected to a Cisco TelePresence System and automatically configures QoS for video. <b>ip-camera</b> Specifies a port connected to a Cisco IP camera and automatically configures QoS for video. <b>media-player</b> Specifies a port connected to a CDP-capable Cisco digital media player and automatically configures QoS for video.					
<b>Command Default</b>	Auto-QoS video is disabled on the port.					
<b>Command Modes</b>	Interface configuration					
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>		Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification					
Cisco IOS XE 3.2SE	This command was introduced.					
<b>Usage Guidelines</b>	<p>Use this command to configure the QoS appropriate for video traffic within the QoS domain. The QoS domain includes the device, the network interior, and edge devices that can classify incoming traffic for QoS. When auto-QoS is enabled, it uses the ingress packet label to categorize traffic, to assign packet labels, and to configure the ingress and egress queues. For more information, see the queue tables at the end of this section.</p> <p>Auto-QoS configures the device for video connectivity to a Cisco TelePresence system, a Cisco IP camera, or a Cisco digital media player.</p> <p>To take advantage of the auto-QoS defaults, you should enable auto-QoS before you configure other QoS commands. You can fine-tune the auto-QoS configuration <i>after</i> you enable auto-QoS.</p> <p>The device applies the auto-QoS-generated commands as if the commands were entered from the command-line interface (CLI). An existing user configuration can cause the application of the generated commands to fail or to be overridden by the generated commands. These actions occur without warning. If all the generated commands are successfully applied, any user-entered configuration that was not overridden remains in the running configuration. Any user-entered configuration that was overridden can be retrieved by reloading the device without saving the current configuration to memory. If the generated commands fail to be applied, the previous running configuration is restored.</p> <p>If this is the first port on which you have enabled auto-QoS, the auto-QoS-generated global configuration commands are executed followed by the interface configuration commands. If you enable auto-QoS on another port, only the auto-QoS-generated interface configuration commands for that port are executed.</p> <p>After auto-QoS is enabled, do not modify a policy map or aggregate policer that includes <i>AutoQoS</i> in its name. If you need to modify the policy map or aggregate policer, make a copy of it, and change the copied policy map or policer. To use the new policy map instead of the generated one, remove the generated policy map from the interface, and apply the new policy map.</p>					

To display the QoS configuration that is automatically generated when auto-QoS is enabled, enable debugging before you enable auto-QoS. Use the **debug auto qos** privileged EXEC command to enable auto-QoS debugging.

The following policy maps and class maps are created and applied when running the **auto qos video cts** command:

Policy maps:

- AutoQos-4.0-Trust-Cos-Input-Policy
- AutoQos-4.0-Output-Policy

Class maps

- class-default (match-any)
- AutoQos-4.0-Output-Priority-Queue (match-any)
- AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
- AutoQos-4.0-Output-Trans-Data-Queue (match-any)
- AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
- AutoQos-4.0-Output-Scavenger-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)

The following policy maps and class maps are created and applied when running the **auto qos video ip-camera** command:

Policy maps:

- AutoQos-4.0-Trust-Dscp-Input-Policy
- AutoQos-4.0-Output-Policy

Class maps:

- class-default (match-any)
- AutoQos-4.0-Output-Priority-Queue (match-any)
- AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
- AutoQos-4.0-Output-Trans-Data-Queue (match-any)
- AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
- AutoQos-4.0-Output-Scavenger-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)

The following policy maps and class maps are created and applied when running the **auto qos video media-player** command:

Policy maps:

- AutoQos-4.0-Trust-Dscp-Input-Policy
- AutoQos-4.0-Output-Policy

Class maps:

- class-default (match-any)
- AutoQos-4.0-Output-Priority-Queue (match-any)
- AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
- AutoQos-4.0-Output-Trans-Data-Queue (match-any)
- AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
- AutoQos-4.0-Output-Scavenger-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)

To disable auto-QoS on a port, use the **no auto qos video** interface configuration command. Only the auto-QoS-generated interface configuration commands for this port are removed. If this is the last port on which auto-QoS is enabled, and you enter the **no auto qos video** command, auto-QoS is considered disabled even though the auto-QoS-generated global configuration commands remain (to avoid disrupting traffic on other ports affected by the global configuration).

**Table 43: Traffic Types, Packet Labels, and Queues**

	VOIP Data Traffic	VOIP Control Traffic	Routing Protocol Traffic	STP <sup>7</sup> BPDU <sup>8</sup> Traffic	Real-Time Video Traffic	All Other Traffic
DSCP <sup>9</sup>	46	24, 26	48	56	34	—
CoS <sup>10</sup>	5	3	6	7	3	—
CoS-to-egress queue map	4, 5 (queue 1)	2, 3, 6, 7 (queue 2)	2, 3, 6, 7 (queue 2)	2, 3, 6, 7 (queue 2)	0 (queue 3)	2 (queue 3) 0, 1 (queue 4)

<sup>7</sup> STP = Spanning Tree Protocol

<sup>8</sup> BPDU = bridge protocol data unit

<sup>9</sup> DSCP = Differentiated Services Code Point

<sup>10</sup> CoS = class of service

**Table 44: Auto-QoS Configuration for the Egress Queues**

Egress Queue	Queue Number	CoS-to-Queue Map	Queue Weight (Bandwidth)	Queue (Buffer) Size for Gigabit-Capable Ports	Queue (Buffer) Size for 10/100 Ethernet Ports
Priority (shaped)	1	4, 5	up to 100 percent	25 percent	15 percent

Egress Queue	Queue Number	CoS-to-Queue Map	Queue Weight (Bandwidth)	Queue (Buffer) Size for Gigabit-Capable Ports	Queue (Buffer) Size for 10/100 Ethernet Ports
SRR shared	2	2, 3, 6, 7	10 percent	25 percent	25 percent
SRR shared	3	0	60 percent	25 percent	40 percent
SRR shared	4	1	20 percent	25 percent	20 percent

**Examples**

The following is an example of the **auto qos video cts** command and the applied policies and class maps:

```

Device(config)# interface gigabitEthernet1/0/12
Device(config-if)# auto qos video cts
Device(config-if)# end
Device# show policy-map interface gigabitEthernet1/0/12

GigabitEthernet1/0/12

Service-policy input: AutoQos-4.0-Trust-Cos-Input-Policy

Class-map: class-default (match-any)
  0 packets
  Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    cos cos table AutoQos-4.0-Trust-Cos-Table

Service-policy output: AutoQos-4.0-Output-Policy

queue stats for all priority classes:
  Queueing
    priority level 1

  (total drops) 0
  (bytes output) 0

Class-map: AutoQos-4.0-Output-Priority-Queue (match-any)
  0 packets
  Match: dscp cs4 (32) cs5 (40) ef (46)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 5
    0 packets, 0 bytes
    5 minute rate 0 bps
  Priority: 30% (300000 kbps), burst bytes 7500000,
  Priority Level: 1

Class-map: AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
  0 packets
  Match: dscp cs2 (16) cs3 (24) cs6 (48) cs7 (56)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing

```

```

queue-limit dscp 16 percent 80
queue-limit dscp 24 percent 90
queue-limit dscp 48 percent 100
queue-limit dscp 56 percent 100

(total drops) 0
(bytes output) 0
bandwidth remaining 10%

queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
0 packets
Match: dscp af41 (34) af42 (36) af43 (38)
0 packets, 0 bytes
5 minute rate 0 bps
Match: cos 4
0 packets, 0 bytes
5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Trans-Data-Queue (match-any)
0 packets
Match: dscp af21 (18) af22 (20) af23 (22)
0 packets, 0 bytes
5 minute rate 0 bps
Match: cos 2
0 packets, 0 bytes
5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
0 packets
Match: dscp af11 (10) af12 (12) af13 (14)
0 packets, 0 bytes
5 minute rate 0 bps
Match: cos 1
0 packets, 0 bytes
5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 4%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Scavenger-Queue (match-any)
0 packets
Match: dscp cs1 (8)
0 packets, 0 bytes
5 minute rate 0 bps
Queueing

(total drops) 0

```

```

(bytes output) 0
bandwidth remaining 1%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)
0 packets
Match: dscp af31 (26) af32 (28) af33 (30)
0 packets, 0 bytes
5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: class-default (match-any)
0 packets
Match: any
0 packets, 0 bytes
5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 25%
queue-buffers ratio 25

```

The following is an example of the **auto qos video ip-camera** command and the applied policies and class maps:

```

Device(config)# interface GigabitEthernet1/0/9
Device(config-if)# auto qos video ip-camera
Device(config-if)# end
Device# show policy-map interface GigabitEthernet1/0/9

GigabitEthernet1/0/9

Service-policy input: AutoQos-4.0-Trust-Dscp-Input-Policy

Class-map: class-default (match-any)
0 packets
Match: any
0 packets, 0 bytes
5 minute rate 0 bps
QoS Set
dscp dscp table AutoQos-4.0-Trust-Dscp-Table

Service-policy output: AutoQos-4.0-Output-Policy

queue stats for all priority classes:
Queueing
priority level 1

(total drops) 0
(bytes output) 0

Class-map: AutoQos-4.0-Output-Priority-Queue (match-any)
0 packets
Match: dscp cs4 (32) cs5 (40) ef (46)
0 packets, 0 bytes

```

```

      5 minute rate 0 bps
Match: cos 5
      0 packets, 0 bytes
      5 minute rate 0 bps
Priority: 30% (300000 kbps), burst bytes 7500000,
Priority Level: 1

Class-map: AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
      0 packets
Match: dscp cs2 (16) cs3 (24) cs6 (48) cs7 (56)
      0 packets, 0 bytes
      5 minute rate 0 bps
Match: cos 3
      0 packets, 0 bytes
      5 minute rate 0 bps
Queueing
queue-limit dscp 16 percent 80
queue-limit dscp 24 percent 90
queue-limit dscp 48 percent 100
queue-limit dscp 56 percent 100

(total drops) 0
(bytes output) 0
bandwidth remaining 10%

queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
      0 packets
Match: dscp af41 (34) af42 (36) af43 (38)
      0 packets, 0 bytes
      5 minute rate 0 bps
Match: cos 4
      0 packets, 0 bytes
      5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Trans-Data-Queue (match-any)
      0 packets
Match: dscp af21 (18) af22 (20) af23 (22)
      0 packets, 0 bytes
      5 minute rate 0 bps
Match: cos 2
      0 packets, 0 bytes
      5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
      0 packets
Match: dscp af11 (10) af12 (12) af13 (14)
      0 packets, 0 bytes
      5 minute rate 0 bps
Match: cos 1

```

```

    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

    (total drops) 0
    (bytes output) 0
bandwidth remaining 4%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Scavenger-Queue (match-any)
    0 packets
    Match: dscp cs1 (8)
        0 packets, 0 bytes
        5 minute rate 0 bps
Queueing

    (total drops) 0
    (bytes output) 0
bandwidth remaining 1%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)
    0 packets
    Match: dscp af31 (26) af32 (28) af33 (30)
        0 packets, 0 bytes
        5 minute rate 0 bps
Queueing

    (total drops) 0
    (bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: class-default (match-any)
    0 packets
    Match: any
        0 packets, 0 bytes
        5 minute rate 0 bps
Queueing

    (total drops) 0
    (bytes output) 0
bandwidth remaining 25%
queue-buffers ratio 25

```

The following is an example of the **auto qos video media-player** command and the applied policies and class maps.

```

Device(config)# interface GigabitEthernet1/0/7
Device(config-if)# auto qos video media-player
Device(config-if)# end
Device# show policy-map interface GigabitEthernet1/0/7

GigabitEthernet1/0/7

Service-policy input: AutoQos-4.0-Trust-Dscp-Input-Policy

Class-map: class-default (match-any)
    0 packets
    Match: any
        0 packets, 0 bytes

```

```

      5 minute rate 0 bps
QoS Set
      dscp dscp table AutoQos-4.0-Trust-Dscp-Table

Service-policy output: AutoQos-4.0-Output-Policy

queue stats for all priority classes:
  Queueing
    priority level 1

  (total drops) 0
  (bytes output) 0

Class-map: AutoQos-4.0-Output-Priority-Queue (match-any)
  0 packets
  Match: dscp cs4 (32) cs5 (40) ef (46)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 5
    0 packets, 0 bytes
    5 minute rate 0 bps
  Priority: 30% (300000 kbps), burst bytes 7500000,
  Priority Level: 1

Class-map: AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
  0 packets
  Match: dscp cs2 (16) cs3 (24) cs6 (48) cs7 (56)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing
    queue-limit dscp 16 percent 80
    queue-limit dscp 24 percent 90
    queue-limit dscp 48 percent 100
    queue-limit dscp 56 percent 100

  (total drops) 0
  (bytes output) 0
  bandwidth remaining 10%

  queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
  0 packets
  Match: dscp af41 (34) af42 (36) af43 (38)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 4
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing

  (total drops) 0
  (bytes output) 0
  bandwidth remaining 10%
  queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Trans-Data-Queue (match-any)
  0 packets
  Match: dscp af21 (18) af22 (20) af23 (22)
    0 packets, 0 bytes

```

```
      5 minute rate 0 bps
Match: cos 2
      0 packets, 0 bytes
      5 minute rate 0 bps
Queueing

      (total drops) 0
      (bytes output) 0
      bandwidth remaining 10%
      queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
      0 packets
Match: dscp af11 (10) af12 (12) af13 (14)
      0 packets, 0 bytes
      5 minute rate 0 bps
Match: cos 1
      0 packets, 0 bytes
      5 minute rate 0 bps
Queueing

      (total drops) 0
      (bytes output) 0
      bandwidth remaining 4%
      queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Scavenger-Queue (match-any)
      0 packets
Match: dscp cs1 (8)
      0 packets, 0 bytes
      5 minute rate 0 bps
Queueing

      (total drops) 0
      (bytes output) 0
      bandwidth remaining 1%
      queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)
      0 packets
Match: dscp af31 (26) af32 (28) af33 (30)
      0 packets, 0 bytes
      5 minute rate 0 bps
Queueing

      (total drops) 0
      (bytes output) 0
      bandwidth remaining 10%
      queue-buffers ratio 10

Class-map: class-default (match-any)
      0 packets
Match: any
      0 packets, 0 bytes
      5 minute rate 0 bps
Queueing

      (total drops) 0
      (bytes output) 0
      bandwidth remaining 25%
      queue-buffers ratio 25
```

**auto qos video**

You can verify your settings by entering the **show auto qos video interface *interface-id*** privileged EXEC command.

# auto qos voip

To automatically configure quality of service (QoS) for voice over IP (VoIP) within a QoS domain, use the **auto qos voip** command in interface configuration mode. Use the **no** form of this command to return to the default setting.

```
auto qos voip {cisco-phone | cisco-softphone | trust}
no auto qos voip {cisco-phone | cisco-softphone | trust}
```

Syntax Description	<b>cisco-phone</b> Specifies a port connected to a Cisco IP phone, and automatically configures QoS for VoIP. The QoS labels of incoming packets are trusted only when the telephone is detected.
<b>cisco-softphone</b>	Specifies a port connected to a device running the Cisco SoftPhone, and automatically configures QoS for VoIP.
<b>trust</b>	Specifies a port connected to a trusted device, and automatically configures QoS for VoIP. The QoS labels of incoming packets are trusted. For nonrouted ports, the CoS value of the incoming packet is trusted. For routed ports, the DSCP value of the incoming packet is trusted.

## Command Default

Auto-QoS is disabled on the port. When auto-QoS is enabled, it uses the ingress packet label to categorize traffic, to assign packet labels, and to configure the ingress and egress queues.

## Command Default

Interface configuration

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

Use this command to configure the QoS appropriate for VoIP traffic within the QoS domain. The QoS domain includes the device, the network interior, and edge devices that can classify incoming traffic for QoS.

Auto-QoS configures the device for VoIP with Cisco IP phones on device and routed ports and for devices running the Cisco SoftPhone application. These releases support only Cisco IP SoftPhone Version 1.3(3) or later. Connected devices must use Cisco Call Manager Version 4 or later.

To take advantage of the auto-QoS defaults, you should enable auto-QoS before you configure other QoS commands. You can fine-tune the auto-QoS configuration *after* you enable auto-QoS.



**Note** The device applies the auto-QoS-generated commands as if the commands were entered from the command-line interface (CLI). An existing user configuration can cause the application of the generated commands to fail or to be overridden by the generated commands. These actions occur without warning. If all the generated commands are successfully applied, any user-entered configuration that was not overridden remains in the running configuration. Any user-entered configuration that was overridden can be retrieved by reloading the device without saving the current configuration to memory. If the generated commands fail to be applied, the previous running configuration is restored.

If this is the first port on which you have enabled auto-QoS, the auto-QoS-generated global configuration commands are executed followed by the interface configuration commands. If you enable auto-QoS on another port, only the auto-QoS-generated interface configuration commands for that port are executed.

When you enter the **auto qos voip cisco-phone** interface configuration command on a port at the edge of the network that is connected to a Cisco IP phone, the device enables the trusted boundary feature. The device uses the Cisco Discovery Protocol (CDP) to detect the presence of a Cisco IP phone. When a Cisco IP phone is detected, the ingress classification on the port is set to trust the QoS label received in the packet. The device also uses policing to determine whether a packet is in or out of profile and to specify the action on the packet. If the packet does not have a DSCP value of 24, 26, or 46 or is out of profile, the device changes the DSCP value to 0. When a Cisco IP phone is absent, the ingress classification is set to not trust the QoS label in the packet. The policing is applied to those traffic matching the policy-map classification before the device enables the trust boundary feature.

- When you enter the **auto qos voip cisco-softphone** interface configuration command on a port at the edge of the network that is connected to a device running the Cisco SoftPhone, the device uses policing to decide whether a packet is in or out of profile and to specify the action on the packet. If the packet does not have a DSCP value of 24, 26, or 46 or is out of profile, the device changes the DSCP value to 0.
- When you enter the **auto qos voip trust** interface configuration command on a port connected to the network interior, the device trusts the CoS value for nonrouted ports or the DSCP value for routed ports in ingress packets (the assumption is that traffic has already been classified by other edge devices).

You can enable auto-QoS on static, dynamic-access, and voice VLAN access, and trunk ports. When enabling auto-QoS with a Cisco IP phone on a routed port, you must assign a static IP address to the IP phone.



**Note** When a device running Cisco SoftPhone is connected to a device or routed port, the device supports only one Cisco SoftPhone application per port.

After auto-QoS is enabled, do not modify a policy map or aggregate policer that includes *AutoQoS* in its name. If you need to modify the policy map or aggregate policer, make a copy of it, and change the copied policy map or policer. To use the new policy map instead of the generated one, remove the generated policy map from the interface, and apply the new policy map.

To display the QoS configuration that is automatically generated when auto-QoS is enabled, enable debugging before you enable auto-QoS. Use the **debug auto qos** privileged EXEC command to enable auto-QoS debugging.

The following policy maps and class maps are created and applied when running the **auto qos voip trust** command:

Policy maps:

- AutoQos-4.0-Trust-Cos-Input-Policy
- AutoQos-4.0-Output-Policy

Class maps:

- class-default (match-any)
- AutoQos-4.0-Output-Priority-Queue (match-any)

- AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
- AutoQos-4.0-Output-Trans-Data-Queue (match-any)
- AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
- AutoQos-4.0-Output-Scavenger-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)

The following policy maps and class maps are created and applied when running the **auto qos voip cisco-softphone** command:

Policy maps:

- AutoQos-4.0-CiscoSoftPhone-Input-Policy
- AutoQos-4.0-Output-Policy

Class maps:

- AutoQos-4.0-Voip-Data-Class (match-any)
- AutoQos-4.0-Voip-Signal-Class (match-any)
- AutoQos-4.0-Multimedia-Conf-Class (match-any)
- AutoQos-4.0-Bulk-Data-Class (match-any)
- AutoQos-4.0-Transaction-Class (match-any)
- AutoQos-4.0-Scavenger-Class (match-any)
- AutoQos-4.0-Signaling-Class (match-any)
- AutoQos-4.0-Default-Class (match-any)
- class-default (match-any)
- AutoQos-4.0-Output-Priority-Queue (match-any)
- AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
- AutoQos-4.0-Output-Trans-Data-Queue (match-any)
- AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
- AutoQos-4.0-Output-Scavenger-Queue (match-any)
- AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)

The following policy maps and class maps are created and applied when running the **auto qos voip cisco-phone** command:

Policy maps:

- service-policy input AutoQos-4.0-CiscoPhone-Input-Policy

**auto qos voip**

- service-policy output AutoQos-4.0-Output-Policy

Class maps:

- class AutoQos-4.0-Voip-Data-CiscoPhone-Class
- class AutoQos-4.0-Voip-Signal-CiscoPhone-Class
- class AutoQos-4.0-Default-Class

To disable auto-QoS on a port, use the **no auto qos voip** interface configuration command. Only the auto-QoS-generated interface configuration commands for this port are removed. If this is the last port on which auto-QoS is enabled and you enter the **no auto qos voip** command, auto-QoS is considered disabled even though the auto-QoS-generated global configuration commands remain (to avoid disrupting traffic on other ports affected by the global configuration).

The device configures egress queues on the port according to the settings in this table.

**Table 45: Auto-QoS Configuration for the Egress Queues**

Egress Queue	Queue Number	CoS-to-Queue Map	Queue Weight (Bandwidth)	Queue (Buffer) Size for Gigabit-Capable Ports	Queue (Buffer) Size for 10/100 Ethernet Ports
Priority (shaped)	1	4, 5	Up to 100 percent	25 percent	15 percent
SRR shared	2	2, 3, 6, 7	10 percent	25 percent	25 percent
SRR shared	3	0	60 percent	25 percent	40 percent
SRR shared	4	1	20 percent	25 percent	20 percent

## Examples

The following is an example of the **auto qos voip trust** command and the applied policies and class maps:

```
Device(config)# interface gigabitEthernet1/0/31
Device(config-if)# auto qos voip trust
Device(config-if)# end
Device# show policy-map interface GigabitEthernet1/0/31

GigabitEthernet1/0/31

Service-policy input: AutoQos-4.0-Trust-Cos-Input-Policy

Class-map: class-default (match-any)
  0 packets
  Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    cos cos table AutoQos-4.0-Trust-Cos-Table

Service-policy output: AutoQos-4.0-Output-Policy

queue stats for all priority classes:
  Queueing
```

```

priority level 1

(total drops) 0
(bytes output) 0

Class-map: AutoQos-4.0-Output-Priority-Queue (match-any)
  0 packets
  Match: dscp cs4 (32) cs5 (40) ef (46)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 5
    0 packets, 0 bytes
    5 minute rate 0 bps
  Priority: 30% (300000 kbps), burst bytes 7500000,
  Priority Level: 1

Class-map: AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
  0 packets
  Match: dscp cs2 (16) cs3 (24) cs6 (48) cs7 (56)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing
  queue-limit dscp 16 percent 80
  queue-limit dscp 24 percent 90
  queue-limit dscp 48 percent 100
  queue-limit dscp 56 percent 100

  (total drops) 0
  (bytes output) 0
  bandwidth remaining 10%

  queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
  0 packets
  Match: dscp af41 (34) af42 (36) af43 (38)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 4
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing

  (total drops) 0
  (bytes output) 0
  bandwidth remaining 10%
  queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Trans-Data-Queue (match-any)
  0 packets
  Match: dscp af21 (18) af22 (20) af23 (22)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 2
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing

  (total drops) 0
  (bytes output) 0

```

**auto qos voip**

```

bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
0 packets
Match: dscp af11 (10) af12 (12) af13 (14)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 1
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

    (total drops) 0
    (bytes output) 0
bandwidth remaining 4%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Scavenger-Queue (match-any)
0 packets
Match: dscp cs1 (8)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

    (total drops) 0
    (bytes output) 0
bandwidth remaining 1%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)
0 packets
Match: dscp af31 (26) af32 (28) af33 (30)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

    (total drops) 0
    (bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: class-default (match-any)
0 packets
Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

    (total drops) 0
    (bytes output) 0
bandwidth remaining 25%
queue-buffers ratio 25

```

The following is an example of the **auto qos voip cisco-phone** command and the applied policies and class maps:

```

Device(config)# interface gigabitEthernet1/0/5
Device(config-if)# auto qos voip cisco-phone
Device(config-if)# end
Device# show policy-map interface gigabitEthernet1/0/5

```

```

GigabitEthernet1/0/5

Service-policy input: AutoQos-4.0-CiscoPhone-Input-Policy

Class-map: AutoQos-4.0-Voip-Data-CiscoPhone-Class (match-any)
  0 packets
  Match: cos 5
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp ef
  police:
    cir 128000 bps, bc 8000 bytes
    conformed 0 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      set-dscp-transmit dscp table policed-dscp
    conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Voip-Signal-CiscoPhone-Class (match-any)
  0 packets
  Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp cs3
  police:
    cir 32000 bps, bc 8000 bytes
    conformed 0 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      set-dscp-transmit dscp table policed-dscp
    conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Default-Class (match-any)
  0 packets
  Match: access-group name AutoQos-4.0-Acl-Default
    0 packets, 0 bytes
    5 minute rate 0 bps
  QoS Set
    dscp default

Class-map: class-default (match-any)
  0 packets
  Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps

Service-policy output: AutoQos-4.0-Output-Policy

queue stats for all priority classes:
  Queueing
    priority level 1

  (total drops) 0
  (bytes output) 0

Class-map: AutoQos-4.0-Output-Priority-Queue (match-any)
  0 packets
  Match: dscp cs4 (32) cs5 (40) ef (46)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 5
    0 packets, 0 bytes

```

```

      5 minute rate 0 bps
Priority: 30% (300000 kbps), burst bytes 7500000,
Priority Level: 1

Class-map: AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
  0 packets
  Match: dscp cs2 (16) cs3 (24) cs6 (48) cs7 (56)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing
    queue-limit dscp 16 percent 80
    queue-limit dscp 24 percent 90
    queue-limit dscp 48 percent 100
    queue-limit dscp 56 percent 100

    (total drops) 0
    (bytes output) 0
    bandwidth remaining 10%

    queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
  0 packets
  Match: dscp af41 (34) af42 (36) af43 (38)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 4
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing

    (total drops) 0
    (bytes output) 0
    bandwidth remaining 10%
    queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Trans-Data-Queue (match-any)
  0 packets
  Match: dscp af21 (18) af22 (20) af23 (22)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 2
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing

    (total drops) 0
    (bytes output) 0
    bandwidth remaining 10%
    queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
  0 packets
  Match: dscp af11 (10) af12 (12) af13 (14)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 1
    0 packets, 0 bytes
    5 minute rate 0 bps
  Queueing

```

```

        (total drops) 0
        (bytes output) 0
        bandwidth remaining 4%
        queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Scavenger-Queue (match-any)
0 packets
Match: dscp cs1 (8)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

        (total drops) 0
        (bytes output) 0
        bandwidth remaining 1%
        queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)
0 packets
Match: dscp af31 (26) af32 (28) af33 (30)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

        (total drops) 0
        (bytes output) 0
        bandwidth remaining 10%
        queue-buffers ratio 10

Class-map: class-default (match-any)
0 packets
Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

        (total drops) 0
        (bytes output) 0
        bandwidth remaining 25%
        queue-buffers ratio 25

```

The following is an example of the **auto qos voip cisco-softphone** command and the applied policies and class maps:

```

Device(config)# interface gigabitEthernet1/0/20
Device(config-if)# auto qos voip cisco-softphone
Device(config-if)# end
Device# show policy-map interface gigabitEthernet1/0/20

GigabitEthernet1/0/20

Service-policy input: AutoQos-4.0-CiscoSoftPhone-Input-Policy

Class-map: AutoQos-4.0-Voip-Data-Class (match-any)
0 packets
Match: dscp ef (46)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 5
    0 packets, 0 bytes
    5 minute rate 0 bps

```

**auto qos voip**

```

QoS Set
  dscp ef
police:
  cir 128000 bps, bc 8000 bytes
  conformed 0 bytes; actions:
    transmit
  exceeded 0 bytes; actions:
    set-dscp-transmit dscp table policed-dscp
  conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Voip-Signal-Class (match-any)
  0 packets
  Match: dscp cs3 (24)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
QoS Set
  dscp cs3
police:
  cir 32000 bps, bc 8000 bytes
  conformed 0 bytes; actions:
    transmit
  exceeded 0 bytes; actions:
    set-dscp-transmit dscp table policed-dscp
  conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Multimedia-Conf-Class (match-any)
  0 packets
  Match: access-group name AutoQos-4.0-Acl-MultiEnhanced-Conf
    0 packets, 0 bytes
    5 minute rate 0 bps
QoS Set
  dscp af41
police:
  cir 5000000 bps, bc 156250 bytes
  conformed 0 bytes; actions:
    transmit
  exceeded 0 bytes; actions:
    drop
  conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Bulk-Data-Class (match-any)
  0 packets
  Match: access-group name AutoQos-4.0-Acl-Bulk-Data
    0 packets, 0 bytes
    5 minute rate 0 bps
QoS Set
  dscp af11
police:
  cir 10000000 bps, bc 312500 bytes
  conformed 0 bytes; actions:
    transmit
  exceeded 0 bytes; actions:
    set-dscp-transmit dscp table policed-dscp
  conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Transaction-Class (match-any)
  0 packets
  Match: access-group name AutoQos-4.0-Acl-Transactional-Data
    0 packets, 0 bytes
    5 minute rate 0 bps
QoS Set

```

```

dscp af21
police:
    cir 10000000 bps, bc 312500 bytes
    conformed 0 bytes; actions:
        transmit
    exceeded 0 bytes; actions:
        set-dscp-transmit dscp table policed-dscp
    conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Scavenger-Class (match-any)
0 packets
Match: access-group name AutoQos-4.0-Acl-Scavenger
0 packets, 0 bytes
5 minute rate 0 bps
QoS Set
    dscp cs1
police:
    cir 10000000 bps, bc 312500 bytes
    conformed 0 bytes; actions:
        transmit
    exceeded 0 bytes; actions:
        drop
    conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Signaling-Class (match-any)
0 packets
Match: access-group name AutoQos-4.0-Acl-Signaling
0 packets, 0 bytes
5 minute rate 0 bps
QoS Set
    dscp cs3
police:
    cir 32000 bps, bc 8000 bytes
    conformed 0 bytes; actions:
        transmit
    exceeded 0 bytes; actions:
        drop
    conformed 0000 bps, exceed 0000 bps

Class-map: AutoQos-4.0-Default-Class (match-any)
0 packets
Match: access-group name AutoQos-4.0-Acl-Default
0 packets, 0 bytes
5 minute rate 0 bps
QoS Set
    dscp default
police:
    cir 10000000 bps, bc 312500 bytes
    conformed 0 bytes; actions:
        transmit
    exceeded 0 bytes; actions:
        set-dscp-transmit dscp table policed-dscp
    conformed 0000 bps, exceed 0000 bps

Class-map: class-default (match-any)
0 packets
Match: any
0 packets, 0 bytes
5 minute rate 0 bps

Service-policy output: AutoQos-4.0-Output-Policy

queue stats for all priority classes:
Queueing

```

**auto qos voip**

```

priority level 1

(total drops) 0
(bytes output) 0

Class-map: AutoQos-4.0-Output-Priority-Queue (match-any)
0 packets
Match: dscp cs4 (32) cs5 (40) ef (46)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 5
    0 packets, 0 bytes
    5 minute rate 0 bps
Priority: 30% (300000 kbps), burst bytes 7500000,
Priority Level: 1

Class-map: AutoQos-4.0-Output-Control-Mgmt-Queue (match-any)
0 packets
Match: dscp cs2 (16) cs3 (24) cs6 (48) cs7 (56)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 3
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing
queue-limit dscp 16 percent 80
queue-limit dscp 24 percent 90
queue-limit dscp 48 percent 100
queue-limit dscp 56 percent 100

(total drops) 0
(bytes output) 0
bandwidth remaining 10%

queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Conf-Queue (match-any)
0 packets
Match: dscp af41 (34) af42 (36) af43 (38)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 4
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0
bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Trans-Data-Queue (match-any)
0 packets
Match: dscp af21 (18) af22 (20) af23 (22)
    0 packets, 0 bytes
    5 minute rate 0 bps
Match: cos 2
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

(total drops) 0
(bytes output) 0

```

```

bandwidth remaining 10%
queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Bulk-Data-Queue (match-any)
  0 packets
  Match: dscp af11 (10) af12 (12) af13 (14)
    0 packets, 0 bytes
    5 minute rate 0 bps
  Match: cos 1
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

  (total drops) 0
  (bytes output) 0
  bandwidth remaining 4%
  queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Scavenger-Queue (match-any)
  0 packets
  Match: dscp cs1 (8)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

  (total drops) 0
  (bytes output) 0
  bandwidth remaining 1%
  queue-buffers ratio 10

Class-map: AutoQos-4.0-Output-Multimedia-Strm-Queue (match-any)
  0 packets
  Match: dscp af31 (26) af32 (28) af33 (30)
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

  (total drops) 0
  (bytes output) 0
  bandwidth remaining 10%
  queue-buffers ratio 10

Class-map: class-default (match-any)
  0 packets
  Match: any
    0 packets, 0 bytes
    5 minute rate 0 bps
Queueing

  (total drops) 0
  (bytes output) 0
  bandwidth remaining 25%
  queue-buffers ratio 25

```

You can verify your settings by entering the **show auto qos interface *interface-id*** privileged EXEC command.

# class

To define a traffic classification match criteria for the specified class-map name, use the **class** command in policy-map configuration mode. Use the **no** form of this command to delete an existing class map.

```
class {class-map-name | class-default}
no class {class-map-name | class-default}
```

## Syntax Description

**class-map-name** The class map name.

**class-default** Refers to a system default class that matches unclassified packets.

## Command Default

No policy map class-maps are defined.

## Command Modes

Policy-map configuration

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

Before using the **class** command, you must use the **policy-map** global configuration command to identify the policy map and enter policy-map configuration mode. After specifying a policy map, you can configure a policy for new classes or modify a policy for any existing classes in that policy map. You attach the policy map to a port by using the **service-policy** interface configuration command.

After entering the **class** command, you enter the policy-map class configuration mode. These configuration commands are available:

- **admit**—Admits a request for Call Admission Control (CAC)
- **bandwidth**—Specifies the bandwidth allocated to the class.
- **exit**—Exits the policy-map class configuration mode and returns to policy-map configuration mode.
- **no**—Returns a command to its default setting.
- **police**—Defines a policer or aggregate policer for the classified traffic. The policer specifies the bandwidth limitations and the action to take when the limits are exceeded. For more information about this command, see *Cisco IOS Quality of Service Solutions Command Reference* available on Cisco.com.
- **priority**—Assigns scheduling priority to a class of traffic belonging to a policy map.
- **queue-buffers**—Configures the queue buffer for the class.
- **queue-limit**—Specifies the maximum number of packets the queue can hold for a class policy configured in a policy map.
- **service-policy**—Configures a QoS service policy.
- **set**—Specifies a value to be assigned to the classified traffic. For more information, see [set, on page 778](#)
- **shape**—Specifies average or peak rate traffic shaping. For more information about this command, see *Cisco IOS Quality of Service Solutions Command Reference* available on Cisco.com.

To return to policy-map configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

The **class** command performs the same function as the **class-map** global configuration command. Use the **class** command when a new classification, which is not shared with any other ports, is needed. Use the **class-map** command when the map is shared among many ports.

You can configure a default class by using the **class class-default** policy-map configuration command. Unclassified traffic (traffic that does not meet the match criteria specified in the traffic classes) is treated as default traffic.

You can verify your settings by entering the **show policy-map** privileged EXEC command.

## Examples

This example shows how to create a policy map called policy1. When attached to the ingress direction, it matches all the incoming traffic defined in class1, sets the IP Differentiated Services Code Point (DSCP) to 10, and polices the traffic at an average rate of 1 Mb/s and bursts at 20 KB. Traffic exceeding the profile is marked down to a DSCP value gotten from the policed-DSCP map and then sent.

```
Device(config)# policy-map policy1
Device(config-pmap)# class class1
Device(config-pmap-c)# set dscp 10
Device(config-pmap-c)# police 1000000 20000 conform-action
Device(config-pmap-c)# police 1000000 20000 exceed-action
Device(config-pmap-c)# exit
```

This example shows how to configure a default traffic class to a policy map. It also shows how the default traffic class is automatically placed at the end of policy-map pm3 even though **class-default** was configured first:

```
Device# configure terminal
Device(config)# class-map cm-3
Device(config-cmap)# match ip dscp 30
Device(config-cmap)# exit

Device(config)# class-map cm-4
Device(config-cmap)# match ip dscp 40
Device(config-cmap)# exit

Device(config)# policy-map pm3
Device(config-pmap)# class class-default
Device(config-pmap-c)# set dscp 10
Device(config-pmap-c)# exit

Device(config-pmap)# class cm-3
Device(config-pmap-c)# set dscp 4
Device(config-pmap-c)# exit

Device(config-pmap)# class cm-4
Device(config-pmap-c)# set precedence 5
Device(config-pmap-c)# exit
Device(config-pmap)# exit

Device# show policy-map pm3
Policy Map pm3
  Class cm-3
    set dscp 4
  Class cm-4
    set precedence 5
```

**class**

```
Class class-default
  set dscp af11
```

# class-map

To create a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode, use the **class-map** command in global configuration mode. Use the **no** form of this command to delete an existing class map and to return to global or policy map configuration mode.

```
class-map class-map name {match-any | match-all}  
no class-map class-map name {match-any | match-all}
```

<b>Syntax Description</b>	<b>match-any</b> (Optional) Perform a logical-OR of the matching statements under this class map. One or more criteria must be matched. <b>match-all</b> (Optional) Performs a logical-AND of the matching statements under this class map. All criterias must match. <i>class-map-name</i> The class map name.				
<b>Command Default</b>	No class maps are defined.				
<b>Command Modes</b>	Global configuration Policy map configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** Use this command to specify the name of the class for which you want to create or modify class-map match criteria and to enter class-map configuration mode.

The **class-map** command and its subcommands are used to define packet classification, marking, and aggregate policing as part of a globally named service policy applied on a per-port basis.

After you are in quality of service (QoS) class-map configuration mode, these configuration commands are available:

- **description**—Describes the class map (up to 200 characters). The **show class-map** privileged EXEC command displays the description and the name of the class map.
- **exit**—Exits from QoS class-map configuration mode.
- **match**—Configures classification criteria.
- **no**—Removes a match statement from a class map.

If you enter the **match-any** keyword, you can only use it to specify an extended named access control list (ACL) with the **match access-group** class-map configuration command.

To define packet classification on a physical-port basis, only one **match** command per class map is supported. The ACL can have multiple access control entries (ACEs).

**Examples**

This example shows how to configure the class map called class1 with one match criterion, which is an access list called 103:

```
Device(config)# access-list 103 permit ip any any dscp 10
Device(config)# class-map class1
Device(config-cmap)# match access-group 103
Device(config-cmap)# exit
```

This example shows how to delete the class map class1:

```
Device(config)# no class-map class1
```

You can verify your settings by entering the **show class-map** privileged EXEC command.

# debug auto qos

To enable debugging of the automatic quality of service (auto-QoS) feature, use the **debug auto qos** command in privileged EXEC mode. Use the **no** form of this command to disable debugging.

**debug auto qos**  
**no debug auto qos**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Auto-QoS debugging is disabled.

**Command Modes** Privileged EXEC

Command History	Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.	

**Usage Guidelines** To display the QoS configuration that is automatically generated when auto-QoS is enabled, enable debugging before you enable auto-QoS. You enable debugging by entering the **debug auto qos** privileged EXEC command.

The **undebug auto qos** command is the same as the **no debug auto qos** command.

When you enable debugging on a device stack, it is enabled only on the active device. To enable debugging on a stack member, you can start a session from the active device by using the **session switch-number** privileged EXEC command. Then enter the **debug** command at the command-line prompt of the stack member. You also can use the **remote command stack-member-number LINE** privileged EXEC command on the active device to enable debugging on a member device without first starting a session.

**Examples** This example shows how to display the QoS configuration that is automatically generated when auto-QoS is enabled:

```
Device# debug auto qos
AutoQoS debugging is on
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# auto qos voip cisco-phone
```

# match (class-map configuration)

To define the match criteria to classify traffic, use the **match** command in class-map configuration mode. Use the **no** form of this command to remove the match criteria.

## Cisco IOS XE Everest 16.5.x and Earlier Releases

```
match {access-group{nameacl-name acl-index} | class-map class-map-name | cos cos-value | dscp
dscp-value | [ ip ] dscp dscp-list | [ip] precedence ip-precedence-list | precedence
precedence-value1...value4 | qos-group qos-group-value | vlan vlan-id}
no match {access-group{nameacl-name acl-index} | class-map class-map-name | cos cos-value | dscp
dscp-value | [ ip ] dscp dscp-list | [ip] precedence ip-precedence-list | precedence
precedence-value1...value4 | qos-group qos-group-value | vlan vlan-id}
```

## Cisco IOS XE Everest 16.6.x and Later Releases

```
match {access-group{name acl-name acl-index} | cos cos-value | dscp dscp-value | [ ip ] dscp dscp-list
| [ ip ] precedence ip-precedence-list | mpls experimental-value | non-client-nrt | precedence
precedence-value1...value4 | protocol protocol-name | qos-group qos-group-value | vlan vlan-id | wlan
wlan-id}
no match {access-group{name acl-name acl-index} | cos cos-value | dscp dscp-value | [ ip ] dscp
dscp-list | [ ip ] precedence ip-precedence-list | mpls experimental-value | non-client-nrt | precedence
precedence-value1...value4 | protocol protocol-name | qos-group qos-group-value | vlan vlan-id | wlan
wlan-id}
```

Syntax Description		
<b>access-group</b>		Specifies an access group.
<b>name acl-name</b>		Specifies the name of an IP standard or extended access control list (ACL) or MAC ACL.
<b>acl-index</b>		Specifies the number of an IP standard or extended access control list (ACL) or MAC ACL. For an IP standard ACL, the ACL index range is 1 to 99 and 1300 to 1999. For an IP extended ACL, the ACL index range is 100 to 199 and 2000 to 2699.
<b>class-map class-map-name</b>		Uses a traffic class as a classification policy and specifies a traffic class name to use as the match criterion.
	<b>Note</b>	This command is not supported in Cisco IOS XE Everest 16.5.1a.
<b>cos cos-value</b>		Matches a packet on the basis of a Layer 2 class of service (CoS)/Inter-Switch Link (ISL) marking. The cos-value is from 0 to 7. You can specify up to four CoS values in one <b>match cos</b> statement, separated by a space.
<b>dscp dscp-value</b>		Specifies the parameters for each DSCP value. You can specify a value in the range 0 to 63 specifying the differentiated services code point value.

<b>ip dscp</b> <i>dscp-list</i>	Specifies a list of up to eight IP Differentiated Services Code Point (DSCP) values to match against incoming packets. Separate each value with a space. The range is 0 to 63. You also can enter a mnemonic name for a commonly used value.
<b>ip precedence</b> <i>ip-precedence-list</i>	Specifies a list of up to eight IP-precedence values to match against incoming packets. Separate each value with a space. The range is 0 to 7. You also can enter a mnemonic name for a commonly used value.
<b>precedence</b> <i>precedence-value1...value4</i>	Assigns an IP precedence value to the classified traffic. The range is 0 to 7. You also can enter a mnemonic name for a commonly used value.
<b>qos-group</b> <i>qos-group-value</i>	Identifies a specific QoS group value as a match criterion. The range is 0 to 31.
<b>vlan</b> <i>vlan-id</i>	Identifies a specific VLAN as a match criterion. The range is 1 to 4094.
<b>mpls experimental-value</b>	Specifies Multi Protocol Label Switching specific values.
<b>non-client-nrt</b>	Matches a non-client NRT (non-real-time).
<b>protocol</b> <i>protocol-name</i>	Specifies the type of protocol.
<b>wlan</b> <i>wlan-id</i>	Identifies 802.11 specific values.

**Command Default** No match criteria are defined.

**Command Modes** Class-map configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
	Cisco IOS XE 3.3SE	The <b>class-map</b> <i>class-map-name</i> are added.
	Cisco IOS XE Everest 16.6.1	The <b>class-map</b> <i>class-map-name</i> are added. The <b>mpls experimental-value</b> is added.

**Usage Guidelines** The **match** command is used to specify which fields in the incoming packets are examined to classify the packets. Only the IP access group or the MAC access group matching to the Ether Type/Len are supported.

If you enter the **class-map match-anyclass-map-name** global configuration command, you can enter the following **match** commands:

- **match access-group name** *acl-name*

**match (class-map configuration)**

**Note** The ACL must be an extended named ACL.

- **match ip dscp *dscp-list***
- **match ip precedence *ip-precedence-list***

The **match access-group *acl-index*** command is not supported.

To define packet classification on a physical-port basis, only one **match** command per class map is supported. In this situation, the **match-any** keyword is equivalent.

For the **match ip dscp *dscp-list*** or the **match ip precedence *ip-precedence-list*** command, you can enter a mnemonic name for a commonly used value. For example, you can enter the **match ip dscp af11** command, which is the same as entering the **match ip dscp 10** command. You can enter the **match ip precedence critical** command, which is the same as entering the **match ip precedence 5** command. For a list of supported mnemonics, enter the **match ip dscp ?** or the **match ip precedence ?** command to see the command-line help strings.

Use the **input-interface *interface-id-list*** keyword when you are configuring an interface-level class map in a hierarchical policy map. For the *interface-id-list*, you can specify up to six entries.

**Examples**

This example shows how to create a class map called **class2**, which matches all the incoming traffic with DSCP values of 10, 11, and 12:

```
Device(config)# class-map class2
Device(config-cmap)# match ip dscp 10 11 12
Device(config-cmap)# exit
```

This example shows how to create a class map called **class3**, which matches all the incoming traffic with IP-precedence values of 5, 6, and 7:

```
Device(config)# class-map class3
Device(config-cmap)# match ip precedence 5 6 7
Device(config-cmap)# exit
```

This example shows how to delete the IP-precedence match criteria and to classify traffic using **acl1**:

```
Device(config)# class-map class2
Device(config-cmap)# match ip precedence 5 6 7
Device(config-cmap)# no match ip precedence
Device(config-cmap)# match access-group acl1
Device(config-cmap)# exit
```

This example shows how to specify a list of physical ports to which an interface-level class map in a hierarchical policy map applies:

```
Device(config)# class-map match-any class4
Device(config-cmap)# match cos 4
Device(config-cmap)# exit
```

This example shows how to specify a range of physical ports to which an interface-level class map in a hierarchical policy map applies:

```
Device(config)# class-map match-any class4
Device(config-cmap)# match cos 4
Device(config-cmap)# exit
```

You can verify your settings by entering the **show class-map** privileged EXEC command.

**match non-client-nrt**

## match non-client-nrt

To match non-client NRT (non-real-time), use the **match non-client-nrt** command in class-map configuration mode. Use the **no** form of this command to return to the default setting.

```
match non-client-nrt
no match non-client-nrt
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Class-map

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** None

This example show how you can configure non-client NRT:

```
Device(config)# class-map test_1000
Device(config-cmap)# match non-client-nrt
```

# policy-map

To create or modify a policy map that can be attached to multiple physical ports or switch virtual interfaces (SVIs) and to enter policy-map configuration mode, use the **policy-map** command in global configuration mode. Use the **no** form of this command to delete an existing policy map and to return to global configuration mode.

**policy-map** *policy-map-name*  
**no** **policy-map** *policy-map-name*

<b>Syntax Description</b>	<i>policy-map-name</i> Name of the policy map.	
<b>Command Default</b>	No policy maps are defined.	
<b>Command Modes</b>	Global configuration (config)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** After entering the **policy-map** command, you enter policy-map configuration mode, and these configuration commands are available:

- **class**—Defines the classification match criteria for the specified class map.
- **description**—Describes the policy map (up to 200 characters).
- **exit**—Exits policy-map configuration mode and returns you to global configuration mode.
- **no**—Removes a previously defined policy map.
- **sequence-interval**—Enables sequence number capability.

To return to global configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

Before configuring policies for classes whose match criteria are defined in a class map, use the **policy-map** command to specify the name of the policy map to be created, added to, or modified. Entering the **policy-map** command also enables the policy-map configuration mode in which you can configure or modify the class policies for that policy map.

You can configure class policies in a policy map only if the classes have match criteria defined for them. To configure the match criteria for a class, use the **class-map** global configuration and **match class-map** configuration commands. You define packet classification on a physical-port basis.

Only one policy map per ingress port is supported. You can apply the same policy map to multiple physical ports.

You can apply a nonhierarchical policy maps to physical ports. A nonhierarchical policy map is the same as the port-based policy maps in the device.

A hierarchical policy map has two levels in the format of a parent-child policy. The parent policy cannot be modified but the child policy (port-child policy) can be modified to suit the QoS configuration.

In VLAN-based QoS, a service policy is applied to an SVI interface.



- 
- Note** Not all MQC QoS combinations are supported for wired ports. For information about these restrictions, see chapters "Restrictions for QoS on Wired Targets" in the QoS configuration guide.
- 

## Examples

This example shows how to create a policy map called policy1. When attached to the ingress port, it matches all the incoming traffic defined in class1, sets the IP DSCP to 10, and polices the traffic at an average rate of 1 Mb/s and bursts at 20 KB. Traffic less than the profile is sent.

```
Device(config)# policy-map policy1
Device(config-pmap)# class class1
Device(config-pmap-c)# set dscp 10
Device(config-pmap-c)# police 1000000 20000 conform-action transmit
Device(config-pmap-c)# exit
```

This example shows how to configure hierarchical policies:

```
Device# configure terminal
Device(config)# class-map c1
Device(config-cmap)# exit

Device(config)# class-map c2
Device(config-cmap)# exit

Device(config)# policy-map child
Device(config-pmap)# class c1
Device(config-pmap-c)# priority level 1
Device(config-pmap-c)# police rate percent 20 conform-action transmit exceed action drop
Device(config-pmap-c-police)# exit
Device(config-pmap-c)# exit

Device(config-pmap)# class c2
Device(config-pmap-c)# bandwidth 20000
Device(config-pmap-c)# exit

Device(config-pmap)# class class-default
Device(config-pmap-c)# bandwidth 20000
Device(config-pmap-c)# exit
Device(config-pmap)# exit

Device(config)# policy-map parent
Device(config-pmap)# class class-default
Device(config-pmap-c)# shape average 1000000
Device(config-pmap-c)# service-policy child
Device(config-pmap-c)# end
```

This example shows how to delete a policy map:

```
Device(config)# no policy-map policymap2
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

# priority

To assign priority to a class of traffic belonging to a policy map, use the **priority** command in policy-map class configuration mode. To remove a previously specified priority for a class, use the **no** form of this command.

```
priority [Kbps [burst -in-bytes] | level level-value [Kbps [burst -in-bytes]] | percent percentage [Kb/s [burst -in-bytes]]]
no priority [Kb/s [burst -in-bytes] | level level value [Kb/s [burst -in-bytes]] | percent percentage [Kb/s [burst -in-bytes]]]
```

<b>Syntax Description</b>	<p><i>Kb/s</i> (Optional) Guaranteed allowed bandwidth, in kilobits per second (kbps), for the priority traffic. The amount of guaranteed bandwidth varies according to the interface and platform in use. Beyond the guaranteed bandwidth, the priority traffic will be dropped in the event of congestion to ensure that the nonpriority traffic is not starved. The value must be between 1 and 2,000,000 kbps.</p> <p><i>burst -in-bytes</i> (Optional) Burst size in bytes. The burst size configures the network to accommodate temporary bursts of traffic. The default burst value, which is computed as 200 milliseconds of traffic at the configured bandwidth rate, is used when the burst argument is not specified. The range of the burst is from 32 to 2000000 bytes.</p> <p><b>level</b> <i>level-value</i> (Optional) Assigns priority level. Available values for <i>level-value</i> are 1 and 2. Level 1 is a higher priority than Level 2. Level 1 reserves bandwidth and goes first, so latency is very low.</p> <p><b>percent</b> <i>percentage</i> (Optional) Specifies the amount of guaranteed bandwidth to be specified by the percent of available bandwidth.</p>						
<b>Command Default</b>	No priority is set.						
<b>Command Modes</b>	Policy-map class configuration (config-pmap-c)						
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> <tr> <td>Cisco IOS XE 3.3SE</td><td>The <i>Kbps</i>, <i>burst -in-bytes</i>, and <b>percent</b> <i>percentage</i> keywords were added.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.	Cisco IOS XE 3.3SE	The <i>Kbps</i> , <i>burst -in-bytes</i> , and <b>percent</b> <i>percentage</i> keywords were added.
<b>Release</b>	<b>Modification</b>						
Cisco IOS XE 3.2SE	This command was introduced.						
Cisco IOS XE 3.3SE	The <i>Kbps</i> , <i>burst -in-bytes</i> , and <b>percent</b> <i>percentage</i> keywords were added.						
<b>Usage Guidelines</b>	<p>The priority command allows you to set up classes based on a variety of criteria (not just User Datagram Ports [UDP] ports) and assign priority to them, and is available for use on serial interfaces and permanent virtual circuits (PVCs). A similar command, the <b>ip rtp priority</b> command, allows you to stipulate priority flows based only on UDP port numbers and is not available for PVCs.</p> <p>The bandwidth and priority commands cannot be used in the same class, within the same policy map. However, these commands can be used together in the same policy map.</p>						

Within a policy map, you can give one or more classes priority status. When multiple classes within a single policy map are configured as priority classes, all traffic from these classes is queued to the same, single, priority queue.

When the policy map containing class policy configurations is attached to the interface to stipulate the service policy for that interface, available bandwidth is assessed. If a policy map cannot be attached to a particular interface because of insufficient interface bandwidth, the policy is removed from all interfaces to which it was successfully attached.

### Example

The following example shows how to configure the priority of the class in policy map policy1:

```
Device(config)# class-map cm1
Device(config-cmap)#match precedence 2
Device(config-cmap)#exit

Device(config)#class-map cm2
Device(config-cmap)#match dscp 30
Device(config-cmap)#exit

Device(config)# policy-map policy1
Device(config-pmap)# class cm1
Device(config-pmap-c)# priority level 1
Device(config-pmap-c)# police 1m
Device(config-pmap-c-police)#exit
Device(config-pmap-c)#exit
Device(config-pmap)#exit

Device(config)#policy-map policy1
Device(config-pmap)#class cm2
Device(config-pmap-c)#priority level 2
Device(config-pmap-c)#police 1m
```

# queue-buffers ratio

To configure the queue buffer for the class, use the **queue-buffers ratio** command in policy-map class configuration mode. Use the **no** form of this command to remove the ratio limit.

**queue-buffers ratio** *ratio limit*  
**no queue-buffers ratio** *ratio limit*

<b>Syntax Description</b>	<i>ratio limit</i> (Optional) Configures the queue buffer for the class. Enter the queue buffers ratio limit (0-100).					
<b>Command Default</b>	No queue buffer for the class is defined.					
<b>Command Modes</b>	Policy-map class configuration (config-pmap-c)					
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>		Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification					
Cisco IOS XE 3.2SE	This command was introduced.					
<b>Usage Guidelines</b>	<p>Either the <b>bandwidth</b>, <b>shape</b>, or <b>priority</b> command must be used before using this command. For more information about these commands, see <i>Cisco IOS Quality of Service Solutions Command Reference</i> available on Cisco.com</p> <p>The allows you to allocate buffers to queues. If buffers are not allocated, then they are divided equally amongst all queues. You can use the queue-buffer ratio to divide it in a particular ratio. The buffers are soft buffers because Dynamic Threshold and Scaling (DTS) is active on all queues by default.</p>					

## Example

The following example sets the queue buffers ratio to 10 percent:

```
Device(config)# policy-map policy_queuebuf01
Device(config-pmap)# class-map class_queuebuf01
Device(config-cmap)# exit
Device(config)# policy policy_queuebuf01
Device(config-pmap)# class class_queuebuf01
Device(config-pmap-c)# bandwidth percent 80
Device(config-pmap-c)# queue-buffers ratio 10
Device(config-pmap)# end
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

# queue-limit

To specify or modify the maximum number of packets the queue can hold for a class policy configured in a policy map, use the **queue-limit** policy-map class configuration command. To remove the queue packet limit from a class, use the **no** form of this command.

```
queue-limit queue-limit-size [{packets}] {cos cos-value | dscp dscp-value} percent percentage-of-packets
no queue-limit queue-limit-size [{packets}] {cos cos-value | dscp dscp-value} percent
percentage-of-packets
```

---

<b>Syntax Description</b>	<b>queue-limit-size</b>	The maximum size of the queue. The maximum varies according to the optional unit of measure keyword specified ( bytes, ms, us, or packets).
	<b>cos</b> <i>cos-value</i>	Specifies parameters for each cos value. CoS values are from 0 to 7.
	<b>dscp</b> <i>dscp-value</i>	Specifies parameters for each DSCP value.
	<b>percent</b> <i>percentage-of-packets</i>	You can specify a value in the range 0 to 63 specifying the differentiated services code point value for the type of queue limit .

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<b>Command Default</b>	None				
<b>Command Modes</b>	Policy-map class configuration (policy-map-c)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

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<b>Usage Guidelines</b>	Although visible in the command line help-strings, the <b>packets</b> unit of measure is not supported; use the <b>percent</b> unit of measure.
-------------------------	---

---



**Note** This command is supported only on wired ports in the egress direction.

Weighted fair queuing (WFQ) creates a queue for every class for which a class map is defined. Packets satisfying the match criteria for a class accumulate in the queue reserved for the class until they are sent, which occurs when the queue is serviced by the fair queuing process. When the maximum packet threshold you defined for the class is reached, queuing of any further packets to the class queue causes tail drop.

You use queue limits to configure Weighted Tail Drop (WTD). WTD ensures the configuration of more than one threshold per queue. Each class of service is dropped at a different threshold value to provide for QoS differentiation.

You can configure the maximum queue thresholds for the different subclasses of traffic, that is, DSCP and CoS and configure the maximum queue thresholds for each subclass.

### Example

The following example configures a policy map called port-queue to contain policy for a class called dscp-1. The policy for this class is set so that the queue reserved for it has a maximum packet limit of 20 percent:

```
Device(config)# policy-map policy11
Device(config-pmap)# class dscp-1
Device(config-pmap-c)# bandwidth percent 20
Device(config-pmap-c)# queue-limit dscp 1 percent 20
```

# service-policy (Wired)

To apply a policy map to a physical port or a switch virtual interface (SVI), use the **service-policy** command in interface configuration mode. Use the **no** form of this command to remove the policy map and port association.

```
service-policy {input | output} policy-map-name
no service-policy {input | output} policy-map-name
```

## Syntax Description

**input policy-map-name** Apply the specified policy map to the input of a physical port or an SVI.

**output policy-map-name** Apply the specified policy map to the output of a physical port or an SVI.

## Command Default

No policy maps are attached to the port.

## Command Modes

WLAN interface configuration

## Command History

### Release

### Modification

Cisco IOS XE 3.2SE

This command was introduced.

## Usage Guidelines

A policy map is defined by the **policy map** command.

Only one policy map is supported per port, per direction. In other words, only one input policy and one output policy is allowed on any one port.

You can apply a policy map to incoming traffic on a physical port or on an SVI. *QoS Configuration Guide (Catalyst 3850 Switches)*.



### Note

Though visible in the command-line help strings, the **history** keyword is not supported, and you should ignore the statistics that it gathers.

## Examples

This example shows how to apply plcmap1 to an physical ingress port:

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# service-policy input plcmap1
```

This example shows how to remove plcmap2 from a physical port:

```
Device(config)# interface gigabitethernet2/0/2
Device(config-if)# no service-policy input plcmap2
```

The following example displays a VLAN policer configuration. At the end of this configuration, the VLAN policy map is applied to an interface for QoS:

```
Device# configure terminal
```

```
Device(config)# class-map vlan100
Device(config-cmap)# match vlan 100
Device(config-cmap)# exit
Device(config)# policy-map vlan100
Device(config-pmap)# policy-map class vlan100
Device(config-pmap-c)# police 100000 bc conform-action transmit exceed-action drop
Device(config-pmap-c-police)# end
Device# configure terminal
Device(config)# interface gigabitEthernet1/0/5
Device(config-if)# service-policy input vlan100
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

**set**

## set

To classify IP traffic by setting a Differentiated Services Code Point (DSCP) or an IP-precedence value in the packet, use the **set** command in policy-map class configuration mode. Use the **no** form of this command to remove traffic classification.

```
set
cos | dscp | precedence | ip | qos-group
set cos
{cos-value} | {cos | dscp | precedence | qos-group} [{table table-map-name}]
set dscp
{dscp-value} | {cos | dscp | precedence | qos-group} [{table table-map-name}]
set ip {dscp | precedence}
set precedence {precedence-value} | {cos | dscp | precedence | qos-group} [{table table-map-name}]
set qos-group
{qos-group-value} | dscp [{table table-map-name}] | precedence [{table table-map-name}]
```

Syntax Description	cos	Sets the Layer 2 class of service (CoS) value or user priority of an outgoing packet. You can specify these values:
		<ul style="list-style-type: none"> <li>• <i>cos-value</i>—CoS value from 0 to 7. You also can enter a mnemonic name for a commonly used value.</li> <li>• Specify a packet-marking category to set the CoS value of the packet. If you also configure a table map for mapping and converting packet-marking values, this establishes the "map from" packet-marking category. Packet-marking category keywords:           <ul style="list-style-type: none"> <li>• <b>cos</b>—Sets a value from the CoS value or user priority.</li> <li>• <b>dscp</b>—Sets a value from packet differentiated services code point (DSCP).</li> <li>• <b>precedence</b>—Sets a value from packet precedence.</li> <li>• <b>qos-group</b>—Sets a value from the QoS group.</li> </ul> </li> <li>• (Optional)<b>table</b> <i>table-map-name</i>—Indicates that the values set in a specified table map are used to set the CoS value. Enter the name of the table map used to specify the CoS value. The table map name can be a maximum of 64 alphanumeric characters.</li> </ul> <p>If you specify a packet-marking category but do not specify the table map, the default action is to copy the value associated with the packet-marking category as the CoS value. For example, if you enter the <b>set cos precedence</b> command, the precedence (packet-marking category) value is copied and used as the CoS value.</p>

---

<b>dscp</b>	<p>Sets the differentiated services code point (DSCP) value to mark IP(v4) and IPv6 packets. You can specify these values:</p> <ul style="list-style-type: none"> <li>• <i>cos-value</i>—Number that sets the DSCP value. The range is from 0 to 63. You also can enter a mnemonic name for a commonly used value.</li> <li>• Specify a packet-marking category to set the DSCP value of the packet. If you also configure a table map for mapping and converting packet-marking values, this establishes the "map from" packet-marking category. Packet-marking category keywords:           <ul style="list-style-type: none"> <li>• <b>cos</b>—Sets a value from the CoS value or user priority.</li> <li>• <b>dscp</b>—Sets a value from packet differentiated services code point (DSCP).</li> <li>• <b>precedence</b>—Sets a value from packet precedence.</li> <li>• <b>qos-group</b>—Sets a value from the QoS group.</li> </ul> </li> <li>• (Optional)<b>table</b> <i>table-map-name</i>—Indicates that the values set in a specified table map will be used to set the DSCP value. Enter the name of the table map used to specify the DSCP value. The table map name can be a maximum of 64 alphanumeric characters.</li> </ul> <p>If you specify a packet-marking category but do not specify the table map, the default action is to copy the value associated with the packet-marking category as the DSCP value. For example, if you enter the <b>set dscp cos</b> command, the CoS value (packet-marking category) is copied and used as the DSCP value.</p>
<b>ip</b>	<p>Sets IP values to the classified traffic. You can specify these values:</p> <ul style="list-style-type: none"> <li>• <b>dscp</b>—Specify an IP DSCP value from 0 to 63 or a packet marking category.</li> <li>• <b>precedence</b>—Specify a precedence-bit value in the IP header; valid values are from 0 to 7 or specify a packet marking category.</li> </ul>

---

---

<b>precedence</b>	<p>Sets the precedence value in the packet header. You can specify these values:</p> <ul style="list-style-type: none"><li>• <i>precedence-value</i>— Sets the precedence bit in the packet header; valid values are from 0 to 7. You also can enter a mnemonic name for a commonly used value.</li><li>• Specify a packet marking category to set the precedence value of the packet.<ul style="list-style-type: none"><li>• <b>cos</b>—Sets a value from the CoS or user priority.</li><li>• <b>dscp</b>—Sets a value from packet differentiated services code point (DSCP).</li><li>• <b>precedence</b>—Sets a value from packet precedence.</li><li>• <b>qos-group</b>—Sets a value from the QoS group.</li></ul></li><li>• (Optional)<b>table <i>table-map-name</i></b>—Indicates that the values set in a specified table map will be used to set the precedence value. Enter the name of the table map used to specify the precedence value. The table map name can be a maximum of 64 alphanumeric characters.</li></ul> <p>If you specify a packet-marking category but do not specify the table map, the default action is to copy the value associated with the packet-marking category as the precedence value. For example, if you enter the <b>set precedence cos</b> command, the CoS value (packet-marking category) is copied and used as the precedence value.</p>
-------------------	--

set

---

<b>qos-group</b>	<p>Assigns a QoS group identifier that can be used later to classify packets.</p> <ul style="list-style-type: none"> <li>• <i>qos-group-value</i>—Sets a QoS value to the classified traffic. The range is 0 to 31. You also can enter a mnemonic name for a commonly used value.</li> <li>• <b>dscp</b>—Sets the original DSCP field value of the packet as the QoS group value.</li> <li>• <b>precedence</b>—Sets the original precedence field value of the packet as the QoS group value.</li> <li>• (Optional)<b>table</b> <i>table-map-name</i>—Indicates that the values set in a specified table map will be used to set the DSCP or precedence value. Enter the name of the table map used to specify the value. The table map name can be a maximum of 64 alphanumeric characters.</li> </ul> <p>If you specify a packet-marking category (<b>dscp</b> or <b>precedence</b>) but do not specify the table map, the default action is to copy the value associated with the packet-marking category as the QoS group value. For example, if you enter the <b>set qos-group precedence</b> command, the precedence value (packet-marking category) is copied and used as the QoS group value.</p>
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<b>Command Default</b>	No traffic classification is defined.
------------------------	---------------------------------------

<b>Command Modes</b>	Policy-map class configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
	Cisco IOS XE 3.3SE	The <b>cos</b> , <b>dscp</b> , <b>qos-group</b> commands were added.

<b>Usage Guidelines</b>	For the <b>set dscp dscp-value</b> command, the <b>set cos cos-value</b> command, and the <b>set ip precedence precedence-value</b> command, you can enter a mnemonic name for a commonly used value. For example, you can enter the <b>set dscp af11</b> command, which is the same as entering the <b>set dscp 10</b> command. You can enter the <b>set ip precedence critical</b> command, which is the same as entering the <b>set ip precedence 5</b> command. For a list of supported mnemonics, enter the <b>set dscp ?</b> or the <b>set ip precedence ?</b> command to see the command-line help strings.
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When you configure the **set dscp cos** command, note the following: The CoS value is a 3-bit field, and the DSCP value is a 6-bit field. Only the three bits of the CoS field are used.

When you configure the **set dscp qos-group** command, note the following:

- The valid range for the DSCP value is a number from 0 to 63. The valid value range for the QoS group is a number from 0 to 99.
- If a QoS group value falls within both value ranges (for example, 44), the packet-marking value is copied and the packets is marked.

- If QoS group value exceeds the DSCP range (for example, 77), the packet-marking value is not copied and the packet is not marked. No action is taken.

The **set qos-group** command cannot be applied until you create a service policy in policy-map configuration mode and then attach the service policy to an interface or ATM virtual circuit (VC).

To return to policy-map configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

## Examples

This example shows how to assign DSCP 10 to all FTP traffic without any policers:

```
Device(config)# policy-map policy_ftp
Device(config-pmap)# class-map ftp_class
Device(config-cmap)# exit
Device(config)# policy policy_ftp
Device(config-pmap)# class ftp_class
Device(config-pmap-c)# set dscp 10
Device(config-pmap)# exit
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

**show auto qos**

## show auto qos

To display the quality of service (QoS) commands entered on the interfaces on which automatic QoS (auto-QoS) is enabled, use the **show auto qos** command in privileged EXEC mode.

**show auto qos [interface [interface-id]]**

<b>Syntax Description</b>	<b>interface [interface-id]</b> (Optional) Displays auto-QoS information for the specified port or for all ports. Valid interfaces include physical ports.
<b>Command Modes</b>	User EXEC Privileged EXEC
<b>Command History</b>	<b>Release</b> <b>Modification</b> Cisco IOS XE 3.2SE This command was introduced.

<b>Usage Guidelines</b>	The <b>show auto qos</b> command output shows only the <b>auto qos</b> command entered on each interface. The <b>show auto qos interface interface-id</b> command output shows the <b>auto qos</b> command entered on a specific interface. Use the <b>show running-config</b> privileged EXEC command to display the auto-QoS configuration and the user modifications. Beginning in Cisco IOS Release 12.2(40)SE, the <b>show auto qos</b> command output shows the service policy information for the Cisco IP phone.
-------------------------	--

## Examples

This is an example of output from the **show auto qos** command after the **auto qos voip cisco-phone** and the **auto qos voip cisco-softphone** interface configuration commands are entered:

```
Device# show auto qos
GigabitEthernet2/0/4
auto qos voip cisco-softphone

GigabitEthernet2/0/5
auto qos voip cisco-phone

GigabitEthernet2/0/6
auto qos voip cisco-phone
```

This is an example of output from the **show auto qos interface interface-id** command when the **auto qos voip cisco-phone** interface configuration command is entered:

```
Device# show auto qos interface gigabitethernet 2/0/5
GigabitEthernet2/0/5
auto qos voip cisco-phone
```

This is an example of output from the **show auto qos interface interface-id** command when the **auto qos voip cisco-phone** interface configuration command is entered:

```
Device# show auto qos interface gigabitethernet1/0/2
GigabitEthernet1/0/2
auto qos voip cisco-phone
```

These are examples of output from the **show auto qos interface *interface-id*** command when auto-QoS is disabled on an interface:

```
Device# show auto qos interface gigabitethernet3/0/1
AutoQoS is disabled
```

**show class-map**

# show class-map

To display quality of service (QoS) class maps, which define the match criteria to classify traffic, use the **show class-map** command in EXEC mode.

**show class-map [class-map-name | type control subscriber {all | class-map-name}]**

<b>Syntax Description</b>	<p><i>class-map-name</i> (Optional) Class map name.</p> <p><b>type control subscriber</b> (Optional) Displays information about control class maps.</p> <p><b>all</b> (Optional) Displays information about all control class maps.</p>				
<b>Command Modes</b>	<p>User EXEC</p> <p>Privileged EXEC</p>				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

## Examples

This is an example of output from the **show class-map** command:

```
Device# show class-map
Class Map match-any videowizard_10-10-10-10 (id 2)
  Match access-group name videowizard_10-10-10-10

Class Map match-any class-default (id 0)
  Match any
Class Map match-any dscp5 (id 3)
  Match ip dscp 5
```

# show platform hardware fed switch

To display device-specific hardware information, use the **show platform hardware fed switch***switch\_number* command.

This topic elaborates only the QoS-specific options, that is, the options available with the **show platform hardware fed switch {switch\_num | active | standby} qos** command.

```
show platform hardware fed switch {switch_num | active | standby} qos {afd | {config type type | [{asic asic_num}]} | stats clients {all | bssid id | wlanid id}} | dscp-cos counters {iifd_id id | interface type number} | le-info | {iifd_id id | interface type number} | policer config {iifd_id id | interface type number} | queue | {config | {iifd_id id | interface type number} | internal port-type type {asic number [{port_num}]}} | label2qmap | [{aqmrepqostbl | iqslabellable | sqslabellable}] | {asicnumber} | stats | {iifd_id id | interface type number} | internal {cpu policer | port-type type asic number} | {asicnumber [{port_num}]}} | resource}
```

---

## Syntax Description

**switch {switch\_num | active | standby}** Switch for which you want to display information. You have the following options:  
**active | standby**

- **switch\_num**—ID of the switch.
- **active**—Displays information relating to the active switch.
- **standby**—Displays information relating to the standby switch, if available.

---

**qos** Displays QoS hardware information. You must choose from the following options:

- **afd**—Displays Approximate Fair Drop (AFD) information in hardware.
- **dscp-cos**—Displays information dscp-cos counters for each port.
- **leinfo**—Displays logical entity information.
- **policer**—Displays QoS policer information in hardware.
- **queue**—Displays queue information in hardware.
- **resource**—Displays hardware resource information.

---

**afdf {config type | stats client}** You must choose from the options under **config type** or **stats client**:

**config type :**

- **client**—Displays wireless client information
- **port**—Displays port-specific information
- **radio**—Displays wireless radio information
- **ssid**—Displays wireless SSID information

**stats client :**

- **all**—Displays statistics of all client.
- **bssid**—Valid range is from 1 to 4294967295.
- **wlanid**—Valid range is from 1 to 4294967295

show platform hardware fed switch

---

<b>asicasic_num</b>	(Optional) ASIC number. Valid range is from 0 to 255.
<b>dscp-cos counters { iifd_id id   interface type number }</b>	Displays per port dscp-cos counters. You must choose from the following options • <b>iif_id id</b> —The target interface ID. Valid range is from 1 to 4294967295. • <b>interface type number</b> —Target interface type and ID.
<b>leinfo</b>	You must choose from the following options under <b>dscp-cos counters</b> : • <b>iif_id id</b> —The target interface ID. Valid range is from 1 to 4294967295. • <b>interface type number</b> —Target interface type and ID.
<b>policer config</b>	Displays configuration information related to policers in hardware. You must choose from the following options: • <b>iif_id id</b> —The target interface ID. Valid range is from 1 to 4294967295. • <b>interface type number</b> —Target interface type and ID.
<b>queue { config { iif_id id   interface type number   internal   label2qmap   stats } }</b>	Displays queue information in hardware. You must choose from the following options: • <b>config</b> —Configuration information. You must choose from the following options: • <b>iif_id id</b> —The target interface ID. Valid range is from 1 to 4294967295. • <b>interface type number</b> —Target interface type and ID. • <b>internal</b> —Displays internal queue related information. • <b>label2qmap</b> —Displays hardware label to queue mapping information. You can choose from the following options: • (Optional) <b>aqmrepqostbl</b> —AQM REP QoS label table lookup. • (Optional) <b>iqslabeltable</b> —IQS QoS label table lookup. • (Optional) <b>sqslabeltable</b> —SQS and local QoS label table lookup. • <b>stats</b> —Displays queue statistics. You must choose from the following options: • <b>iif_id id</b> —The target interface ID. Valid range is from 1 to 4294967295. • <b>interface type number</b> —Target interface type and ID. • <b>internal {cpu policer   port_type port_type asic asic_num [ port_num port_num ] }</b> —Displays internal queue related information.
<b>resource</b>	Displays hardware resource usage information. You must enter the following keyword: <b>usage</b>

---

<b>Command Modes</b>	User EXEC Privileged EXEC
<b>Command History</b>	<b>Release</b> Cisco IOS XE 3.2SE

This is an example of output from the **show platform hardware fed switch switch\_number qos queue stats internal cpu policer** command

```
Device#show platform hardware fed switch 3 qos queue stats internal cpu policer
```

QId	PlcIdx	Queue Name	(default)		(set)	
			Enabled	Rate	Rate	Drop
0	11	DOT1X Auth	No	1000	1000	0
1	1	L2 Control	No	500	500	0
2	14	Forus traffic	No	1000	1000	0
3	0	ICMP GEN	Yes	200	200	0
4	2	Routing Control	Yes	1800	1800	0
5	14	Forus Address resolution	No	1000	1000	0
6	3	ICMP Redirect	No	500	500	0
7	6	WLESS PRI-5	No	1000	1000	0
8	4	WLESS PRI-1	No	1000	1000	0
9	5	WLESS PRI-2	No	1000	1000	0
10	6	WLESS PRI-3	No	1000	1000	0
11	6	WLESS PRI-4	No	1000	1000	0
12	0	BROADCAST	Yes	200	200	0
13	10	Learning cache ovfl	Yes	100	100	0
14	13	Sw forwarding	Yes	1000	1000	0
15	8	Topology Control	No	13000	13000	0
16	12	Proto Snooping	No	500	500	0
17	16	DHCP Snooping	No	1000	1000	0
18	9	Transit Traffic	Yes	500	500	0
19	10	RPF Failed	Yes	100	100	0
20	15	MCAST END STATION	Yes	2000	2000	0
21	13	LOGGING	Yes	1000	1000	0
22	7	Punt Webauth	No	1000	1000	0
23	10	Crypto Control	Yes	100	100	0
24	10	Exception	Yes	100	100	0
25	3	General Punt	No	500	500	0
26	10	NFL SAMPLED DATA	Yes	100	100	0
27	2	SGT Cache Full	Yes	1800	1800	0
28	10	EGR Exception	Yes	100	100	0
29	16	Show frwd	No	1000	1000	0
30	9	MCAST Data	Yes	500	500	0
31	10	Gold Pkt	Yes	100	100	0

**show policy-map**

# show policy-map

To display quality of service (QoS) policy maps, which define classification criteria for incoming traffic, use the **show policy-map** command in EXEC mode.

**show policy-map [{policy-map-name | interface interface-id}]**

**show policy-map interface {Auto-template | Capwap | GigabitEthernet | GroupVI | InternalInterface | Loopback | Lspvif | Null | Port-channel | TenGigabitEthernet | Tunnel | Vlan | brief | class | input | output}**

## Syntax Description

**policy-map-name** (Optional) Name of the policy-map.

**interface interface-id** (Optional) Displays the statistics and the configurations of the input and output policies that are attached to the interface.

## Command Modes

User EXEC

Privileged EXEC

## Command History

### Release

Cisco IOS XE 3.2SE

This command was introduced in Cisco IOS XE 3.2SE.

Cisco IOS XE 3.3SE

The **interface** keyword was added in Cisco IOS XE 3.3SE.

## Usage Guidelines

Policy maps can include policers that specify the bandwidth limitations and the action to take if the limits are exceeded.



**Note** Though visible in the command-line help string, the **control-plane**, **session**, and **type** keywords are not supported, and the statistics shown in the display should be ignored.

This is an example of the output for the **show policy-map interface** command.

```
Device# show policy-map interface gigabitethernet1/0/48
Service-policy output: port_shape_parent
Class-map: class-default (match-any)
  191509734 packets
  Match: any
  Queueing
    (total drops) 524940551420
    (bytes output) 14937264500
    shape (average) cir 250000000, bc 2500000, be 2500000
    target shape rate 250000000
Service-policy : child_trip_play
```

```
queue stats for all priority classes:  
  Queueing  
    priority level 1  
  
      (total drops) 52494051420  
      (bytes output) 14937180648  
  
queue stats for all priority classes:  
  Queueing  
    priority level 2  
  
      (total drops) 0  
      (bytes output) 0  
  
Class-map: dscp56 (match-any)  
  191508445 packets  
  Match: dscp cs7 (56)  
    0 packets, 0 bytes  
    5 minute rate 0 bps  
  Priority: Strict,  
  
  Priority Level: 1  
  police:  
    cir 10 %  
    cir 25000000 bps, bc 781250 bytes  
    conformed 0 bytes; actions: >>>>counters not supported  
      transmit  
    exceeded 0 bytes; actions:  
      drop  
    conformed 0000 bps, exceeded 0000 bps  >>>>counters not supported
```

show tech-support qos

# show tech-support qos

To display quality of service (QoS)-related information for use by technical support, use the **show tech-support qos** command in privileged EXEC mode.

**show tech-support qos [{switch {switch-number | active | all | standby} | [{control-plane | interface {interface-name | all}}]}]**

<b>Syntax Description</b>	<b>switch switch-number</b> <b>active</b> <b>all</b> <b>standby</b> <b>control-plane</b> <b>interface interface-name</b> <b>all</b>	(Optional) Displays QoS-related information for a specific switch. (Optional) Displays QoS-related information for the active instance of the switch. (Optional) Displays QoS-related information for all instances of the switch. (Optional) Displays QoS-related information for the standby instance of the switch. (Optional) Displays QoS-related information for the control-plane. (Optional) Displays QoS-related information for a specified interface. (Optional) Displays QoS-related information for all interfaces.
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Gibraltar 16.11.1	<b>Modification</b> This command was introduced.
<b>Usage Guidelines</b>	The output of this command is very long. To better manage this output, you can redirect the output to an external file (for example, <b>show tech-support qos   redirect flash:filename</b> ) in the local writable storage file system or remote file system.	
	The output of the <b>show tech-support qos</b> command displays a list of commands and their output. These commands differ based on the platform.	
<b>Examples</b>	The following is sample output from the <b>show tech-support qos</b> command:	

```
Device# show tech-support qos
```

```
----- show platform software fed switch 1 qos policy target brief
-----
```

TCG summary for policy: system-cpp-policy

Loc Interface	IIF-ID	Dir	tccg	Child #	m/p/q	State: (cfg,opr)
?:255 Control Plane	0x00000001000001	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4da31c8
?:0 CoPP-Queue-0	0x0000000100000d	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4da41e8
?:0 CoPP-Queue-1	0x0000000100000e	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4dbede8
?:0 CoPP-Queue-2	0x0000000100000f	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4dc2df8
?:0 CoPP-Queue-3	0x00000001000010	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4dc6e08
?:0 CoPP-Queue-4	0x00000001000011	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4dcae18
?:0 CoPP-Queue-5	0x00000001000012	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4dcee28
?:0 CoPP-Queue-6	0x00000001000013	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4dd2e38
?:0 CoPP-Queue-7	0x00000001000014	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4dd6e48
?:0 CoPP-Queue-8	0x00000001000015	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4ddae58
?:0 CoPP-Queue-9	0x00000001000016	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4dde668
?:0 CoPP-Queue-10	0x00000001000017	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4de2e78
?:0 CoPP-Queue-11	0x00000001000018	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4de6e88
?:0 CoPP-Queue-12	0x00000001000019	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4deae98
?:0 CoPP-Queue-13	0x0000000100001a	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4deeee8
?:0 CoPP-Queue-14	0x0000000100001b	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4df2eb8
?:0 CoPP-Queue-15	0x0000000100001c	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4df6ec8
?:0 CoPP-Queue-16	0x0000000100001d	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4dfaed8
?:0 CoPP-Queue-17	0x0000000100001e	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4dfeee8
?:0 CoPP-Queue-18	0x0000000100001f	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e02ef8
?:0 CoPP-Queue-19	0x00000001000020	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e06f08
?:0 CoPP-Queue-20	0x00000001000021	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e0ae88
?:0 CoPP-Queue-21	0x00000001000022	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e0ee98
?:0 CoPP-Queue-22	0x00000001000023	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e12ea8
?:0 CoPP-Queue-23	0x00000001000024	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e16eb8
?:0 CoPP-Queue-24	0x00000001000025	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e1aec8
?:0 CoPP-Queue-25	0x00000001000026	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e1eed8
?:0 CoPP-Queue-26	0x00000001000027	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e22ee8
?:0 CoPP-Queue-27	0x00000001000028	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e26ef8
?:0 CoPP-Queue-28	0x00000001000029	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e2af08
?:0 CoPP-Queue-29	0x0000000100002a	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e2ef18
?:0 CoPP-Queue-30	0x0000000100002b	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e32f28
?:0 CoPP-Queue-31	0x0000000100002c	OUT	22	0	0/17/0	VALID,SET_INHW 0xffe4e36f38

```
----- show platform software fed switch 1 qos policy summary -----
```

Policymap Summary: (counters)							
CGID	Clases	Targets	Child	CfgErr	InHw	OpErr	Policy Name
15212688	22	33	0	0	33	0	system-cpp-policy
.							
.							
.							

Output fields are self-explanatory.

# trust device

To configure trust for supported devices connected to an interface, use the **trust device** command in interface configuration mode. Use the **no** form of this command to disable trust for the connected device.

```
trust device {cisco-phone | cts | ip-camera | media-player}
no trust device {cisco-phone | cts | ip-camera | media-player}
```

<b>Syntax Description</b>	<p><b>cisco-phone</b> Configures a Cisco IP phone</p> <hr/> <p><b>cts</b> Configures a Cisco TelePresence System</p> <hr/> <p><b>ip-camera</b> Configures an IP Video Surveillance Camera (IPVSC)</p> <hr/> <p><b>media-player</b> Configures a Cisco Digital Media Player (DMP)</p>				
<b>Command Default</b>	Trust disabled				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>Use the <b>trust device</b> command on the following types of interfaces:</p> <ul style="list-style-type: none"> <li>• <b>Auto</b>— auto-template interface</li> <li>• <b>Capwap</b>—CAPWAP tunnel interface</li> <li>• <b>GigabitEthernet</b>—Gigabit Ethernet IEEE 802</li> <li>• <b>GroupVI</b>—Group virtual interface</li> <li>• <b>Internal Interface</b>—Internal interface</li> <li>• <b>Loopback</b>—Loopback interface</li> <li>• <b>Null</b>—Null interface</li> <li>• <b>Port-channel</b>—Ethernet Channel interface</li> <li>• <b>TenGigabitEthernet</b>—10-Gigabit Ethernet</li> <li>• <b>Tunnel</b>—Tunnel interface</li> <li>• <b>Vlan</b>—Catalyst VLANs</li> <li>• <b>range</b>—<b>interface range</b> command</li> </ul>				

## Example

The following example configures trust for a Cisco IP phone in Interface GigabitEthernet 1/0/1:

```
Device(config)# interface GigabitEthernet1/0/1
Device(config-if)# trust device cisco-phone
```

You can verify your settings by entering the **show interface status** privileged EXEC command.





PART **XI**

## **Routing**

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- [IP Unicast Routing Commands, on page 815](#)





## Bidirectional Forwarding Detection Commands

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- authentication (BFD), on page 800
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- bfd echo, on page 805
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# authentication (BFD)

To configure authentication in a Bidirectional Forwarding Detection (BFD) template for single hop sessions, use the **authentication** command in BFD configuration mode. To disable authentication in BFD template for single-hop sessions, use the **no** form of this command

```
authentication authentication-type keychain keychain-name
no authentication authentication-type keychain keychain-name
```

<b>Syntax Description</b>	<p><i>authentication-type</i>      Authentication type. Valid values are md5, meticulous-md5, meticulous-sha1, and sha-1.</p> <p><b>keychain</b> <i>keychain-name</i> Configures an authentication key chain with the specified name. The maximum number of characters allowed in the name is 32.</p>				
<b>Command Default</b>	Authentication in BFD template for single hop sessions is not enabled.				
<b>Command Modes</b>	BFD configuration (config-bfd)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.1</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Denali 16.3.1	This command was introduced.				
<b>Usage Guidelines</b>	You can configure authentication in single hop templates. We recommend that you configure authentication to enhance security. Authentication must be configured on each BFD source-destination pair, and authentication parameters must match on both devices.				

## Examples

The following example shows how to configure authentication for the template1 BFD single-hop template:

```
Device> enable
Device# configuration terminal
Device(config)# bfd-template single-hop template1
Device(config-bfd) # authentication sha-1 keychain bfd-singlehop
```

# bfd

To set the baseline Bidirectional Forwarding Detection (BFD) session parameters on an interface, use the **bfd** interface configuration mode. To remove the baseline BFD session parameters, use the **no** form of this command

**bfd interval milliseconds min\_rx milliseconds multiplier multiplier-value**  
**no bfd interval milliseconds min\_rx milliseconds multiplier multiplier-value**

<b>Syntax Description</b>	<b>interval milliseconds</b> Specifies the rate, in milliseconds, at which BFD control packets will be sent to BFD peers. The valid range for the milliseconds argument is from 50 to 9999.  <b>min_rx milliseconds</b> Specifies the rate, in milliseconds, at which BFD control packets will be expected to be received from BFD peers. The valid range for the milliseconds argument is from 50 to 9999.  <b>multiplier</b> <b>multiplier-value</b> Specifies the number of consecutive BFD control packets that must be missed from a BFD peer before BFD declares that the peer is unavailable and the Layer 3 BFD peer is informed of the failure. The valid range for the multiplier-value argument is from 3 to 50.
---------------------------	--

**Command Default** No baseline BFD session parameters are set.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** The **bfd** command can be configured on SVI, Ethernet and port-channel interfaces.

If BFD runs on a port channel interface, BFD has a timer value restriction of  $250 * 3$  milliseconds.

The **bfd interval** configuration is not removed when:

- an IPv4 address is removed from an interface
- an IPv6 address is removed from an interface
- IPv6 is disabled from an interface
- an interface is shutdown
- IPv4 CEF is disabled globally or locally on an interface
- IPv6 CEF is disabled globally or locally on an interface

The **bfd interval** configuration is removed when the subinterface on which its is configured is removed.

**Note**

If we configure `bfd interval` command in interface config mode, then `bfd echo` mode is enabled by default. We need to enable either `no ip redirect` (if BFD echo is needed) or `no bfd echo` in interface config mode.

Before using BFD echo mode, you must disable sending Internet Control Message Protocol (ICMP) redirect messages by entering the `no ip redirect` command, in order to avoid high CPU utilization.

**Examples**

The following example shows the BFD session parameters set for Gigabit Ethernet 1/0/3:

```
Device> enable
Device# configuration terminal
Device(config)# interface gigabitethernet 1/0/3
Device(config-if)# bfd interval 100 min_rx 100 multiplier 3
```

# bfd all-interfaces

To enable Bidirectional Forwarding Detection (BFD) for all interfaces participating in the routing process, use the **bfd all-interfaces** command in router configuration or address family interface configuration mode. To disable BFD for all neighbors on a single interface, use the **no** form of this command.

**bfd all-interfaces**  
**no bfd all-interfaces**

**Syntax Description** This command has no arguments or keywords.

**Command Default** BFD is disabled on the interfaces participating in the routing process.

**Command Modes** Router configuration (config-router)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** To enable BFD for all interfaces, enter the **bfd all-interfaces** command in router configuration mode

**Examples** The following example shows how to enable BFD for all Enhanced Interior Gateway Routing Protocol (EIGRP) neighbors:

```
Device> enable
Device# configuration terminal
Device(config)# router eigrp 123
Device(config-router)# bfd all-interfaces
Device(config-router)# end
```

The following example shows how to enable BFD for all Intermediate System-to-Intermediate System (IS-IS) neighbors:

```
Device> enable
Device# configuration terminal
Device(config)# router isis tag1
Device(config-router)# bfd all-interfaces
Device(config-router)# end
```

# bfd check-ctrl-plane-failure

To enable Bidirectional Forwarding Detection (BFD) control plane failure checking for the Intermediate System-to-Intermediate System (IS-IS) routing protocol, use the **bfd check-control-plane-failure** command in router configuration mode. To disable control plane failure detection, use the **no** form of this command.

**bfd check-ctrl-plane-failure**  
**no bfd check-ctrl-plane-failure**

**Syntax Description** This command has no arguments or keywords.

**Command Default** BFD control plane failure checking is disabled.

**Command Modes** Router configuration (config-router)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** The **bfd check-ctrl-plane-failure** command can be configured for an IS-IS routing process only. The command is not supported on other protocols.

When a switch restarts, a false BFD session failure can occur, where neighboring routers behave as if a true forwarding failure has occurred. However, if the **bfd check-ctrl-plane-failure** command is enabled on a switch, the router can ignore control plane related BFD session failures. We recommend that you add this command to the configuration of all neighboring routers just prior to a planned router restart, and that you remove the command from all neighboring routers when the restart is complete.

**Examples** The following example enables BFD control plane failure checking for the IS-IS routing protocol:

```
Device> enable
Device# configuration terminal
Device(config)# router isis
Device(config-router)# bfd check-ctrl-plane-failure
Device(config-router)# end
```

# bfd echo

To enable Bidirectional Forwarding Detection (BFD) echo mode, use the **bfd echo** command in interface configuration mode. To disable BFD echo mode, use the **no** form of this command

**bfd echo**  
**no bfd echo**

**Syntax Description** This command has no arguments or keywords.

**Command Default** BFD echo mode is enabled by default if BFD is configured using **bfd interval** command in interface configuration mode.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
Cisco IOS XE Denali 16.3.1	This command was introduced.	

**Usage Guidelines** Echo mode is enabled by default. Entering the **no bfd echo** command without any keywords turns off the sending of echo packets and signifies that the switch is unwilling to forward echo packets received from BFD neighbor switches.

When echo mode is enabled, the desired minimum echo transmit interval and required minimum transmit interval values are taken from the **bfd interval milliseconds min\_rx milliseconds** parameters, respectively.



**Note** Before using BFD echo mode, you must disable sending Internet Control Message Protocol (ICMP) redirect messages by entering the **no ip redirects** command, in order to avoid high CPU utilization.

## Examples

The following example configures echo mode between BFD neighbors:

```
Device> enable
Device# configuration terminal
Device(config)# interface GigabitEthernet 1/0/3
Device(config-if)# bfd echo
```

The following output from the **show bfd neighbors details** command shows that the BFD session neighbor is up and using BFD echo mode. The relevant command output is shown in bold in the output.

```
Device# show bfd neighbors details
OurAddr      NeighAddr   LD/RD  RH/RS Holdown(mult) State Int
172.16.1.2   172.16.1.1 1/6     Up      0 (3 )       Up    Fa0/1
Session state is UP and using echo function with 100 ms interval.
Local Diag: 0, Demand mode: 0, Poll bit: 0
MinTxInt: 1000000, MinRxInt: 1000000, Multiplier: 3
Received MinRxInt: 1000000, Received Multiplier: 3
Holdown (hits): 3000(0), Hello (hits): 1000(337)
Rx Count: 341, Rx Interval (ms) min/max/avg: 1/1008/882 last: 364 ms ago
Tx Count: 339, Tx Interval (ms) min/max/avg: 1/1016/886 last: 632 ms ago
Registered protocols: EIGRP
```

**bfd echo**

```
Uptime: 00:05:00
Last packet: Version: 1          - Diagnostic: 0
              State bit: Up       - Demand bit: 0
              Poll bit: 0        - Final bit: 0
              Multiplier: 3      - Length: 24
              My Discr.: 6        - Your Discr.: 1
Min tx interval: 1000000 - Min rx interval: 1000000
Min Echo interval: 50000
```

# bfd slow-timers

To configure the Bidirectional Forwarding Detection (BFD) slow timers value, use the **bfd slow-timers** command in interface configuration mode. To change the slow timers used by BFD, use the **no** form of this command.

```
bfd slow-timers [milliseconds]
no bfd slow-timers
```

**Command Default** The BFD slow timer value is 1000 milliseconds

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Examples** The following example shows how to configure the BFD slow timers value to 14,000 milliseconds:

```
Device(config)# bfd slow-timers 14000
```

The following output from the show bfd neighbors details command shows that the BFD slow timers value of 14,000 milliseconds has been implemented. The values for the MinTxInt and MinRxInt will correspond to the configured value for the BFD slow timers. The relevant command output is shown in bold.

```
Device# show bfd neighbors details
OurAddr      NeighAddr   LD/RD  RH/RS Holdown(mult) State Int
172.16.1.2    172.16.1.1 1/6     Up      0 (3 )        Up     Fa0/1
Session state is UP and using echo function with 100 ms interval.
Local Diag: 0, Demand mode: 0, Poll bit: 0
MinTxInt: 14000, MinRxInt: 14000, Multiplier: 3
Received MinRxInt: 1000000, Received Multiplier: 3
Holdown (hits): 3600(0), Hello (hits): 1200(337)
Rx Count: 341, Rx Interval (ms) min/max/avg: 1/1008/882 last: 364 ms ago
Tx Count: 339, Tx Interval (ms) min/max/avg: 1/1016/886 last: 632 ms ago
Registered protocols: EIGRP
Uptime: 00:05:00
Last packet: Version: 1           - Diagnostic: 0
              State bit: Up       - Demand bit: 0
              Poll bit: 0        - Final bit: 0
              Multiplier: 3      - Length: 24
              My Discr.: 6       - Your Discr.: 1
Min tx interval: 1000000 - Min rx interval: 1000000
Min Echo interval: 50000
```

**Note**

- If the BFD session is down, then the BFD control packets will be sent with the slow timer interval.
- If the BFD session is up, then if echo is enabled, then BFD control packets will be sent in negotiated slow timer interval and echo packets will be sent in negotiated configured BFD interval. If echo is not enabled, then BFD control packets will be sent in negotiated configured interval.

# bfd template

To create a Bidirectional Forwarding Detection (BFD) template and to enter BFD configuration mode, use the **bfd-template** command in global configuration mode. To remove a BFD template, use the **no** form of this command.

**bfd template** *template-name*  
**no bfd template** *template-name*

**Command Default** A BFD template is not bound to an interface.

**Command Modes** Interface configuration (config-if)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** Even if you have not created the template by using the **bfd-template** command, you can configure the name of the template under an interface, but the template is considered invalid until you define the template. You do not have to reconfigure the template name again. It becomes valid automatically.

## Examples

```
Device> enable
Device# configuration terminal
Device(config)# interface Gigabitethernet 1/3/0
Device(config-if)# bfd template template1
```

# bfd-template single-hop

To bind a single hop Bidirectional Forwarding Detection (BFD) template to an interface, use the **bfd template** command in interface configuration mode. To unbind single-hop BFD template from an interface, use the **no** form of this command

```
bfd-template single-hop template-name
no bfd-template single-hop template-name
```

## Syntax Description

<b>single-hop</b>	Creates the single-hop BFD template.
<i>template-name</i>	Template name.

## Command Default

A BFD template does not exist.

## Command Modes

Global configuration (config)

## Command History

<b>Release</b>	<b>Modification</b>
Cisco IOS XE Denali 16.3.1	This command was introduced.

## Usage Guidelines

The **bfd-template** command allows you to create a BFD template and places the device in BFD configuration mode. The template can be used to specify a set of BFD interval values. BFD interval values specified as part of the BFD template are not specific to a single interface.

## Examples

The following example shows how to create a BFD template and specify BFD interval values:

```
Device> enable
Device# configuration terminal
Device(config)# bfd-template single-hop node1
Device(bfd-config)#interval min-tx 100 min-rx 100 multiplier 3
Device(bfd-config)#echo
```

The following example shows how to create a BFD single-hop template and configure BFD interval values and an authentication key chain:

```
Device> enable
Device# configuration terminal
Device(config)# bfd-template single-hop template1
Device(bfd-config)#interval min-tx 200 min-rx 200 multiplier 3
Device(bfd-config)#authentication keyed-sha-1 keychain bfd_singlehop
```



### Note

BFD echo is not enabled by default in the **bfd-template** configuration. This needs to be configured explicitly.

# ip route static bfd

To specify static route bidirectional forwarding detection (BFD) neighbors, use the **ip route static bfd** command in global configuration mode. To remove a static route BFD neighbor, use the **no** form of this command.

```
ip route static bfd {interface-type interface-number ip-address | vrf vrf-name} [group group-name] [passive] [unassociate]
no ip route static bfd {interface-type interface-number ip-address | vrf vrf-name} [group group-name] [passive] [unassociate]
```

<b>Syntax Description</b>	<i>interface-type interface-number</i>	Interface type and number.
	<i>ip-address</i>	IP address of the gateway, in A.B.C.D format.
	<b>vrf vrf-name</b>	Specifies Virtual Routing and Forwarding (VRF) instance and the destination vrf name.
	<b>group group-name</b>	(Optional) Assigns a BFD group. The group-name is a character string of up to 32 characters specifying the BFD group name.
	<b>unassociate</b>	(Optional) Unassociates the static route configured for a BFD.

**Command Default** No static route BFD neighbors are specified.

**Command Modes** Global configuration (config)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** Use the **ip route static bfd** command to specify static route BFD neighbors. All static routes that have the same interface and gateway specified in the configuration share the same BFD session for reachability notification.

All static routes that specify the same values for the interface-type, interface-number, and ip-address arguments will automatically use BFD to determine gateway reachability and take advantage of fast failure detection.

The **group** keyword assigns a BFD group. The static BFD configuration is added to the VPN routing and forwarding (VRF) instance with which the interface is associated. The **passive** keyword specifies the passive member of the group. Adding static BFD in a group without the passive keyword makes the BFD an active member of the group. A static route should be tracked by the active BFD configuration in order to trigger a BFD session for the group. To remove all the static BFD configurations (active and passive) of a specific group, use the **no ip route static bfd** command and specify the BFD group name.

The **unassociate** keyword specifies that a BFD neighbor is not associated with static route, and the BFD sessions are requested if an interface has been configured with BFD. This is useful in bringing up a BFDv4

**ip route static bfd**

session in the absence of an IPv4 static route. If the unassociate keyword is not provided, then the IPv4 static routes are associated with BFD sessions.

BFD requires that BFD sessions are initiated on both endpoint devices. Therefore, this command must be configured on each endpoint device.

The BFD static session on a switch virtual interface (SVI) is established only after the **bfd interval milliseconds min\_rx milliseconds multiplier multiplier-value** command is disabled and enabled on that SVI.

To enable the static BFD sessions, perform the following steps:

1. Enable BFD timers on the SVI.

**bfd interval milliseconds min\_rx milliseconds multiplier multiplier-value**

2. Enable BFD for the static IP route

**ip route static bfd interface-type interface-number ip-address**

3. Disable and enable the BFD timers on the SVI again.

**no bfd interval milliseconds min\_rx milliseconds multiplier multiplier-value**

**bfd interval milliseconds min\_rx milliseconds multiplier multiplier-value**

## Examples

The following example shows how to configure BFD for all static routes through a specified neighbor, group, and active member of the group:

```
Device# configuration terminal
Device(config)# ip route static bfd GigabitEthernet 1/0/1 10.1.1.1 group group1
```

The following example shows how to configure BFD for all static routes through a specified neighbor, group, and passive member of the group:

```
Device# configuration terminal
Device(config)# ip route static bfd GigabitEthernet 1/0/1 10.2.2.2 group group1 passive
```

The following example shows how to configure BFD for all static routes in an unassociated mode without the group and passive keywords:

```
Device# configuration terminal
Device(config)# ip route static bfd GigabitEthernet 1/0/1 10.2.2.2 unassociate
```

# ipv6 route static bfd

To specify static route Bidirectional Forwarding Detection for IPv6 (BFDv6) neighbors, use the **ipv6 route static bfd** command in global configuration mode. To remove a static route BFDv6 neighbor, use the **no** form of this command.

```
ipv6 route static bfd [vrf vrf-name] interface-type interface-number ipv6-address [unassociated]
no ipv6 route static bfd
```

<b>Syntax Description</b>	<b>vrf vrf-name</b>  <b>interface-type interface-number</b>  <b>ipv6-address</b>  <b>unassociated</b>	(Optional) Name of the virtual routing and forwarding (VRF) instance by which static routes should be specified.  Interface type and number.  IPv6 address of the neighbor.  (Optional) Moves a static BFD neighbor from associated mode to unassociated mode.
---------------------------	---	--

**Command Default** No static route BFDv6 neighbors are specified.

**Command Modes** Global configuration (config)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** Use the **ipv6 route static bfd** command to specify static route neighbors. All of the static routes that have the same interface and gateway specified in the configuration share the same BFDv6 session for reachability notification. BFDv6 requires that BFDv6 sessions are initiated on both endpoint routers. Therefore, this command must be configured on each endpoint router. An IPv6 static BFDv6 neighbor must be fully specified (with the interface and the neighbor address) and must be directly attached.

All static routes that specify the same values for **vrf vrf-name**, **interface-type interface-number**, and **ipv6-address** will automatically use BFDv6 to determine gateway reachability and take advantage of fast failure detection.

## Examples

The following example creates a neighbor on Ethernet interface 0/0 with an address of 2001::1:

```
Device# configuration terminal
Device(config)# ipv6 route static bfd ethernet 0/0 2001::1
```

The following example converts the neighbor to unassociated mode:

```
Device# configuration terminal
Device(config)# ipv6 route static bfd ethernet 0/0 2001::1 unassociated
```

```
■ ipv6 route static bfd
```



## IP Unicast Routing Commands

---

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- [ip load-sharing, on page 817](#)
- [show ip bgp neighbors, on page 818](#)
- [show tech-support bgp, on page 833](#)

**ip cef load-sharing algorithm**

# ip cef load-sharing algorithm

To select a Cisco Express Forwarding load-balancing algorithm, use the **ip cef load-sharing algorithm** command in global configuration mode. To return to the default universal load-balancing algorithm, use the **no** form of this command.

**ip cef load-sharing algorithm {original | [universal [id]]}**  
**no ip cef load-sharing algorithm**

Syntax Description	<b>original</b>	Sets the load-balancing algorithm to the original algorithm based on a source and destination hash.
	<b>universal</b>	Sets the load-balancing algorithm to the universal algorithm that uses a source and destination and an ID hash.
	<i>id</i>	(Optional) Fixed identifier.

**Command Default** The universal load-balancing algorithm is selected by default. If you do not configure the fixed identifier for a load-balancing algorithm, the router automatically generates a unique ID.

**Command Modes** Global configuration (config)

Command History	Release	Modification
		This command was introduced.

**Usage Guidelines** The original Cisco Express Forwarding load-balancing algorithm produced distortions in load sharing across multiple devices because of the use of the same algorithm on every device. When the load-balancing algorithm is set to universal mode, each device on the network can make a different load sharing decision for each source-destination address pair, and that resolves load-balancing distortions.

**Examples** The following example shows how to enable the Cisco Express Forwarding original load-balancing algorithm:

```
Device> enable
Device# configure terminal
Device(config)# ip cef load-sharing algorithm original
Device(config)# exit
```

Related Commands	Command	Description
	<b>ip load-sharing</b>	Enables load balancing for Cisco Express Forwarding.

# ip load-sharing

To enable load balancing for Cisco Express Forwarding on an interface, use the **ip load-sharing** command in interface configuration mode. To disable load balancing for Cisco Express Forwarding on the interface, use the **no** form of this command.

```
ip load-sharing {per-packet | per-destination }
no ip load-sharing per-packet
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>per-packet</b></td><td>Enables per-packet load balancing for Cisco Express Forwarding on the interface. This functionality and keyword are not supported on all platforms. See "Usage Guidelines" for more information.</td></tr> <tr> <td><b>per-destination</b></td><td>Enables per-destination load balancing for Cisco Express Forwarding on the interface.</td></tr> </table>	<b>per-packet</b>	Enables per-packet load balancing for Cisco Express Forwarding on the interface. This functionality and keyword are not supported on all platforms. See "Usage Guidelines" for more information.	<b>per-destination</b>	Enables per-destination load balancing for Cisco Express Forwarding on the interface.
<b>per-packet</b>	Enables per-packet load balancing for Cisco Express Forwarding on the interface. This functionality and keyword are not supported on all platforms. See "Usage Guidelines" for more information.				
<b>per-destination</b>	Enables per-destination load balancing for Cisco Express Forwarding on the interface.				

**Command Default** Per-destination load balancing is enabled by default when you enable Cisco Express Forwarding.

**Command Modes** Interface configuration (config-if)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
		This command was introduced.

**Usage Guidelines** Per-packet load balancing allows the router to send data packets over successive equal-cost paths without regard to individual destination hosts or user sessions. Path utilization is good, but packets destined for a given destination host might take different paths and might arrive out of order.

Per-destination load balancing allows the device to use multiple, equal-cost paths to achieve load sharing. Packets for a given source-destination host pair are guaranteed to take the same path, even if multiple, equal-cost paths are available. Traffic for different source-destination host pairs tends to take different paths.



**Note** If you want to enable per-packet load sharing to a particular destination, then all interfaces that can forward traffic to the destination must be enabled for per-packet load sharing.

## Examples

The following example shows how to enable per-packet load balancing:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/0/1
Device(config-if)# ip load-sharing per-packet
```

The following example shows how to enable per-destination load balancing:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/0/1
Device(config-if)# ip load-sharing per-destination
```

**show ip bgp neighbors**

# show ip bgp neighbors

To display information about Border Gateway Protocol (BGP) and TCP connections to neighbors, use the **show ip bgp neighbors** command in user or privileged EXEC mode.

```
show ip bgp [{ipv4 {multicast | unicast} | vpnv4 all | vpnv6 unicast all} ] neighbors [{slowip-address | ip6-address [{advertised-routes | dampened-routes | flap-statistics | paths [reg-exp] | policy [detail] | received prefix-filter | received-routes | routes}]}]
```

Syntax Description	<b>ipv4</b>	(Optional) Displays peers in the IPv4 address family.
	<b>multicast</b>	(Optional) Specifies IPv4 multicast address prefixes.
	<b>unicast</b>	(Optional) Specifies IPv4 unicast address prefixes.
	<b>vpnv4 all</b>	(Optional) Displays peers in the VPNv4 address family.
	<b>vpnv6 unicast all</b>	(Optional) Displays peers in the VPNv6 address family.
	<b>slow</b>	(Optional) Displays information about dynamically configured slow peers.
	<i>ip-address</i>	(Optional) IP address of the IPv4 neighbor. If this argument is omitted, information about all neighbors is displayed.
	<i>ip6-address</i>	(Optional) IP address of the IPv6 neighbor.
	<b>advertised-routes</b>	(Optional) Displays all routes that have been advertised to neighbors.
	<b>dampened-routes</b>	(Optional) Displays the dampened routes received from the specified neighbor.
	<b>flap-statistics</b>	(Optional) Displays the flap statistics of the routes learned from the specified neighbor (for external BGP peers only).
	<b>paths</b> <i>reg-exp</i>	(Optional) Displays autonomous system paths learned from the specified neighbor. An optional regular expression can be used to filter the output.
	<b>policy</b>	(Optional) Displays the policies applied to this neighbor per address family.
	<b>detail</b>	(Optional) Displays detailed policy information such as route maps, prefix lists, community lists, access control lists (ACLs), and autonomous system path filter lists.
	<b>received prefix-filter</b>	(Optional) Displays the prefix list (outbound route filter [ORF]) sent from the specified neighbor.
	<b>received-routes</b>	(Optional) Displays all received routes (both accepted and rejected) from the specified neighbor.
	<b>routes</b>	(Optional) Displays all routes that are received and accepted. The output displayed when this keyword is entered is a subset of the output displayed by the <b>received-routes</b> keyword.

<b>Command Default</b>	The output of this command displays information for all neighbors.	
<b>Command Modes</b>	User EXEC (> Privileged EXEC (#)	
<b>Command History</b>		
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.
	Cisco IOS XE Gibraltar 16.11.1	BGP Peak Prefix Watermark was added to the command output.

<b>Usage Guidelines</b>	Use the <b>show ip bgp neighbors</b> command to display BGP and TCP connection information for neighbor sessions. For BGP, this includes detailed neighbor attribute, capability, path, and prefix information. For TCP, this includes statistics related to BGP neighbor session establishment and maintenance.  Prefix activity is displayed based on the number of prefixes that are advertised and withdrawn. Policy denials display the number of routes that were advertised but then ignored based on the function or attribute that is displayed in the output.
<b>Examples</b>	Example output is different for the various keywords available for the <b>show ip bgp neighbors</b> command. Examples using the various keywords appear in the following sections.

### show ip bgp neighbors: Example

The following example shows output for the BGP neighbor at 10.108.50.2. This neighbor is an internal BGP (iBGP) peer. This neighbor supports the route refresh and graceful restart capabilities.

```
Device#show ip bgp neighbors 10.108.50.2
BGP neighbor is 10.108.50.2, remote AS 1, internal link
  BGP version 4, remote router ID 192.168.252.252
  BGP state = Established, up for 00:24:25
  Last read 00:00:24, last write 00:00:24, hold time is 180, keepalive interval is
    60 seconds
  Neighbor capabilities:
    Route refresh: advertised and received(old & new)
    MPLS Label capability: advertised and received
    Graceful Restart Capability: advertised
    Address family IPv4 Unicast: advertised and received
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
      Sent          Rcvd
    Opens:          3            3
    Notifications: 0            0
    Updates:        0            0
    Keepalives:     113          112
    Route Refresh:  0            0
    Total:         116          115
Default minimum time between advertisement runs is 5 seconds
For address family: IPv4 Unicast
  BGP additional-paths computation is enabled
```

show ip bgp neighbors

```

BGP advertise-best-external is enabled
BGP table version 1, neighbor version 1/0
Output queue size : 0
Index 1, Offset 0, Mask 0x2
1 update-group member

Sent          Rcvd
Prefix activity:  -----
Prefixes Current:      0          0
Prefixes Total:        0          0
Implicit Withdraw:    0          0
Explicit Withdraw:   0          0
Used as bestpath:     n/a         0
Used as multipath:    n/a         0
Outbound          Inbound
Local Policy Denied Prefixes:  -----
Total:                  0          0
Number of NLIRs in the update sent: max 0, min 0
Connections established 3; dropped 2
Last reset 00:24:26, due to Peer closed the session
External BGP neighbor may be up to 2 hops away.
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled
Local host: 10.108.50.1, Local port: 179
Foreign host: 10.108.50.2, Foreign port: 42698
Enqueued packets for retransmit: 0, input: 0 mis-ordered: 0 (0 bytes)
Event Timers (current time is 0x68B944):
Timer           Starts      Wakeups       Next
Retrans          27          0            0x0
TimeWait         0           0            0x0
AckHold          27          18           0x0
SendWnd          0           0            0x0
KeepAlive        0           0            0x0
GiveUp           0           0            0x0
PmtuAger         0           0            0x0
DeadWait         0           0            0x0
iss: 3915509457  sndnxt: 3915510016  sndnxt: 3915510016  sndwnd: 15826
irs: 233567076  rcvnxxt: 233567616  rcvwnd: 15845  delrcvwnd: 539
SRTT: 292 ms, RTTO: 359 ms, RTV: 67 ms, KRTT: 0 ms
minRTT: 12 ms, maxRTT: 300 ms, ACK hold: 200 ms
Flags: passive open, nagle, gen tcbs
IP Precedence value : 6
Datagrams (max data segment is 1460 bytes):
Rcvd: 38 (out of order: 0), with data: 27, total data bytes: 539
Sent: 45 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion: 08

```

The table below describes the significant fields shown in the display. Fields that are preceded by the asterisk character (\*) are displayed only when the counter has a nonzero value.

**Table 46: show ip bgp neighbors Field Descriptions**

Field	Description
BGP neighbor	IP address of the BGP neighbor and its autonomous system number.
remote AS	Autonomous system number of the neighbor.
local AS 300 no-prepend (not shown in display)	Verifies that the local autonomous system number is not prepended to received external routes. This output supports the hiding of the local autonomous systems when a network administrator is migrating autonomous systems.

Field	Description
internal link	“internal link” is displayed for iBGP neighbors; “external link” is displayed for external BGP (eBGP) neighbors.
BGP version	BGP version being used to communicate with the remote router.
remote router ID	IP address of the neighbor.
BGP state	Finite state machine (FSM) stage of session negotiation.
up for	Time, in hh:mm:ss, that the underlying TCP connection has been in existence.
Last read	Time, in hh:mm:ss, since BGP last received a message from this neighbor.
last write	Time, in hh:mm:ss, since BGP last sent a message to this neighbor.
hold time	Time, in seconds, that BGP will maintain the session with this neighbor without receiving messages.
keepalive interval	Time interval, in seconds, at which keepalive messages are transmitted to this neighbor.
Neighbor capabilities	BGP capabilities advertised and received from this neighbor. “advertised and received” is displayed when a capability is successfully exchanged between two routers.
Route refresh	Status of the route refresh capability.
MPLS Label capability	Indicates that MPLS labels are both sent and received by the eBGP peer.
Graceful Restart Capability	Status of the graceful restart capability.
Address family IPv4 Unicast	IP Version 4 unicast-specific properties of this neighbor.
Message statistics	Statistics organized by message type.
InQ depth is	Number of messages in the input queue.
OutQ depth is	Number of messages in the output queue.
Sent	Total number of transmitted messages.
Revd	Total number of received messages.
Opens	Number of open messages sent and received.
Notifications	Number of notification (error) messages sent and received.
Updates	Number of update messages sent and received.
Keepalives	Number of keepalive messages sent and received.

show ip bgp neighbors

Field	Description
Route Refresh	Number of route refresh request messages sent and received.
Total	Total number of messages sent and received.
Default minimum time between...	Time, in seconds, between advertisement transmissions.
For address family:	Address family to which the following fields refer.
BGP table version	Internal version number of the table. This is the primary routing table with which the neighbor has been updated. The number increments when the table changes.
neighbor version	Number used by the software to track prefixes that have been sent and those that need to be sent.
1 update-group member	Number of the update-group member for this address family.
Prefix activity	Prefix statistics for this address family.
Prefixes Current	Number of prefixes accepted for this address family.
Prefixes Total	Total number of received prefixes.
Implicit Withdraw	Number of times that a prefix has been withdrawn and readvertised.
Explicit Withdraw	Number of times that a prefix has been withdrawn because it is no longer feasible.
Used as bestpath	Number of received prefixes installed as best paths.
Used as multipath	Number of received prefixes installed as multipaths.
* Saved (soft-reconfig)	Number of soft resets performed with a neighbor that supports soft reconfiguration. This field is displayed only if the counter has a nonzero value.
* History paths	This field is displayed only if the counter has a nonzero value.
* Invalid paths	Number of invalid paths. This field is displayed only if the counter has a nonzero value.
Local Policy Denied Prefixes	Prefixes denied due to local policy configuration. Counters are updated for inbound and outbound policy denials. The fields under this heading are displayed only if the counter has a nonzero value.
* route-map	Displays inbound and outbound route-map policy denials.
* filter-list	Displays inbound and outbound filter-list policy denials.
* prefix-list	Displays inbound and outbound prefix-list policy denials.
* Ext Community	Displays only outbound extended community policy denials.
* AS_PATH too long	Displays outbound AS_PATH length policy denials.

Field	Description
* AS_PATH loop	Displays outbound AS_PATH loop policy denials.
* AS_PATH confed info	Displays outbound confederation policy denials.
* AS_PATH contains AS 0	Displays outbound denials of autonomous system 0.
* NEXT_HOP Martian	Displays outbound martian denials.
* NEXT_HOP non-local	Displays outbound nonlocal next-hop denials.
* NEXT_HOP is us	Displays outbound next-hop-self denials.
* CLUSTER_LIST loop	Displays outbound cluster-list loop denials.
* ORIGINATOR loop	Displays outbound denials of local originated routes.
* unsuppress-map	Displays inbound denials due to an unsuppress map.
* advertise-map	Displays inbound denials due to an advertise map.
* VPN Imported prefix	Displays inbound denials of VPN prefixes.
* Well-known Community	Displays inbound denials of well-known communities.
* SOO loop	Displays inbound denials due to site-of-origin.
* Bestpath from this peer	Displays inbound denials because the best path came from the local router.
* Suppressed due to dampening	Displays inbound denials because the neighbor or link is in a dampening state.
* Bestpath from iBGP peer	Deploys inbound denials because the best path came from an iBGP neighbor.
* Incorrect RIB for CE	Deploys inbound denials due to RIB errors for a customer edge (CE) router.
* BGP distribute-list	Displays inbound denials due to a distribute list.
Number of NLRI...	Number of network layer reachability attributes in updates.
Current session network count peaked...	Displays the peak number of networks observed in the current session.
Highest network count observed at...	Displays the peak number of networks observed since startup.
Connections established	Number of times a TCP and BGP connection has been successfully established.
dropped	Number of times that a valid session has failed or been taken down.
Last reset	Time, in hh:mm:ss, since this peering session was last reset. The reason for the reset is displayed on this line.

**show ip bgp neighbors**

Field	Description
External BGP neighbor may be...	Indicates that the BGP time to live (TTL) security check is enabled. The maximum number of hops that can separate the local and remote peer is displayed on this line.
Connection state	Connection status of the BGP peer.
unread input bytes	Number of bytes of packets still to be processed.
Connection is ECN Disabled	Explicit congestion notification status (enabled or disabled).
Local host: 10.108.50.1, Local port: 179	IP address of the local BGP speaker. BGP port number 179.
Foreign host: 10.108.50.2, Foreign port: 42698	Neighbor address and BGP destination port number.
Enqueued packets for retransmit:	Packets queued for retransmission by TCP.
Event Timers	TCP event timers. Counters are provided for starts and wakeups (expired timers).
Retrans	Number of times a packet has been retransmitted.
TimeWait	Time waiting for the retransmission timers to expire.
AckHold	Acknowledgment hold timer.
SendWnd	Transmission (send) window.
KeepAlive	Number of keepalive packets.
GiveUp	Number of times a packet is dropped due to no acknowledgment.
PmtuAger	Path MTU discovery timer.
DeadWait	Expiration timer for dead segments.
iss:	Initial packet transmission sequence number.
snduna:	Last transmission sequence number that has not been acknowledged.
sndnxt:	Next packet sequence number to be transmitted.
sndwnd:	TCP window size of the remote neighbor.
irs:	Initial packet receive sequence number.
rcvnxt:	Last receive sequence number that has been locally acknowledged.
rcvwnd:	TCP window size of the local host.

Field	Description
delrcvwnd:	Delayed receive window—data the local host has read from the connection, but has not yet subtracted from the receive window the host has advertised to the remote host. The value in this field gradually increases until it is higher than a full-sized packet, at which point it is applied to the rcvwnd field.
SRTT:	A calculated smoothed round-trip timeout.
RTTO:	Round-trip timeout.
RTV:	Variance of the round-trip time.
KRTT:	New round-trip timeout (using the Karn algorithm). This field separately tracks the round-trip time of packets that have been re-sent.
minRTT:	Shortest recorded round-trip timeout (hard-wire value used for calculation).
maxRTT:	Longest recorded round-trip timeout.
ACK hold:	Length of time the local host will delay an acknowledgment to carry (piggyback) additional data.
IP Precedence value:	IP precedence of the BGP packets.
Datagrams	Number of update packets received from a neighbor.
Rcvd:	Number of received packets.
out of order:	Number of packets received out of sequence.
with data	Number of update packets sent with data.
total data bytes	Total amount of data received, in bytes.
Sent	Number of update packets sent.
Second Congestion	Number of update packets with data sent.
Datagrams: Rcvd	Number of update packets received from a neighbor.
retransmit	Number of packets retransmitted.
fastretransmit	Number of duplicate acknowledgments retransmitted for an out of order segment before the retransmission timer expires.
partialack	Number of retransmissions for partial acknowledgments (transmissions before or without subsequent acknowledgments).
Second Congestion	Number of second retransmissions sent due to congestion.

**show ip bgp neighbors**

### show ip bgp neighbors (4-Byte Autonomous System Numbers)

The following partial example shows output for several external BGP neighbors in autonomous systems with 4-byte autonomous system numbers, 65536 and 65550. This example requires Cisco IOS Release 12.0(32)SY8, 12.0(33)S3, 12.2(33)SRE, 12.2(33)XNE, 12.2(33)SXII, Cisco IOS XE Release 2.4, or a later release.

```
Device#show ip bgp neighbors

BGP neighbor is 192.168.1.2, remote AS 65536, external link
  BGP version 4, remote router ID 0.0.0.0
  BGP state = Idle
    Last read 02:03:38, last write 02:03:38, hold time is 120, keepalive interval is 70
    seconds
    Configured hold time is 120, keepalive interval is 70 seconds
    Minimum holdtime from neighbor is 0 seconds
  .
  .
  .

BGP neighbor is 192.168.3.2, remote AS 65550, external link
  Description: finance
  BGP version 4, remote router ID 0.0.0.0
  BGP state = Idle
    Last read 02:03:48, last write 02:03:48, hold time is 120, keepalive interval is 70
    seconds
    Configured hold time is 120, keepalive interval is 70 seconds
    Minimum holdtime from neighbor is 0 seconds
```

### show ip bgp neighbors advertised-routes

The following example displays routes advertised for only the 172.16.232.178 neighbor:

```
Device#show ip bgp neighbors 172.16.232.178 advertised-routes

BGP table version is 27, local router ID is 172.16.232.181
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete
Network          Next Hop          Metric LocPrf Weight Path
*>i10.0.0.0      172.16.232.179      0     100      0 ?
*> 10.20.2.0      10.0.0.0          0           32768 i
```

The table below describes the significant fields shown in the display.

**Table 47: show ip bgp neighbors advertised-routes Field Descriptions**

Field	Description
BGP table version	Internal version number of the table. This is the primary routing table with which the neighbor has been updated. The number increments when the table changes.
local router ID	IP address of the local BGP speaker.

Field	Description
Status codes	Status of the table entry. The status is displayed at the beginning of each line in the table. It can be one of the following values: <ul style="list-style-type: none"> <li>• s—The table entry is suppressed.</li> <li>• d—The table entry is dampened and will not be advertised to BGP neighbors.</li> <li>• h—The table entry does not contain the best path based on historical information.</li> <li>• *—The table entry is valid.</li> <li>• &gt;—The table entry is the best entry to use for that network.</li> <li>• i—The table entry was learned via an internal BGP (iBGP) session.</li> </ul>
Origin codes	Origin of the entry. The origin code is placed at the end of each line in the table. It can be one of the following values: <ul style="list-style-type: none"> <li>• i—Entry originated from Interior Gateway Protocol (IGP) and was advertised with a <b>network</b> router configuration command.</li> <li>• e—Entry originated from Exterior Gateway Protocol (EGP).</li> <li>• ?—Origin of the path is not clear. Usually, this is a route that is redistributed into BGP from an IGP.</li> </ul>
Network	IP address of a network entity.
Next Hop	IP address of the next system used to forward a packet to the destination network. An entry of 0.0.0.0 indicates that there are non-BGP routes in the path to the destination network.
Metric	If shown, this is the value of the interautonomous system metric. This field is not used frequently.
LocPrf	Local preference value as set with the <b>set local-preference</b> route-map configuration command. The default value is 100.
Weight	Weight of the route as set via autonomous system filters.
Path	Autonomous system paths to the destination network. There can be one entry in this field for each autonomous system in the path.

### show ip bgp neighbors check-control-plane-failure

The following is sample output from the **show ip bgp neighbors** command entered with the **check-control-plane-failure** option configured:

```
Device#show ip bgp neighbors 10.10.10.1
BGP neighbor is 10.10.10.1, remote AS 10, internal link
Fall over configured for session
BFD is configured. BFD peer is Up. Using BFD to detect fast failover (single-hop) with
c-bit check-control-plane-failure.
```

**show ip bgp neighbors**

```
Inherits from template cbit-tps for session parameters
BGP version 4, remote router ID 10.7.7.7
BGP state = Established, up for 00:03:55
Last read 00:00:02, last write 00:00:21, hold time is 180, keepalive interval is 60 seconds

Neighbor sessions:
  1 active, is not multisession capable (disabled)
Neighbor capabilities:
  Route refresh: advertised and received(new)
  Four-octets ASN Capability: advertised and received
  Address family IPv4 Unicast: advertised and received
  Enhanced Refresh Capability: advertised and received
  Multisession Capability:
    Stateful switchover support enabled: NO for session 1
```

**show ip bgp neighbors paths**

The following is sample output from the **show ip bgp neighbors** command entered with the **paths** keyword:

```
Device#show ip bgp neighbors 172.29.232.178 paths 10
Address      Refcount Metric Path
0x60E577B0          2      40 10 ?
```

The table below describes the significant fields shown in the display.

**Table 48: show ip bgp neighbors paths Field Descriptions**

Field	Description
Address	Internal address where the path is stored.
RefCount	Number of routes using that path.
Metric	Multi Exit Discriminator (MED) metric for the path. (The name of this metric for BGP versions 2 and 3 is INTER_AS.)
Path	Autonomous system path for that route, followed by the origin code for that route.

**show ip bgp neighbors received prefix-filter**

The following example shows that a prefix list that filters all routes in the 10.0.0.0 network has been received from the 192.168.20.72 neighbor:

```
Device#show ip bgp neighbors 192.168.20.72 received prefix-filter
Address family:IPv4 Unicast
ip prefix-list 192.168.20.72:1 entries
  seq 5 deny 10.0.0.0/8 le 32
```

The table below describes the significant fields shown in the display.

**Table 49: show ip bgp neighbors received prefix-filter Field Descriptions**

Field	Description
Address family	Address family mode in which the prefix filter is received.
ip prefix-list	Prefix list sent from the specified neighbor.

### show ip bgp neighbors policy

The following sample output shows the policies applied to the neighbor at 192.168.1.2. The output displays both inherited policies and policies configured on the neighbor device. Inherited policies are policies that the neighbor inherits from a peer group or a peer-policy template.

```
Device#show ip bgp neighbors 192.168.1.2 policy
```

```
Neighbor: 192.168.1.2, Address-Family: IPv4 Unicast
Locally configured policies:
  route-map ROUTE in
Inherited policies:
  prefix-list NO-MARKETING in
    route-map ROUTE in
    weight 300
    maximum-prefix 10000
```

### BGP Attribute Filter and Enhanced Attribute Error Handling

The following is sample output from the **show ip bgp neighbors** command that indicates the discard attribute values and treat-as-withdraw attribute values configured. It also provides a count of received Updates matching a treat-as-withdraw attribute, a count of received Updates matching a discard attribute, and a count of received malformed Updates that are treat-as-withdraw.

```
Device#show ip bgp vpng4 all neighbors 10.0.103.1
```

```
BGP neighbor is 10.0.103.1, remote AS 100, internal link
  Path-attribute treat-as-withdraw inbound
  Path-attribute treat-as-withdraw value 128
  Path-attribute treat-as-withdraw 128 in: count 2
  Path-attribute discard 128 inbound
  Path-attribute discard 128 in: count 2

  Outbound      Inbound
Local Policy Denied Prefixes:      -----      -----
  MALFORM treat as withdraw:          0          1
  Total:                           0          1
```

### BGP Additional Paths

The following output indicates that the neighbor is capable of advertising additional paths and sending additional paths it receives. It is also capable of receiving additional paths and advertised paths.

```
Device#show ip bgp neighbors 10.108.50.2
```

**show ip bgp neighbors**

```
BGP neighbor is 10.108.50.2, remote AS 1, internal link
BGP version 4, remote router ID 192.168.252.252
BGP state = Established, up for 00:24:25
Last read 00:00:24, last write 00:00:24, hold time is 180, keepalive interval is 60 seconds

Neighbor capabilities:
  Additional paths Send: advertised and received
  Additional paths Receive: advertised and received
  Route refresh: advertised and received(old & new)
  Graceful Restart Capabilty: advertised and received
  Address family IPv4 Unicast: advertised and received
```

### BGP—Multiple Cluster IDs

In the following output, the cluster ID of the neighbor is displayed. (The vertical bar and letter “i” for “include” cause the device to display only lines that include the user’s input after the “i”, in this case, “cluster-id.”) The cluster ID displayed is the one directly configured through a neighbor or a template.

```
Device#show ip bgp neighbors 192.168.2.2 | i cluster-id
Configured with the cluster-id 192.168.15.6
```

### BGP Peak Prefix Watermark

The following sample output shows the peak watermarks and their timestamps displayed for the peak number of route entries per neighbor bases:

```
Device#show ip bgp ipv4 unicast neighbors 11.11.11.11
BGP neighbor is 11.11.11.11, remote AS 1, internal link
BGP version 4, remote router ID 0.0.0.0
BGP state = Idle, down for 00:01:43
Neighbor sessions:
  0 active, is not multisession capable (disabled)
  Stateful switchover support enabled: NO
  Do log neighbor state changes (via global configuration)
  Default minimum time between advertisement runs is 0 seconds

For address family: IPv4 Unicast
BGP table version 27, neighbor version 1/27
Output queue size : 0
Index 0, Advertise bit 0
Slow-peer detection is disabled
Slow-peer split-update-group dynamic is disabled
      Sent          Rcvd
Prefix activity:    ----        -----
  Prefixes Current:      0          0
  Prefixes Total:        0          0
  Implicit Withdraw:    0          0
  Explicit Withdraw:    0          0
  Used as bestpath:     n/a         0
  Used as multipath:    n/a         0
  Used as secondary:   n/a         0

      Outbound        Inbound
Local Policy Denied Prefixes:  -----        -----
  Total:                  0          0
Number of NLIRs in the update sent: max 2, min 0
```

```

Current session network count peaked at 20 entries at 00:00:23 Aug 8 2018 PST (00:01:29.156
ago).
Highest network count observed at 20 entries at 23:55:32 Aug 7 2018 PST (00:06:20.156
ago).
Last detected as dynamic slow peer: never
Dynamic slow peer recovered: never
Refresh Epoch: 1
Last Sent Refresh Start-of-rib: never
Last Sent Refresh End-of-rib: never
Last Received Refresh Start-of-rib: never
Last Received Refresh End-of-rib: never
          Sent      Rcvd
Refresh activity:      -----
                    Refresh Start-of-RIB   0        0
                    Refresh End-of-RIB    0        0

```

### BGP Soft Inbound and Outbound Refresh Time

In the following example, the times of occurrence of the soft inbound and outbound refresh, to or from the given neighbour, are displayed:

```

Device#show ip bgp l2vpn evpn neighbors 11.11.11.11

BGP neighbor is 11.11.11.11, remote AS 1, internal link
  BGP version 4, remote router ID 11.11.11.11
  BGP state = Established, up for 00:14:06
  Last read 00:00:21, last write 00:00:28, hold time is 180, keepalive
  .....
  Do log neighbor state changes (via global configuration)

  Default minimum time between advertisement runs is 0 seconds

For address family: L2VPN E-VPN
Session: 11.11.11.11
BGP table version 30, neighbor version 30/0
Output queue size : 0
Index 1, Advertise bit 0
1 update-group member
Community attribute sent to this neighbor
Extended-community attribute sent to this neighbor
.....
.....
Last detected as dynamic slow peer: never
Dynamic slow peer recovered: never
Refresh Epoch: 2
Last Sent Refresh Start-of-rib: never
Last Sent Refresh End-of-rib: never
Last Received Refresh Start-of-rib: 00:14:06
Last Received Refresh End-of-rib: 00:14:06
Refresh-In took 0 seconds
          Sent      Rcvd
Refresh activity:      -----
                    Refresh Start-of-RIB   0        1
                    Refresh End-of-RIB    0        1

Address tracking is enabled, the RIB does have a route to 11.11.11.11
Route to peer address reachability Up: 1; Down: 0
  Last notification 00:14:07
  Connections established 1; dropped 0
.....

```

show ip bgp neighbors

```
.....  
Packets received in fast path: 0, fast processed: 0, slow path: 0  
fast lock acquisition failures: 0, slow path: 0  
TCP Semaphore 0x7FA8A0AE7BA0 FREE
```

Related Commands	Command	Description
	<b>bgp asnotation dot</b>	Changes the default display and the regular expression match format of BGP 4-byte autonomous system numbers from asplain (decimal values) to dot notation.
	<b>bgp enhanced-error</b>	Restores the default behavior of treating Update messages that have a malformed attribute as withdrawn, or includes iBGP peers in the Enhanced Attribute Error Handling feature.
	<b>neighbor path-attribute discard</b>	Configures the device to discard unwanted Update messages from the specified neighbor that contain a specified path attribute.
	<b>neighbor path-attribute treat-as-withdraw</b>	Configures the device to withdraw from the specified neighbor unwanted Update messages that contain a specified attribute.
	<b>neighbor send-label</b>	Enables a BGP router to send MPLS labels with BGP routes to a neighboring BGP router.
	<b>neighbor send-label explicit-null</b>	Enables a BGP router to send MPLS labels with explicit-null information for a CSC-CE router and BGP routes to a neighboring CSC-PE router.
	<b>router bgp</b>	Configures the BGP routing process.

# show tech-support bgp

To automatically run show commands that display BGP related system information, use the **show tech-support bgp** command in the privileged EXEC mode.

```
show tech-support bgp [address-family {all | ipv4 [flowspec | multicast | unicast | [mdt | mvpn] {all | vrf vrf-instance-name} ] | ipv6 [flowspec | multicast | mvpn {all | vrf vrf-instance-name} | unicast] | l2vpn [evpn | vpls] | link-state [link-state] | [nsap | rtfilter] [unicast] | [vpnv4 | vpnv6] [flowspec | multicast | unicast] {all | vrf vrf-instance-name} } ] [detail]
```

Syntax Description		
<b>address-family</b>		(Optional) Displays the output for a specified address family.
<b>address-family all</b>		(Optional) Displays the output for all address families.
<b>ipv4</b>		(Optional) Displays the output for IPv4 address family.
<b>ipv6</b>		(Optional) Displays the output for IPv6 address family.
<b>l2vpn</b>		(Optional) Displays the output for L2VPN address family.
<b>link-state</b>		(Optional) Displays the output for Link State address family.
<b>nsap</b>		(Optional) Displays the output for NSAP address family.
<b>rtfilter</b>		(Optional) Displays the output for RT Filter address family.
<b>vpnv4</b>		(Optional) Displays the output for VPNV4 address family.
<b>vpnv6</b>		(Optional) Displays the output for VPNV6 address family.
<b>flowspec</b>		(Optional) Displays the flowspec related information for an address family.
<b>multicast</b>		(Optional) Displays the multicast related information for an address family.
<b>unicast</b>		(Optional) Displays the unicast related information for an address family.
<b>mdt</b>		(Optional) Displays the Multicast Distribution Tree (MDT) related information for an address family.

```
show tech-support bgp
```

<b>mvpn</b>	(Optional) Displays the Multicast VPN (MVPN) related information for an address family.
<b>vrf</b>	Displays the information for a VPN Routing/Forwarding instance.
<b>evpn</b>	(Optional) Displays the Ethernet VPN (EVPN) related information for an address family.
<b>vpls</b>	(Optional) Displays the Virtual Private LAN Services (VPLS) related information for an address family.
<i>vrf-instance-name</i>	Specifies the name of the VPN Routing/Forwarding instance.
<b>all</b>	Displays the information about all VPN NLRIs.
<b>detail</b>	(Optional) Displays the detailed routes information.

**Command Modes** User EXEC (>)

Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.	

**Usage Guidelines** The **show tech-support bgp** command is used to display the outputs of various BGP show commands and log them to the show-tech file. The output from the **show tech-support bgp** command is very long. To better manage this output, you can redirect the output to a file (for example, **show tech-support > filename**) in the local writable storage file system or the remote file system. Redirecting the output to a file also makes sending the output to your Cisco Technical Assistance Center (TAC) representative easier.

You can use one of the following redirection methods:

- > filename - Redirects the output to a file.
- >> filename - Redirects the output to a file in append mode.

The following **show** commands run automatically when the **show tech-support bgp** command is used:

- **show clock**
- **show version**
- **show running-config**
- **show process cpu sorted**
- **show process cpu history**
- **show process memory sorted**

The following **show** commands for a specific address family run automatically when the **show tech-support bgp address-familyaddress-family-name address-family-modifier** command is used:

- **show bgp address-family-name address-family-modifier summary**
- **show bgp address-family-name address-family-modifier detail**
- **show bgp address-family-name address-family-modifier internal**
- **show bgp address-family-name address-family-modifier neighbors**
- **show bgp address-family-name address-family-modifier update-group**
- **show bgp address-family-name address-family-modifier replication**
- **show bgp address-family-name address-family-modifier community**
- **show bgp address-family-name address-family-modifier dampening dampened-paths**
- **show bgp address-family-name address-family-modifier dampening flap-statistics**
- **show bgp address-family-name address-family-modifier dampening parameters**
- **show bgp address-family-name address-family-modifier injected-paths**
- **show bgp address-family-name address-family-modifier cluster-ids**
- **show bgp address-family-name address-family-modifier cluster-ids internal**
- **show bgp address-family-name address-family-modifier peer-group**
- **show bgp address-family-name address-family-modifier pending-prefixes**
- **show bgp address-family-name address-family-modifier rib-failure**

In addition to the above commands, the following segment routing specific **show** commands also run when the **show tech-support bgp** command is used:

- **show bgp all binding-sid**
- **show segment-routing client**
- **show segment-routing mpls state**
- **show segment-routing mpls gb**
- **show segment-routing mpls connected-prefix-sid-map protocol ipv4**
- **show segment-routing mpls connected-prefix-sid-map protocol backup ipv4**
- **show mpls traffic-eng tunnel auto-tunnel client bgp**

```
■ show tech-support bgp
```



PART **XII**

## **Security**

- [Security Commands, on page 839](#)





## Security Commands

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# aaa accounting

To enable authentication, authorization, and accounting (AAA) accounting of requested services for billing or security purposes when you use RADIUS or TACACS+, use the **aaa accounting** command in global configuration mode. To disable AAA accounting, use the **no** form of this command.

```
aaa accounting {auth-proxy | system | network | exec | connections | commands level}
{default | list-name} {start-stop | stop-only | none} [broadcast] group group-name
no aaa accounting {auth-proxy | system | network | exec | connections | commands level}
{default | list-name} {start-stop | stop-only | none} [broadcast] group group-name
```

Syntax Description	
<b>auth-proxy</b>	Provides information about all authenticated-proxy user events.
<b>system</b>	Performs accounting for all system-level events not associated with users, such as reloads.
<b>network</b>	Runs accounting for all network-related service requests.
<b>exec</b>	Runs accounting for EXEC shell session. This keyword might return user profile information such as what is generated by the <b>autocommand</b> command.
<b>connection</b>	Provides information about all outbound connections made from the network access server.
<b>commands</b> <i>level</i>	Runs accounting for all commands at the specified privilege level. Valid privilege level entries are integers from 0 through 15.
<b>default</b>	Uses the listed accounting methods that follow this argument as the default list of methods for accounting services.
<i>list-name</i>	Character string used to name the list of at least one of the accounting methods described in
<b>start-stop</b>	Sends a "start" accounting notice at the beginning of a process and a "stop" accounting notice at the end of a process. The "start" accounting record is sent in the background. The requested user process begins regardless of whether the "start" accounting notice was received by the accounting server.
<b>stop-only</b>	Sends a "stop" accounting notice at the end of the requested user process.
<b>none</b>	Disables accounting services on this line or interface.
<b>broadcast</b>	(Optional) Enables sending accounting records to multiple AAA servers. Simultaneously sends accounting records to the first server in each group. If the first server is unavailable, fail over occurs using the backup servers defined within that group.
<i>group</i> <i>groupname</i>	At least one of the keywords described in <a href="#">Table 50: AAA accounting Methods, on page 843</a>
<b>Command Default</b>	AAA accounting is disabled.
<b>Command Modes</b>	Global configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

Usage Guidelines	Use the <b>aaa accounting</b> command to enable accounting and to create named method lists defining specific accounting methods on a per-line or per-interface basis.
------------------	--

**Table 50: AAA accounting Methods**

Keyword	Description
<b>group radius</b>	Uses the list of all RADIUS servers for authentication as defined by the <b>aaa group server radius</b> command.
<b>group tacacs+</b>	Uses the list of all TACACS+ servers for authentication as defined by the <b>aaa group server tacacs+</b> command.
<b>group group-name</b>	Uses a subset of RADIUS or TACACS+ servers for accounting as defined by the server group group-name.

In [Table 50: AAA accounting Methods, on page 843](#), the **group radius** and **group tacacs+** methods refer to a set of previously defined RADIUS or TACACS+ servers. Use the **radius server** and **tacacs server** commands to configure the host servers. Use the **aaa group server radius** and **aaa group server tacacs+** commands to create a named group of servers.

Cisco IOS software supports the following two methods of accounting:

- RADIUS—The network access server reports user activity to the RADIUS security server in the form of accounting records. Each accounting record contains accounting attribute-value (AV) pairs and is stored on the security server.
- TACACS+—The network access server reports user activity to the TACACS+ security server in the form of accounting records. Each accounting record contains accounting attribute-value (AV) pairs and is stored on the security server.

Method lists for accounting define the way accounting will be performed. Named accounting method lists enable you to designate a particular security protocol to be used on specific lines or interfaces for particular types of accounting services. Create a list by entering the *list-name* and the *method*, where *list-name* is any character string used to name this list (excluding the names of methods, such as radius or tacacs+) and *method* identifies the methods to be tried in sequence as given.

If the **aaa accounting** command for a particular accounting type is issued without a named method list specified, the default method list is automatically applied to all interfaces or lines (where this accounting type applies) except those that have a named method list explicitly defined. (A defined method list overrides the default method list.) If no default method list is defined, then no accounting takes place.



**Note** System accounting does not use named accounting lists; you can only define the default list for system accounting.

For minimal accounting, include the **stop-only** keyword to send a stop record accounting notice at the end of the requested user process. For more accounting, you can include the **start-stop** keyword, so that RADIUS or TACACS+ sends a start accounting notice at the beginning of the requested process and a stop accounting

notice at the end of the process. Accounting is stored only on the RADIUS or TACACS+ server. The none keyword disables accounting services for the specified line or interface.

When AAA accounting is activated, the network access server monitors either RADIUS accounting attributes or TACACS+ AV pairs pertinent to the connection, depending on the security method you have implemented. The network access server reports these attributes as accounting records, which are then stored in an accounting log on the security server. For a list of supported RADIUS accounting attributes, refer to the appendix RADIUS Attributes in the *Cisco IOS Security Configuration Guide*. For a list of supported TACACS+ accounting AV pairs, refer to the appendix TACACS+ Attribute-Value Pairs in the *Cisco IOS Security Configuration Guide*.




---

**Note** This command cannot be used with TACACS or extended TACACS.

---

This example defines a default commands accounting method list, where accounting services are provided by a TACACS+ security server, set for privilege level 15 commands with a stop-only restriction:

```
Device(config)# aaa accounting commands 15 default stop-only group TACACS+
```

This example defines a default auth-proxy accounting method list, where accounting services are provided by a TACACS+ security server with a stop-only restriction. The aaa accounting commands activates authentication proxy accounting.

```
Device(config)# aaa new model
Device(config)# aaa authentication login default group TACACS+
Device(config)# aaa authorization auth-proxy default group TACACS+
Device(config)# aaa accounting auth-proxy default start-stop group TACACS+
```

# aaa accounting dot1x

To enable authentication, authorization, and accounting (AAA) accounting and to create method lists defining specific accounting methods on a per-line or per-interface basis for IEEE 802.1x sessions, use the **aaa accounting dot1x** command in global configuration mode. To disable IEEE 802.1x accounting, use the **no** form of this command.

```
aaa accounting dot1x {name | default} start-stop {broadcast group {name | radius | tacacs+} [group {name | radius | tacacs+} ... ] | group {name | radius | tacacs+} [group {name | radius | tacacs+} ... ]}
no aaa accounting dot1x {name | default}
```

Syntax Description	<p><b>name</b> Name of a server group. This is optional when you enter it after the <b>broadcast group</b> and <b>group</b> keywords.</p> <p><b>default</b> Specifies the accounting methods that follow as the default list for accounting services.</p> <p><b>start-stop</b> Sends a start accounting notice at the beginning of a process and a stop accounting notice at the end of a process. The start accounting record is sent in the background. The requested user process begins regardless of whether or not the start accounting notice was received by the accounting server.</p> <p><b>broadcast</b> Enables accounting records to be sent to multiple AAA servers and sends accounting records to the first server in each group. If the first server is unavailable, the switch uses the list of backup servers to identify the first server.</p> <p><b>group</b> Specifies the server group to be used for accounting services. These are valid server group names:</p> <ul style="list-style-type: none"> <li>• <b>name</b> — Name of a server group.</li> <li>• <b>radius</b> — Lists of all RADIUS hosts.</li> <li>• <b>tacacs+</b> — Lists of all TACACS+ hosts.</li> </ul> <p>The <b>group</b> keyword is optional when you enter it after the <b>broadcast group</b> and <b>group</b> keywords. You can enter more than one optional <b>group</b> keyword.</p>				
<b>radius</b>	(Optional) Enables RADIUS accounting.				
<b>tacacs+</b>	(Optional) Enables TACACS+ accounting.				
<b>Command Default</b>	AAA accounting is disabled.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

```
aaa accounting dot1x
```

### Usage Guidelines

This command requires access to a RADIUS server.

We recommend that you enter the **dot1x reauthentication** interface configuration command before configuring IEEE 802.1x RADIUS accounting on an interface.

This example shows how to configure IEEE 802.1x accounting:

```
Device(config)# aaa new-model
Device(config)# aaa accounting dot1x default start-stop group radius
```

# aaa accounting identity

To enable authentication, authorization, and accounting (AAA) accounting for IEEE 802.1x, MAC authentication bypass (MAB), and web authentication sessions, use the **aaa accounting identity** command in global configuration mode. To disable IEEE 802.1x accounting, use the **no** form of this command.

```
aaa accounting identity {name | default} start-stop {broadcast group {name | radius | tacacs+} [group {name | radius | tacacs+} ... ] | group {name | radius | tacacs+} [group {name | radius | tacacs+} ... ]}
no aaa accounting identity {name | default}
```

Syntax Description	<p><b>name</b> Name of a server group. This is optional when you enter it after the <b>broadcast group</b> and <b>group</b> keywords.</p> <p><b>default</b> Uses the accounting methods that follow as the default list for accounting services.</p> <p><b>start-stop</b> Sends a start accounting notice at the beginning of a process and a stop accounting notice at the end of a process. The start accounting record is sent in the background. The requested-user process begins regardless of whether or not the start accounting notice was received by the accounting server.</p> <p><b>broadcast</b> Enables accounting records to be sent to multiple AAA servers and send accounting records to the first server in each group. If the first server is unavailable, the switch uses the list of backup servers to identify the first server.</p> <p><b>group</b> Specifies the server group to be used for accounting services. These are valid server group names: <ul style="list-style-type: none"> <li>• <b>name</b> — Name of a server group.</li> <li>• <b>radius</b> — Lists of all RADIUS hosts.</li> <li>• <b>tacacs+</b> — Lists of all TACACS+ hosts.</li> </ul> The <b>group</b> keyword is optional when you enter it after the <b>broadcast group</b> and <b>group</b> keywords. You can enter more than one optional <b>group</b> keyword. </p> <p><b>radius</b> (Optional) Enables RADIUS authorization.</p> <p><b>tacacs+</b> (Optional) Enables TACACS+ accounting.</p>				
Command Default	AAA accounting is disabled.				
Command Modes	Global configuration				
Command History	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding-bottom: 5px;">Release</th><th style="text-align: right; padding-bottom: 5px;">Modification</th></tr> </thead> <tbody> <tr> <td style="padding-top: 5px;">Cisco IOS XE 3.2SE</td><td style="text-align: right; padding-top: 5px;">This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				
Usage Guidelines	To enable AAA accounting identity, you need to enable policy mode. To enable policy mode, enter the <b>authentication display new-style</b> command in privileged EXEC mode.				

**aaa accounting identity**

This example shows how to configure IEEE 802.1x accounting identity:

```
Device# authentication display new-style
```

Please note that while you can revert to legacy style configuration at any time unless you have explicitly entered new-style configuration, the following caveats should be carefully read and understood.

- (1) If you save the config in this mode, it will be written to NVRAM in NEW-style config, and if you subsequently reload the router without reverting to legacy config and saving that, you will no longer be able to revert.
- (2) In this and legacy mode, Webauth is not IPv6-capable. It will only become IPv6-capable once you have entered new-style config manually, or have reloaded with config saved in 'authentication display new' mode.

```
Device# configure terminal
Device(config)# aaa accounting identity default start-stop group radius
```

# aaa authentication dot1x

To specify the authentication, authorization, and accounting (AAA) method to use on ports complying with the IEEE 802.1x authentication, use the **aaa authentication dot1x** command in global configuration mode on the switch stack or on a standalone switch. To disable authentication, use the **no** form of this command.

```
aaa authentication dot1x {default} method1
no aaa authentication dot1x {default} method1
```

<b>Syntax Description</b>	<p><b>default</b> The default method when a user logs in. Use the listed authentication method that follows this argument.</p> <p><b>method1</b> Specifies the server authentication. Enter the <b>group radius</b> keywords to use the list of all RADIUS servers for authentication.</p> <p><b>Note</b> Though other keywords are visible in the command-line help strings, only the <b>default</b> and <b>group radius</b> keywords are supported.</p>				
<b>Command Default</b>	No authentication is performed.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	The <b>method</b> argument identifies the method that the authentication algorithm tries in the specified sequence to validate the password provided by the client. The only method that is IEEE 802.1x-compliant is the <b>group radius</b> method, in which the client data is validated against a RADIUS authentication server.  If you specify <b>group radius</b> , you must configure the RADIUS server by entering the <b>radius-server host</b> global configuration command.  Use the <b>show running-config</b> privileged EXEC command to display the configured lists of authentication methods.
	This example shows how to enable AAA and how to create an IEEE 802.1x-compliant authentication list. This authentication first tries to contact a RADIUS server. If this action returns an error, the user is not allowed access to the network.

```
Device(config)# aaa new-model
Device(config)# aaa authentication dot1x default group radius
```

# aaa authorization

To set the parameters that restrict user access to a network, use the **aaa authorization** command in global configuration mode. To remove the parameters, use the **no** form of this command.

```
aaa authorization { auth-proxy | cache | commands level | config-commands | configuration | console | credential-download | exec | multicast | network | onep | policy-if | prepaid | radius-proxy | reverse-access | subscriber-service | template} {default | list_name} [method1 [ method2 . . . ]]
aaa authorization { auth-proxy | cache | commands level | config-commands | configuration | console | credential-download | exec | multicast | network | reverse-access | template} {default | list_name} [method1 [ method2 . . . ]]
no aaa authorization { auth-proxy | cache | commands level | config-commands | configuration | console | credential-download | exec | multicast | network | reverse-access | template} {default | list_name} [method1 [ method2 . . . ]]
```

Syntax Description	
<b>auth-proxy</b>	Runs authorization for authentication proxy services.
<b>cache</b>	Configures the authentication, authorization, and accounting (AAA) server.
<b>commands</b>	Runs authorization for all commands at the specified privilege level.
<i>level</i>	Specific command level that should be authorized. Valid entries are 0 through 15.
<b>config-commands</b>	Runs authorization to determine whether commands entered in configuration mode are authorized.
<b>configuration</b>	Downloads the configuration from the AAA server.
<b>console</b>	Enables the console authorization for the AAA server.
<b>credential-download</b>	Downloads EAP credential from Local/RADIUS/LDAP.
<b>exec</b>	Enables the console authorization for the AAA server.
<b>multicast</b>	Downloads the multicast configuration from the AAA server.
<b>network</b>	Runs authorization for all network-related service requests, including Serial Line Internet Protocol (SLIP), PPP, PPP Network Control Programs (NCPs), and AppleTalk Remote Access (ARA).
<b>onep</b>	Runs authorization for the ONEP service.
<b>reverse-access</b>	Runs authorization for reverse access connections, such as reverse Telnet.
<b>template</b>	Enables template authorization for the AAA server.
<b>default</b>	Uses the listed authorization methods that follow this keyword as the default list of methods for authorization.
<i>list_name</i>	Character string used to name the list of authorization methods.

---

*method1 [method2...]* (Optional) An authorization method or multiple authorization methods to be used for authorization. A method may be any one of the keywords listed in the table below.

---

**Command Default** Authorization is disabled for all actions (equivalent to the method keyword **none**).

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

---

**Usage Guidelines** Use the **aaa authorization** command to enable authorization and to create named methods lists, which define authorization methods that can be used when a user accesses the specified function. Method lists for authorization define the ways in which authorization will be performed and the sequence in which these methods will be performed. A method list is a named list that describes the authorization methods (such as RADIUS or TACACS+) that must be used in sequence. Method lists enable you to designate one or more security protocols to be used for authorization, which ensures a backup system in case the initial method fails. Cisco IOS software uses the first method listed to authorize users for specific network services; if that method fails to respond, the Cisco IOS software selects the next method listed in the method list. This process continues until there is successful communication with a listed authorization method, or until all the defined methods are exhausted.



**Note** The Cisco IOS software attempts authorization with the next listed method only when there is no response from the previous method. If authorization fails at any point in this cycle--meaning that the security server or the local username database responds by denying the user services--the authorization process stops and no other authorization methods are attempted.

If the **aaa authorization** command for a particular authorization type is issued without a specified named method list, the default method list is automatically applied to all interfaces or lines (where this authorization type applies) except those that have a named method list explicitly defined. (A defined method list overrides the default method list.) If no default method list is defined, then no authorization takes place. The default authorization method list must be used to perform outbound authorization, such as authorizing the download of IP pools from the RADIUS server.

Use the **aaa authorization** command to create a list by entering the values for the *list-name* and the *method* arguments, where *list-name* is any character string used to name this list (excluding all method names) and *method* identifies the list of authorization methods tried in the given sequence.



**Note** In the table that follows, the **group***group-name*, **group ldap**, **group radius**, and **group tacacs+** methods refer to a set of previously defined RADIUS or TACACS+ servers. Use the **radius server** and **tacacs server** commands to configure the host servers. Use the **aaa group server radius**, **aaa group server ldap**, and **aaa group server tacacs+** commands to create a named group of servers.

---

This table describes the method keywords.

**Table 51: aaa authorization Methods**

Keyword	Description
<b>cache group-name</b>	Uses a cache server group for authorization.
<b>group group-name</b>	Uses a subset of RADIUS or TACACS+ servers for accounting as defined by the <b>server group group-name</b> command.
<b>group ldap</b>	Uses the list of all Lightweight Directory Access Protocol (LDAP) servers for authentication.
<b>group radius</b>	Uses the list of all RADIUS servers for authentication as defined by the <b>aaa group server radius</b> command.
<b>group tacacs+</b>	Uses the list of all TACACS+ servers for authentication as defined by the <b>aaa group server tacacs+</b> command.
<b>if-authenticated</b>	Allows the user to access the requested function if the user is authenticated.  <b>Note</b> The <b>if-authenticated</b> method is a terminating method. Therefore, if it is listed as a method, any methods listed after it will never be evaluated.
<b>local</b>	Uses the local database for authorization.
<b>none</b>	Indicates that no authorization is performed.

Cisco IOS software supports the following methods for authorization:

- Cache Server Groups—The router consults its cache server groups to authorize specific rights for users.
- If-Authenticated—The user is allowed to access the requested function provided the user has been authenticated successfully.
- Local—The router or access server consults its local database, as defined by the **username** command, to authorize specific rights for users. Only a limited set of functions can be controlled through the local database.
- None—The network access server does not request authorization information; authorization is not performed over this line or interface.
- RADIUS—The network access server requests authorization information from the RADIUS security server group. RADIUS authorization defines specific rights for users by associating attributes, which are stored in a database on the RADIUS server, with the appropriate user.
- TACACS+—The network access server exchanges authorization information with the TACACS+ security daemon. TACACS+ authorization defines specific rights for users by associating attribute-value (AV) pairs, which are stored in a database on the TACACS+ security server, with the appropriate user.

Method lists are specific to the type of authorization being requested. AAA supports five different types of authorization:

- Commands—Applies to the EXEC mode commands a user issues. Command authorization attempts authorization for all EXEC mode commands, including global configuration commands, associated with a specific privilege level.
- EXEC—Applies to the attributes associated with a user EXEC terminal session.
- Network—Applies to network connections. The network connections can include a PPP, SLIP, or ARA connection.



**Note** You must configure the **aaa authorization config-commands** command to authorize global configuration commands, including EXEC commands prepended by the **do** command.

- Reverse Access—Applies to reverse Telnet sessions.
- Configuration—Applies to the configuration downloaded from the AAA server.

When you create a named method list, you are defining a particular list of authorization methods for the indicated authorization type.

Once defined, the method lists must be applied to specific lines or interfaces before any of the defined methods are performed.

The authorization command causes a request packet containing a series of AV pairs to be sent to the RADIUS or TACACS daemon as part of the authorization process. The daemon can do one of the following:

- Accept the request as is.
- Make changes to the request.
- Refuse the request and authorization.

For a list of supported RADIUS attributes, see the module RADIUS Attributes. For a list of supported TACACS+ AV pairs, see the module TACACS+ Attribute-Value Pairs.



**Note** Five commands are associated with privilege level 0: **disable**, **enable**, **exit**, **help**, and **logout**. If you configure AAA authorization for a privilege level greater than 0, these five commands will not be included in the privilege level command set.

The following example shows how to define the network authorization method list named mygroup, which specifies that RADIUS authorization will be used on serial lines using PPP. If the RADIUS server fails to respond, local network authorization will be performed.

```
Device(config)# aaa authorization network mygroup group radius local
```

aaa new-model

# aaa new-model

To enable the authentication, authorization, and accounting (AAA) access control model, issue the **aaa new-model** command in global configuration mode. To disable the AAA access control model, use the **no** form of this command.

```
aaa new-model
no aaa new-model
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** AAA is not enabled.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** This command enables the AAA access control system.

If the **login local** command is configured for a virtual terminal line (VTY), and the **aaa new-model** command is removed, you must reload the switch to get the default configuration or the **login** command. If the switch is not reloaded, the switch defaults to the **login local** command under the VTY.



**Note** We do not recommend removing the **aaa new-model** command.

The following example shows this restriction:

```
Device(config)# aaa new-model
Device(config)# line vty 0 15
Device(config-line)# login local
Device(config-line)# exit
Device(config)# no aaa new-model
Device(config)# exit
Device# show running-config | b line vty

line vty 0 4
  login local !<== Login local instead of "login"
line vty 5 15
  login local
!
```

## Examples

The following example initializes AAA:

```
Device(config)# aaa new-model
Device(config)#
```

Related Commands	Command	Description
	<b>aaa accounting</b>	Enables AAA accounting of requested services for billing or security purposes.
	<b>aaa authentication arap</b>	Enables an AAA authentication method for ARAP using TACACS+.
	<b>aaa authentication enable default</b>	Enables AAA authentication to determine if a user can access the privileged command level.
	<b>aaa authentication login</b>	Sets AAA authentication at login.
	<b>aaa authentication ppp</b>	Specifies one or more AAA authentication method for use on serial interfaces running PPP.
	<b>aaa authorization</b>	Sets parameters that restrict user access to a network.

```
aaa policy interface-config allow-subinterface
```

# aaa policy interface-config allow-subinterface

To enable authentication, authorization, and accounting (AAA) Link Control Protocol (LCP) interface configuration policy parameters, issue the **aaa policy interface-config allow-subinterface** command in global configuration mode. To disable LCP interface configuration policy parameters, use the **no** form of this command.

```
aaa policy interface-config allow-subinterface
no aaa policy interface-config allow-subinterface
```

## Syntax Description

**interface-config** Specifies the LCP interface configuration policy parameters.

**allow-subinterface** Specifies not to create a full virtual access interface by default.

## Command Modes

Global configuration (config)

## Command History

Release	Modification
Cisco IOS XE 3.6.0E	This command was introduced.

## Usage Guidelines

Use the interface-config keyword to apply interface configuration mode commands on the virtual access interface associated with the session.

## Examples

The following example shows how to enable AAA LCP interface configuration policy parameters:

```
Device# configure terminal
Device(config)# aaa new-model
Device(config)# aaa policy interface-config allow-subinterface
```

## Related Commands

Command	Description
<b>aaa new-model</b>	Enables the AAA access control model.

# access-session mac-move deny

To disable MAC move on a device, use the **access-session mac-move deny** global configuration command. To return to the default setting, use the **no** form of this command.

```
access-session mac-move deny
no access-session mac-move deny
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** MAC move is enabled.

**Command Modes** Global configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The **no** form of this command enables authenticated hosts to move between any authentication-enabled ports (MAC authentication bypass [MAB], 802.1x, or Web-auth) on a device. For example, if there is a device between an authenticated host and port, and that host moves to another port, the authentication session is deleted from the first port, and the host is reauthenticated on the new port.

If MAC move is disabled, and an authenticated host moves to another port, it is not reauthenticated, and a violation error occurs.

This example shows how to enable MAC move on a device:

```
Device(config)# no access-session mac-move deny
```

Related Commands	Command	Description
	<b>authentication event</b>	Sets the action for specific authentication events.
	<b>authentication fallback</b>	Configures a port to use web authentication as a fallback method for authentication.
	<b>authentication host-mode</b>	Sets the authorization manager mode on a port.
	<b>authentication open</b>	Enables or disables open access on a port.
	<b>authentication order</b>	Sets the order of authentication methods used on a port.
	<b>authentication periodic</b>	Enables or disables reauthentication on a port.
	<b>authentication port-control</b>	Enables manual control of the port authorization state.
	<b>authentication priority</b>	Adds an authentication method to the port-priority list.

**access-session mac-move deny**

Command	Description
<b>authentication timer</b>	Configures the timeout and reauthentication parameters for an authentication manager session.
<b>authentication violation</b>	Configures the violation modes that occur when a new device connects to a port with the maximum number of devices already connected.
<b>show authentication</b>	Displays information about authentication manager events on the switch.

# action

To set the action for the VLAN access map entry, use the **action** command in access-map configuration mode. To return to the default setting, use the **no** form of this command.

**action{drop | forward}**  
**no action**

<b>Syntax Description</b>	<b>drop</b> Drops the packet when the specified conditions are matched.  <b>forward</b> Forwards the packet when the specified conditions are matched.				
<b>Command Default</b>	The default action is to forward packets.				
<b>Command Modes</b>	Access-map configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** You enter access-map configuration mode by using the **vlan access-map** global configuration command. If the action is **drop**, you should define the access map, including configuring any access control list (ACL) names in match clauses, before applying the map to a VLAN, or all packets could be dropped. In access-map configuration mode, use the **match access-map** configuration command to define the match conditions for a VLAN map. Use the **action** command to set the action that occurs when a packet matches the conditions.

The drop and forward parameters are not used in the **no** form of the command.

You can verify your settings by entering the **show vlan access-map** privileged EXEC command.

This example shows how to identify and apply a VLAN access map (vmap4) to VLANs 5 and 6 that causes the VLAN to forward an IP packet if the packet matches the conditions defined in access list al2:

```
Device(config)# vlan access-map vmap4
Device(config-access-map)# match ip address al2
Device(config-access-map)# action forward
Device(config-access-map)# exit
Device(config)# vlan filter vmap4 vlan-list 5-6
```

## **authentication host-mode**

To set the authorization manager mode on a port, use the **authentication host-mode** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

**authentication host-mode { multi-auth | multi-domain | multi-host | single-host }**  
**no authentication host-mode**

<b>Syntax Description</b>	<b>multi-auth</b>	Enables multiple-authorization mode (multi-auth mode) on the port.
	<b>multi-domain</b>	Enables multiple-domain mode on the port.
	<b>multi-host</b>	Enables multiple-host mode on the port.
	<b>single-host</b>	Enables single-host mode on the port.
<b>Command Default</b>	Single host mode is enabled.	
<b>Command Modes</b>	Interface configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
<b>Usage Guidelines</b>	<p>Single-host mode should be configured if only one data host is connected. Do not connect a voice device to authenticate on a single-host port. Voice device authorization fails if no voice VLAN is configured on the port.</p> <p>Multi-domain mode should be configured if data host is connected through an IP phone to the port. Multi-domain mode should be configured if the voice device needs to be authenticated.</p> <p>Multi-auth mode should be configured to allow devices behind a hub to obtain secured port access through individual authentication. Only one voice device can be authenticated in this mode if a voice VLAN is configured.</p> <p>Multi-host mode also offers port access for multiple hosts behind a hub, but multi-host mode gives unrestricted port access to the devices after the first user gets authenticated.</p>	
	<p>This example shows how to enable multi-auth mode on a port:</p> <pre>Device(config-if)# authentication host-mode multi-auth</pre> <p>This example shows how to enable multi-domain mode on a port:</p> <pre>Device(config-if)# authentication host-mode multi-domain</pre> <p>This example shows how to enable multi-host mode on a port:</p>	

```
Device(config-if)# authentication host-mode multi-host
```

This example shows how to enable single-host mode on a port:

```
Device(config-if)# authentication host-mode single-host
```

You can verify your settings by entering the **show authentication sessions interface *interface* details** privileged EXEC command.

**authentication mac-move permit**

# authentication mac-move permit

To enable MAC move on a device, use the **authentication mac-move permit** command in global configuration mode. To disable MAC move, use the **no** form of this command.

**authentication mac-move permit**  
**no authentication mac-move permit**

**Syntax Description** This command has no arguments or keywords.

**Command Default** MAC move is disabled.

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** This is a legacy command. The new command is **access-session mac-move deny**.

The command enables authenticated hosts to move between any authentication-enabled ports (MAC authentication bypass [MAB], 802.1x, or Web-auth) on a device. For example, if there is a device between an authenticated host and port, and that host moves to another port, the authentication session is deleted from the first port, and the host is reauthenticated on the new port.

If MAC move is disabled, and an authenticated host moves to another port, it is not reauthenticated, and a violation error occurs.

This example shows how to enable MAC move on a device:

```
Device(config)# authentication mac-move permit
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>access-session mac-move deny</b>	Disables MAC move on a device.
	<b>authentication event</b>	Sets the action for specific authentication events.
	<b>authentication fallback</b>	Configures a port to use web authentication as a fall IEEE 802.1x authentication.
	<b>authentication host-mode</b>	Sets the authorization manager mode on a port.
	<b>authentication open</b>	Enables or disables open access on a port.
	<b>authentication order</b>	Sets the order of authentication methods used on a p
	<b>authentication periodic</b>	Enable or disables reauthentication on a port.
	<b>authentication port-control</b>	Enables manual control of the port authorization sta

Command	Description
<b>authentication priority</b>	Adds an authentication method to the port-priority list.
<b>authentication timer</b>	Configures the timeout and reauthentication parameters.
<b>authentication violation</b>	Configures the violation modes that occur when a device connects to a port with the maximum number of users exceeded.
<b>show authentication</b>	Displays information about authentication management.

# authentication priority

To add an authentication method to the port-priority list, use the **authentication priority** command in interface configuration mode. To return to the default, use the **no** form of this command.

```
authentication priority [dot1x | mab] {webauth}
no authentication priority [dot1x | mab] {webauth}
```

<b>Syntax Description</b>	<b>dot1x</b> <b>mab</b> <b>webauth</b>	(Optional) Adds 802.1x to the order of authentication methods. (Optional) Adds MAC authentication bypass (MAB) to the order of authentication methods. Adds web authentication to the order of authentication methods.
<b>Command Default</b>	The default priority is 802.1x authentication, followed by MAC authentication bypass and web authentication.	
<b>Command Modes</b>	Interface configuration	
<b>Command History</b>	<b>Release</b> Cisco IOS XE 3.2SE	<b>Modification</b> This command was introduced.
<b>Usage Guidelines</b>	<p>Ordering sets the order of methods that the switch attempts when trying to authenticate a new device is connected to a port.</p> <p>When configuring multiple fallback methods on a port, set web authentication (webauth) last.</p> <p>Assigning priorities to different authentication methods allows a higher-priority method to interrupt an in-progress authentication method with a lower priority.</p>	



**Note** If a client is already authenticated, it might be reauthenticated if an interruption from a higher-priority method occurs.

The default priority of an authentication method is equivalent to its position in execution-list order: 802.1x authentication, MAC authentication bypass (MAB), and web authentication. Use the **dot1x**, **mab**, and **webauth** keywords to change this default order.

This example shows how to set 802.1x as the first authentication method and web authentication as the second authentication method:

```
Device(config-if)# authentication priority dot1x webauth
```

This example shows how to set MAB as the first authentication method and web authentication as the second authentication method:

```
Device(config-if)# authentication priority mab webauth
```

Related Commands	Command	Description
	<b>authentication control-direction</b>	Configures the port mode as unidirectional or bidirectional.
	<b>authentication event fail</b>	Specifies how the Auth Manager handles authentication failures and accounting server becomes available.
	<b>authentication event no-response action</b>	Specifies how the Auth Manager handles authentication failures and accounting server becomes available.
	<b>authentication event server alive action reinitialize</b>	Reinitializes an authorized Auth Manager session when a previous and accounting server becomes available.
	<b>authentication event server dead action authorize</b>	Authorizes Auth Manager sessions when the authentication, accounting, and accounting server becomes unreachable.
	<b>authentication fallback</b>	Enables a web authentication fallback method.
	<b>authentication host-mode</b>	Allows hosts to gain access to a controlled port.
	<b>authentication open</b>	Enables open access on a port.
	<b>authentication order</b>	Specifies the order in which the Auth Manager attempts to authenticate.
	<b>authentication periodic</b>	Enables automatic reauthentication on a port.
	<b>authentication port-control</b>	Configures the authorization state of a controlled port.
	<b>authentication timer inactivity</b>	Configures the time after which an inactive Auth Manager session times out.
	<b>authentication timer reauthenticate</b>	Specifies the period of time between which the Auth Manager attempts to reauthenticate.
	<b>authentication timer restart</b>	Specifies the period of time after which the Auth Manager attempts to restart.
	<b>authentication violation</b>	Specifies the action to be taken when a security violation occurs on a port.
	<b>mab</b>	Enables MAC authentication bypass on a port.
	<b>show authentication registrations</b>	Displays information about the authentication methods that are registered.
	<b>show authentication sessions</b>	Displays information about current Auth Manager sessions.
	<b>show authentication sessions interface</b>	Displays information about the Auth Manager for a given interface.

# authentication violation

To configure the violation modes that occur when a new device connects to a port or when a new device connects to a port after the maximum number of devices are connected to that port, use the **authentication violation** command in interface configuration mode.

```
authentication violation { protect | replace | restrict | shutdown }
no authentication violation { protect | replace | restrict | shutdown }
```

Syntax Description	protect	Drops unexpected incoming MAC addresses. No syslog errors are generated.
	replace	Removes the current session and initiates authentication with the new host.
	restrict	Generates a syslog error when a violation error occurs.
	shutdown	Error-disables the port or the virtual port on which an unexpected MAC address occurs.
Command Default	Authentication violation shutdown mode is enabled.	
Command Modes	Interface configuration	
Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Use the **authentication violation** command to specify the action to be taken when a security violation occurs on a port.

This example shows how to configure an IEEE 802.1x-enabled port as error-disabled and to shut down when a new device connects it:

```
Device(config-if)# authentication violation shutdown
```

This example shows how to configure an 802.1x-enabled port to generate a system error message and to change the port to restricted mode when a new device connects to it:

```
Device(config-if)# authentication violation restrict
```

This example shows how to configure an 802.1x-enabled port to ignore a new device when it connects to the port:

```
Device(config-if)# authentication violation protect
```

This example shows how to configure an 802.1x-enabled port to remove the current session and initiate authentication with a new device when it connects to the port:

```
Device(config-if)# authentication violation replace
```

You can verify your settings by entering the **show authentication** privileged EXEC command.

**cisp enable**

# cisp enable

To enable Client Information Signaling Protocol (CISP) on a switch so that it acts as an authenticator to a supplicant switch and a supplicant to an authenticator switch, use the **cisp enable** global configuration command.

**cisp enable**  
**no cisp enable**

**Syntax Description** This command has no arguments or keywords.

**Command Default** No default behavior or values.

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
	Cisco IOS XE Denali 16.3.1	This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.x

**Usage Guidelines** The link between the authenticator and supplicant switch is a trunk. When you enable VTP on both switches, the VTP domain name must be the same, and the VTP mode must be server.

To avoid the MD5 checksum mismatch error when you configure VTP mode, verify that:

- VLANs are not configured on two different switches, which can be caused by two VTP servers in the same domain.
- Both switches have different configuration revision numbers.

This example shows how to enable CISP:

```
Device(config)# cisp enable
```

## Related Commands

<b>Command</b>	<b>Description</b>
<b>dot1x credentialsprofile</b>	Configures a profile on a supplicant switch.
<b>dot1x supplicant force-multicast</b>	Forces 802.1X supplicant to send multicast packets.
<b>dot1x supplicant controlled transient</b>	Configures controlled access by 802.1X supplicants.
<b>show cisp</b>	Displays CISP information for a specified interface.

# clear device-tracking database

To delete device-tracking database (binding table) entries, and clear counters, events, and messages, enter the **clear device-tracking** command in privileged EXEC mode.

```
clear device-tracking { counters [ interface inteface_type_no | vlan vlan_id ] | database [ address { hostname | all } [ interface inteface_type_no | policy policy_name | vlan vlan_id ] | interface inteface_type_no [ vlan vlan_id ] | mac mac_address [ interface inteface_type_no | policy policy_name | vlan vlan_id ] | policy policy_name | prefix { prefix | all } [ interface inteface_type_no | policy policy_name | vlan vlan_id ] | vlanid vlan_id ] | events | messages }
```

<b>Syntax Description</b>	
<b>counters</b>	<p>Clears device-tracking counters for the specified interface or VLAN.</p> <p>Counters are displayed in the <b>show device-tracking counters all</b> privileged EXEC command.</p>
<b>interface</b> <i>inteface_type_no</i>	<p>Enter an interface type and number. Use the question mark (?) online help function to display the types of interfaces available on the device.</p> <p>The clear action is performed for the interface you specify.</p>
<b>vlan</b> <i>vlan_id</i>	<p>Enter a VLAN ID. The clear action is performed for the VLAN ID you specify.</p> <p>The valid value range is from 1 to 4095.</p>
<b>database</b>	<p>Clears dynamic entries in the binding table.</p> <p><b>Note</b> Static entries configured by using the <b>device-tracking binding vlan <i>vlan_id</i></b> command are not deleted.</p> <p>You can delete all the dynamic entries in the table, or optionally, you can specify one or more IP addresses, MAC addresses, IPv6 prefixes, entries on a particular interface or VLAN, or a policy.</p>
<b>hostname</b>	Enter the hostname or IP address on which you want to perform the clear action.
<b>all</b>	Performs the clear action on all IP addresses or IPv6 prefixes.
<b>policy</b> <i>policy_name</i>	Performs the clear action on the specified policy. Enter the policy name.
<b>mac</b> <i>mac_address</i>	Performs the clear action on the specified MAC address. Enter the MAC address.
<b>prefix</b> <i>prefix</i>	Performs the clear action on the specified IPv6 prefix. Enter a prefix or enter <b>all</b> to indicate all prefixes.
<b>events</b>	<p>Clears the device-tracking events history.</p> <p>Events are displayed in the <b>show device-tracking events</b> privileged EXEC command.</p>
<b>messages</b>	<p>Clears the device-tracking message history.</p> <p>Events are displayed in the <b>show device-tracking messages</b> privileged EXEC command.</p>

**clear device-tracking database**

<b>Command Default</b>	Database entries go through their binding entry lifecycle. Counters: Each counter is a nonnegative 32-bit integer and it wraps-around when the limit is reached. Events and messages: After the limit of 255 is reached, starting with the oldest, events and messages are overwritten.				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.1.1	This command was introduced.
Release	Modification				
Cisco IOS XE Denali 16.1.1	This command was introduced.				

## Examples

The following example shows you how to clear all entries from the binding table.

```
Device# show device-tracking database Binding Table has 25 entries, 25 dynamic (limit 200000)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match      0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk     0010:Orig trusted access  0020:DHCP assigned
0040:Cga authenticated      0080:Cert authenticated   0100:Statically assigned
```

Network Layer Address			Link Layer Address			vlan
prlvl	age	state	Time left			
ARP 192.0.9.49				001d.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	699 s	001d.4411.3ab7	Te1/0/4	200
ARP 192.0.9.48				001d.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	691 s	001d.4411.3ab7	Te1/0/4	200
ARP 192.0.9.47				001d.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	687 s	001d.4411.3ab7	Te1/0/4	200
ARP 192.0.9.46				001d.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	714 s	001d.4411.3ab7	Te1/0/4	200
ARP 192.0.9.45				001d.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	692 s	001d.4411.3ab7	Te1/0/4	200
ARP 192.0.9.44				001d.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	702 s	001c.4411.3ab7	Te1/0/4	200
ARP 192.0.9.43				001c.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	680 s	001c.4411.3ab7	Te1/0/4	200
ARP 192.0.9.42				001c.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	708 s	001c.4411.3ab7	Te1/0/4	200
ARP 192.0.9.41				001c.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	683 s	001c.4411.3ab7	Te1/0/4	200
ARP 192.0.9.40				001c.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	708 s	001c.4411.3ab7	Te1/0/4	200
ARP 192.0.9.39				001c.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	710 s	001c.4411.3ab7	Te1/0/4	200
ARP 192.0.9.38				001c.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	697 s	001c.4411.3ab7	Te1/0/4	200
ARP 192.0.9.37				001c.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	707 s	001c.4411.3ab7	Te1/0/4	200
ARP 192.0.9.36				001c.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	695 s	001c.4411.3ab7	Te1/0/4	200
ARP 192.0.9.35				001c.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	708 s	001c.4411.3ab7	Te1/0/4	200
ARP 192.0.9.34				001c.4411.3ab7	Te1/0/4	200
00FF 22s		REACHABLE	706 s			

ARP 192.0.9.33			001b.4411.3ab7	Tel/0/4	200
00FF 22s	REACHABLE	683 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.32			001b.4411.3ab7	Tel/0/4	200
00FF 22s	REACHABLE	697 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.31			001b.4411.3ab7	Tel/0/4	200
00FF 22s	REACHABLE	683 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.30			001b.4411.3ab7	Tel/0/4	200
00FF 22s	REACHABLE	678 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.29			001b.4411.3ab7	Tel/0/4	200
00FF 22s	REACHABLE	696 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.28			001b.4411.3ab7	Tel/0/4	200
00FF 22s	REACHABLE	704 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.27			001b.4411.3ab7	Tel/0/4	200
00FF 22s	REACHABLE	713 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.26			001b.4411.3ab7	Tel/0/4	200
00FF 22s	REACHABLE	695 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.25			001b.4411.3ab7	Tel/0/4	200
00FF 22s	REACHABLE	686 s			

Device# **clear device-tracking database**

```
*Dec 13 15:10:22.837: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.49 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.838: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.48 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.838: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.47 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.838: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.46 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.839: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.45 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.839: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.44 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.839: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.43 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.839: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.42 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.840: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.41 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.840: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.40 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.840: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.39 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.841: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.38 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.841: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.37 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.841: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.36 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.842: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.35 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.842: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.34 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.842: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.33 VLAN=200
MAC=001b.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.842: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.32 VLAN=200
MAC=001b.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.843: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.31 VLAN=200
MAC=001b.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.843: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.30 VLAN=200
MAC=001b.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.843: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.29 VLAN=200
MAC=001b.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.844: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.28 VLAN=200
```

**clear device-tracking database**

```
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF
*Dec 13 15:10:22.844: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.27 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF
*Dec 13 15:10:22.844: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.26 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF
*Dec 13 15:10:22.844: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.25 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF

Device# show device-tracking database
<no output; binding table cleared>
```

# clear errdisable interface vlan

To reenable a VLAN that was error-disabled, use the **clear errdisable interface** command in privileged EXEC mode.

**clear errdisable interface *interface-id* vlan [vlan-list]**

<b>Syntax Description</b>	<i>interface-id</i>	Specifies an interface.												
	<i>vlan list</i>	(Optional) Specifies a list of VLANs to be reenabled. I												
<b>Command Default</b>	No default behavior or values.													
<b>Command Modes</b>	Privileged EXEC													
<b>Command History</b>	<b>Release</b>	<b>Modification</b>												
	Cisco IOS XE 3.2SE	This command was introduced.												
<b>Usage Guidelines</b>	You can reenable a port by using the <b>shutdown</b> and <b>no shutdown</b> interface configuration commands, or you can clear error-disable for VLANs by using the <b>clear errdisable interface</b> command.													
	This example shows how to reenable all VLANs that were error-disabled on Gigabit Ethernet port 4/0/2:													
	<pre>Device# clear errdisable interface gigabitethernet4/0/2 vlan</pre>													
<b>Related Commands</b>	<table border="1"> <thead> <tr> <th>Command</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>errdisable detect cause</b></td> <td>Enables error-disabled detection.</td> </tr> <tr> <td><b>errdisable recovery</b></td> <td>Configures the recovery mechanism.</td> </tr> <tr> <td><b>show errdisable detect</b></td> <td>Displays error-disabled detection information.</td> </tr> <tr> <td><b>show errdisable recovery</b></td> <td>Displays error-disabled recovery information.</td> </tr> <tr> <td><b>show interfaces status err-disabled</b></td> <td>Displays interface status of a link that is error-disabled.</td> </tr> </tbody> </table>		Command	Description	<b>errdisable detect cause</b>	Enables error-disabled detection.	<b>errdisable recovery</b>	Configures the recovery mechanism.	<b>show errdisable detect</b>	Displays error-disabled detection information.	<b>show errdisable recovery</b>	Displays error-disabled recovery information.	<b>show interfaces status err-disabled</b>	Displays interface status of a link that is error-disabled.
Command	Description													
<b>errdisable detect cause</b>	Enables error-disabled detection.													
<b>errdisable recovery</b>	Configures the recovery mechanism.													
<b>show errdisable detect</b>	Displays error-disabled detection information.													
<b>show errdisable recovery</b>	Displays error-disabled recovery information.													
<b>show interfaces status err-disabled</b>	Displays interface status of a link that is error-disabled.													

**clear mac address-table**

# clear mac address-table

To delete from the MAC address table a specific dynamic address, all dynamic addresses on a particular interface, all dynamic addresses on stack members, or all dynamic addresses on a particular VLAN, use the **clear mac address-table** command in privileged EXEC mode. This command also clears the MAC address notification global counters.

```
clear mac address-table {dynamic [address mac-addr | interface interface-id | vlan vlan-id]
| move update | notification}
```

<b>Syntax Description</b>	<b>dynamic</b> Deletes all dynamic MAC addresses. <b>address mac-addr</b> (Optional) Deletes the specified dynamic MAC address. <b>interface interface-id</b> (Optional) Deletes all dynamic MAC addresses on the specified interface. <b>vlan vlan-id</b> (Optional) Deletes all dynamic MAC addresses for the specified VLAN. <b>move update</b> Clears the MAC address table move-update counters. <b>notification</b> Clears the notifications in the history table and reset the global counters.				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** You can verify that the information was deleted by entering the **show mac address-table** privileged EXEC command.

This example shows how to remove a specific MAC address from the dynamic address table:

```
Device# clear mac address-table dynamic address 0008.0070.0007
```

Related Commands	Command	Description
	<b>mac address-table notification</b>	Enables the MAC address notification feature.
	<b>mac address-table move update {receive   transmit}</b>	Configures MAC address-table move update on the switch.
	<b>show mac address-table</b>	Displays the MAC address table static and dynamic entries.
	<b>show mac address-table move update</b>	Displays the MAC address-table move update information on the switch.

Command	Description
<b>show mac address-table notification</b>	Displays the MAC address notification settings for all interfaces or on the specified interface when the <b>interface</b> keyword is appended.
<b>snmp trap mac-notification change</b>	Enables the SNMP MAC address notification trap on a specific interface.

# deny (MAC access-list configuration)

To prevent non-IP traffic from being forwarded if the conditions are matched, use the **deny** MAC access-list configuration command on the switch stack or on a standalone switch. To remove a deny condition from the named MAC access list, use the **no** form of this command.

```
deny {any | host src-MAC-addr | src-MAC-addr mask} {any | host dst-MAC-addr | dst-MAC-addr mask} [type mask | aarp | amber | appletalk | dec-spanning | decnet-iv | diagnostic | dsm | etype-6000 | etype-8042 | lat | lave-sca | lsap lsap mask | mop-console | mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp] [cos cos]  

no deny {any | host src-MAC-addr | src-MAC-addr mask} {any | host dst-MAC-addr | dst-MAC-addr mask} [type mask | aarp | amber | appletalk | dec-spanning | decnet-iv | diagnostic | dsm | etype-6000 | etype-8042 | lat | lave-sca | lsap lsap mask | mop-console | mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp] [cos cos]
```

Syntax Description		
<b>any</b>		Denies any source or destination MAC address.
<b>host <i>src-MAC-addr</i>   <i>src-MAC-addr mask</i></b>		Defines a host MAC address and optional subnet mask. If no mask is specified, the defined address, non-IP traffic from
<b>host <i>dst-MAC-addr</i>   <i>dst-MAC-addr mask</i></b>		Defines a destination MAC address and optional subnet mask. If no mask is specified, a packet matches the defined address, non-IP traffic from
<b><i>type mask</i></b>		(Optional) Specifies the EtherType number of a packet. This value identifies the protocol of the packet. The type is 0 to 65535, specified in hexadecimal. The mask is a mask of don't care bits applied to the type field.
<b>aarp</b>		(Optional) Specifies EtherType AppleTalk Address Resolution Protocol (ARP) address to a network address.
<b>amber</b>		(Optional) Specifies EtherType DEC-Amber.
<b>appletalk</b>		(Optional) Specifies EtherType AppleTalk/EtherTalk.
<b>dec-spanning</b>		(Optional) Specifies EtherType Digital Equipment Corporation (DEC) Spanning Tree.
<b>decnet-iv</b>		(Optional) Specifies EtherType DECnet Phase IV.
<b>diagnostic</b>		(Optional) Specifies EtherType DEC-Diagnostic.
<b>dsm</b>		(Optional) Specifies EtherType DEC-DSM.
<b>etype-6000</b>		(Optional) Specifies EtherType 0x6000.
<b>etype-8042</b>		(Optional) Specifies EtherType 0x8042.
<b>lat</b>		(Optional) Specifies EtherType DEC-LAT.
<b>lave-sca</b>		(Optional) Specifies EtherType DEC-LAVC-SCA.

<b>lsap</b> <i>lsap-number mask</i>	(Optional) Specifies the LSAP number (0 to 65535). <i>mask</i> is a mask of don't care bits applied to the LSAP number.
<b>mop-console</b>	(Optional) Specifies EtherType DEC-MOP Router Console.
<b>mop-dump</b>	(Optional) Specifies EtherType DEC-MOP Dump.
<b>msdos</b>	(Optional) Specifies EtherType DEC-MSDOS.
<b>mumps</b>	(Optional) Specifies EtherType DEC-MUMPS.
<b>netbios</b>	(Optional) Specifies EtherType DEC- Network BIOS.
<b>vines-echo</b>	(Optional) Specifies EtherType Virtual Integrator Banyan Systems.
<b>vines-ip</b>	(Optional) Specifies EtherType VINES IP.
<b>xns-idp</b>	(Optional) Specifies EtherType Xerox Network IDP. An arbitrary EtherType in decimal, hexadecimal, or octal.
<b>cos</b> <i>cos</i>	(Optional) Specifies a class of service (CoS) in decimal, hexadecimal, or octal. A warning: CoS can be performed only in hardware. A warning: A warning message is displayed if a hardware-based CoS is configured.

**Command Default** This command has no defaults. However, the default action for a MAC-named ACL is to deny.

**Command Modes** Mac-access list configuration

**Command History**

**Release**

Cisco IOS XE 3.2SE

**Modification**

This command was introduced.

**Usage Guidelines**

You enter MAC-access list configuration mode by using the **mac access-list extended** global configuration command.

If you use the **host** keyword, you cannot enter an address mask; if you do not use the **host** keyword, you must enter an address mask.

When an access control entry (ACE) is added to an access control list, an implied **deny-any-any** condition exists at the end of the list. That is, if there are no matches, the packets are denied. However, before the first ACE is added, the list permits all packets.

To filter IPX traffic, you use the *type mask* or **lsap** *lsap mask* keywords, depending on the type of IPX encapsulation being used. Filter criteria for IPX encapsulation types as specified in Novell terminology and Cisco IOS terminology are listed in the table.

**deny (MAC access-list configuration)****Table 52: IPX Filtering Criteria**

<b>IPX Encapsulation Type</b>		<b>Filter Criterion</b>
<b>Cisco IOS Name</b>	<b>Novel Name</b>	
arpa	Ethernet II	EtherType 0x8137
snap	Ethernet-snap	EtherType 0x8137
sap	Ethernet 802.2	LSAP 0xE0E0
novell-ether	Ethernet 802.3	LSAP 0xFFFF

This example shows how to define the named MAC extended access list to deny NETBIOS traffic from any source to MAC address 00c0.00a0.03fa. Traffic matching this list is denied.

```
Device(config-ext-macl)# deny any host 00c0.00a0.03fa netbios.
```

This example shows how to remove the deny condition from the named MAC extended access list:

```
Device(config-ext-macl)# no deny any 00c0.00a0.03fa 0000.0000.0000 netbios.
```

This example denies all packets with EtherType 0x4321:

```
Device(config-ext-macl)# deny any any 0x4321 0
```

You can verify your settings by entering the **show access-lists** privileged EXEC command.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>mac access-list extended</b>	Creates an access list based on MAC addresses for extended access lists.
<b>permit</b>	Permits from the MAC access-list configuration. Permits non-IP traffic to be forwarded if conditions are met.
<b>show access-lists</b>	Displays access control lists configured on a switch.

# device-role (IPv6 snooping)

To specify the role of the device attached to the port, use the **device-role** command in IPv6 snooping configuration mode.

**device-role {node | switch}**

---

## Syntax Description

**node** Sets the role of the attached device to node.

**switch** Sets the role of the attached device to switch.

---

## Command Default

The device role is node.

## Command Modes

IPv6 snooping configuration

---

## Command History

### Release

Cisco IOS XE 3.2SE

### Modification

This command was introduced.

---

---

## Usage Guidelines

The **device-role** command specifies the role of the device attached to the port. By default, the device role is node.

The **switch** keyword indicates that the remote device is a switch and that the local switch is now operating in multiswitch mode; binding entries learned from the port will be marked with `trunk_port` preference level. If the port is configured as a trust-port, binding entries will be marked with `trunk_trusted_port` preference level.

This example shows how to define an IPv6 snooping policy name as `policy1`, place the device in IPv6 snooping configuration mode, and configure the device as the node:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# device-role node
```

# device-role (IPv6 nd inspection)

To specify the role of the device attached to the port, use the **device-role** command in neighbor discovery (ND) inspection policy configuration mode.

**device-role {host | switch}**

<b>Syntax Description</b>	<b>host</b> Sets the role of the attached device to host. <b>switch</b> Sets the role of the attached device to switch.				
<b>Command Default</b>	The device role is host.				
<b>Command Modes</b>	ND inspection policy configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	<p>The <b>device-role</b> command specifies the role of the device attached to the port. By default, the device role is host, and therefore all the inbound router advertisement and redirect messages are blocked.</p> <p>The <b>switch</b> keyword indicates that the remote device is a switch and that the local switch is now operating in multiswitch mode; binding entries learned from the port will be marked with trunk_port preference level. If the port is configured as a trust-port, binding entries will be marked with trunk_trusted_port preference level.</p>
-------------------------	--

The following example defines a Neighbor Discovery Protocol (NDP) policy name as policy1, places the device in ND inspection policy configuration mode, and configures the device as the host:

```
Device(config)# ipv6 nd inspection policy policy1
Device(config-nd-inspection)# device-role host
```

# device-tracking binding

To specify how binding entries are maintained in the binding table, enter the **device-tracking binding** command in global configuration mode. With this command you can configure the lifetime of each state, the maximum number of entries allowed in a binding table, and whether binding entry events are logged. You can also use this command to configure static binding entries. To revert to the default value, use the **no** form of the command.

```
device-tracking binding { down-lifetime | logging | max-entries | reachable-lifetime | stale-lifetime | vlan }
```

For the sake of clarity, the remaining command string after each one of the above options is listed separately:

- **device-tracking binding down-lifetime { seconds | infinite }**  
**no device-tracking binding down-lifetime**
- **device-tracking binding logging**  
**no device-tracking binding logging**
- **device-tracking binding max-entries no\_of\_entries [ mac-limit no\_of\_entries | port-limit no\_of\_entries [ mac-limit no\_of\_entries ] | vlan-limit no\_of\_entries [ mac-limit no\_of\_entries | port-limit no\_of\_entries [ mac-limit no\_of\_entries ] ] ]**  
**no device-tracking binding max-entries**
- **device-tracking binding reachable-lifetime { seconds | infinite } [ down-lifetime { seconds | infinite } | stale-lifetime { seconds | infinite } [ down-lifetime { seconds | infinite } ] ]**  
**no device-tracking binding reachable-lifetime**
- **device-tracking binding stale-lifetime { seconds | infinite } [ down-lifetime { seconds | infinite } ]**  
**no device-tracking binding stale-lifetime**
- **device-tracking binding vlan vlan\_id { ipv4\_add ipv6\_add ipv6\_prefix } [ interface inteface\_type\_no [ 48-bit-hardware-address ] [ reachable-lifetime { seconds | default | infinite } tracking { default | disable | enable } reachable-lifetime { seconds | default | infinite } ]**  
**no device-tracking binding vlan vlan\_id { ipv4\_add ipv6\_add ipv6\_prefix } [ interface inteface\_type\_no [ 48-bit-hardware-address ] [ reachable-lifetime { seconds | default | infinite } tracking { default | disable | enable } reachable-lifetime { seconds | default | infinite } ]**

---

Syntax Description	<b>down-lifetime { seconds   infinite }</b>	Provides the option to configure a countdown timer for a binding entry in the DOWN state, or, to disable the timer.  A binding entry enters the DOWN state when the host's connecting interface is administratively down. If a timer is configured, one of these events may occur before timer expiry - either the interface can be up again, or, the entry can remain in the DOWN state. If the interface is up before timer expiry, the timer is stopped, and the state of the entry changes. If the entry remains in the DOWN state after timer expiry, it is removed from the binding table. If the timer is disabled or turned off, the entry is never removed from the binding table and can remain in the DOWN state indefinitely, or until the interface is up again.
		Configure one of these options: <ul style="list-style-type: none"> <li>• <b>seconds</b>: Configure a value for the down-lifetime timer. Enter a value between 1 and 86400 seconds. The default value is 86400 seconds (24 hours).</li> <li>• <b>infinite</b>: Disables the timer for the DOWN state. This means that a timer is not started when an entry enters the DOWN state.</li> </ul>
<b>logging</b>		Enables generation of logs for binding entry events.
<b>device-tracking binding</b>	<b>max-entries</b>	Configures the maximum number of entries for a binding table. Enter a value between 1 and 200000. The default value is 200000.
<i>no_of_entries [</i>	<b>Note</b>	This limit applies only to dynamic entries and not static binding entries.
<b>mac-limit no_of_entries</b>		
<b>  port-limit</b>		
<b>no_of_entries  </b>		Optionally, you can also configure these limits:
<b>vlan-limit no_of_entries</b>		<ul style="list-style-type: none"> <li>• <b>mac-limit no_of_entries</b>: Configures the maximum number of entries allowed per MAC address. Enter a value between 1 and 100000. By default, a limit is not set.</li> <li>• <b>port-limit no_of_entries</b>: Configures the maximum number of entries allowed per interface. Enter a value between 1 and 100000. By default, a limit is not set.</li> <li>• <b>vlan-limit no_of_entries</b>: Configures the maximum number of entries allowed per VLAN. Enter a value between 1 and 100000. By default, a limit is not set.</li> </ul>

---

The **no** form of the command resets the **max-entries** value to 200000 and sets the **mac-limit**, **port-limit**, **vlan-limit** to "no limit".

---

<b>reachable-lifetime { seconds   infinite }</b>	Provides the option to configure a countdown timer for a binding entry in the REACHABLE state, or, to disable the timer.  If a timer is configured, either one of these events may occur before timer expiry - incoming packets are received from the host, or there are no incoming packets from the host. Every time an incoming packet is received from the host, the timer is reset. If no incoming packets are received and the timer expires, then the state of the entry changes based on the reachability of the host. If the timer is disabled or turned off, the entry can remain in the REACHABLE state, indefinitely.  Configure one of these options: <ul style="list-style-type: none"><li>• <b>seconds</b>: Configure a value for the reachable-lifetime timer. Enter a value between 1 and 86400 seconds. The default value is 300 seconds (5 minutes).</li><li>• <b>infinite</b>: Disables the timer for the REACHABLE state. This means that a timer is not started when an entry enters the REACHABLE state.</li></ul>
<b>stale-lifetime { seconds   infinite }</b>	Provides the option to configure a countdown timer for a binding entry in the STALE state, or, to disable the timer.  If a timer is configured, either one of these events may occur before timer expiry - incoming packets are received from the host, or there are no incoming packets from the host. If an incoming packet is received, the timer is stopped and the entry transitions to a new state. If no incoming packets are received and the timer expires, then the entry is removed from the binding table. If the timer is disabled or turned off, the entry can remain in the STALE state, indefinitely.  If polling is enabled, a final attempt is made to probe the host at stale timer expiry.  <b>Note</b> If polling is enabled, polling occurs when the reachable lifetime timer expires (3 times), and then a final attempt at stale timer expiry as well. The time required to poll an entry after expiry of reachable lifetime, is subtracted from the stale lifetime.  Configure one of these options: <ul style="list-style-type: none"><li>• <b>seconds</b>: Configure a value for the stale-lifetime timer. Enter a value between 1 and 86400 seconds. The default value is 86400 seconds (24 hours).</li><li>• <b>infinite</b>: Disables the timer for the STALE state. This means that a timer is not started when an entry enters the STALE state.</li></ul>

---

**device-tracking binding**


---

**device-tracking binding** Creates a static binding entry in the binding table. You can also specify how static **vlan vlan\_id { ipv4\_add**  binding entries are maintained in the binding table.

```
ipv6_add ipv6_prefix }  
{ interface  
interface_type_no } [  
48-bit-hardware-address  
] [  
reachable-lifetime {  
seconds | default |  
infinite } tracking {  
default | disable |  
enable }  
reachable-lifetime {  
seconds | default |  
infinite } ]
```

**Note**

The limit you configure for the **max-entries no\_of\_entries** option (above) does not apply to static binding entries. There is no limit to the number of static entries you can create.

- Enter an IP address or prefix:
  - **ipv4\_add** : Enter an IPv4 address.
  - **ipv6\_add** : Enter an IPv6 address.
  - **ipv6\_prefix** : Enter an IPv6 prefix.
- **interface interface\_type\_no**: Enter an interface type and number. Use the question mark (?) online help function to display the types of interfaces available on the device.
- (Optional) **48-bit-hardware-address**: Enter a MAC address. If you do not configure a MAC address for the binding entry, any MAC address is allowed.
- (Optional) **reachable-lifetime {seconds | default | infinite }**: Configures the reachable lifetime settings for a static binding entry in the REACHABLE state. If you want to configure a reachable lifetime for a static binding entry, you must specify the MAC address for the entry.

If you do not configure a value, the same value as configured for **device-tracking binding reachable-lifetime** applies.

**seconds**: Configure a value for the reachable-lifetime timer. Enter a value between 1 and 86400 seconds. The default value is 300 seconds (5 minutes).

**default**: Uses the same value as configured for dynamic entries in the binding table.

**infinite**: Disables the timer for the REACHABLE state. This means that a timer is not started when a static binding entry enters the REACHABLE state.

- (Optional) **tracking {default | disable | enable}**: Configures polling related settings for a static binding entry.

**default**: Polling is disabled.

**disable**: Disables polling for a static binding entry.

**enable**: Enables polling for a static binding entry.

**Command Default**


---

If you do not configure a value, the default values for down, reachable, and stale lifetimes, and maximum number of binding entries allowed in a binding table are applicable - as long as a policy-level value is not set. See the *Usage Guidelines* below for further details.

**Command Modes**

Global configuration [Device(config)# ]

Command History	Release	Modification
	Cisco IOS XE Denali 16.1.1	This command was introduced.

**Usage Guidelines** The **device-tracking binding** command enables you to specify how entries are maintained in a binding table, at a global level. The settings therefore apply to all interfaces and VLANs where SISF-based device-tracking is enabled. But for the system to start extracting binding information from packets that enter the network and to create binding entries to which the settings you configure here will apply, there must exist a policy that is attached an interface or VLAN.

If there is no policy on any interface or VLAN, the only entries that can exist in a binding table are any static binding entries you create.

#### Changing Any Binding Entry Setting

When you reconfigure a value or setting with the **device-tracking binding** command, the change applies only to subsequently created binding entries. The changed configuration does not apply to existing entries. The older setting applies to an older entry.

To display the current settings, enter the **show device-tracking database** command in privileged EXEC mode.

#### Global versus Policy-Level Settings

For some of the settings you configure with this command, there are policy level counterparts. (A policy level parameter is configured in the device-tracking configuration mode and applies only to that policy). The tables below clarifies when a globally configured value takes precedence and when a policy-level value takes precedence:

Option under device-tracking binding global configuration command	Policy-level counterpart in the device-tracking configuration mode
<b>device-tracking binding reachable-lifetime { seconds   infinite }</b>	<b>tracking enable [reachable-lifetime [seconds   infinite]]</b>
Device(config)# device-tracking binding reachable-lifetime 2000	Device(config)# device-tracking policy sisf-01 Device(config-device-tracking)# Device(config-device-tracking)# tracking enable reachable-lifetime 250

If a policy-level value *and* a globally configured value exists, the policy-level value applies.

If only a globally configured value exists, the globally configured value applies.

If only a policy-level value exists the policy-level value applies.

See: [Example: Configuring a Reachable, Stale, and Down Lifetime at the Global vs Policy Level, on page 889](#).

Option under device-tracking binding global configuration command	Policy-level counterpart in the device-tracking configuration mode
<b>device-tracking binding stale-lifetime { seconds   infinite }</b>	<b>tracking disable [stale-lifetime [seconds   infinite]]</b>

**device-tracking binding**

Option under device-tracking binding global configuration command	Policy-level counterpart in the device-tracking configuration mode
Device(config)# device-tracking binding stale-lifetime 2000	Device(config)# device-tracking policy sisf-01 Device(config-device-tracking)# Device(config-device-tracking)# tracking enable stale-lifetime 500
If a policy-level value <i>and</i> a globally configured value exists, the policy-level value applies.	
If only a globally configured value exists, the globally configured value applies.	
If only a policy-level value exists the policy-level value applies.	
See: <a href="#">Example: Configuring a Reachable, Stale, and Down Lifetime at the Global vs Policy Level, on page 889.</a>	

Option under device-tracking binding global configuration command	Policy-level counterpart in the device-tracking configuration mode
<b>device-tracking binding max-entries no_of_entries</b> [ <b>mac-limit no_of_entries</b>   <b>port-limit no_of_entries</b>   <b>vlan-limit no_of_entries</b> ]	<b>limit address-countip-per-port</b>
Device(config)# device-tracking binding max-entries 30 vlan-limit 25 port-limit 20 mac-limit 19	Device(config)# device-tracking policy sisf-01 Device(config-device-tracking)# Device(config-device-tracking)# limit address-count 30
If a policy-level value <i>and</i> globally configured values exist, the creation of binding entries is stopped when a limit is reached - this can be one of the global values or the policy-level value.	
If only globally configured values exist, the creation of binding entries is stopped when a limit is reached.	
If only a policy-level value exists, the creation of binding entries is stopped when the policy-level limit is reached.	
See: <a href="#">Example: Global vs Policy-Level Address Limits, on page 893.</a>	

Option under device-tracking binding global configuration command	Policy-level counterpart in the device-tracking configuration mode
<b>device-tracking binding max-entries no_of_entries</b> [ <b>mac-limit no_of_entries</b> ]	IPv4 per MAC and IPv6 per MAC  While you cannot configure either one of the above limits in a policy, a programmatically created policy may have either one, both, or neither one of the limits.

Option under device-tracking binding global configuration command	Policy-level counterpart in the device-tracking configuration mode
<pre>Device(config)# device-tracking binding   max-entries 300   mac-limit 3</pre>	<pre>Device# show device-tracking policy LISP-DT-GLEAN-VLAN Policy LISP-DT-GLEAN-VLAN configuration:   security-level glean (*)   device-role node   gleaning from Neighbor Discovery   gleaning from DHCP   gleaning from ARP   gleaning from DHCP4   NOT gleaning from protocol unkn   limit address-count for IPv4 per mac 4 (*)   limit address-count for IPv6 per mac 12 (*)   tracking enable &lt;output truncated&gt;</pre>

If a policy-level value *and* globally configured values exists, the creation of binding entries is stopped when a limit is reached - this can be one of the global values or the policy-level value.

If only globally configured values exist, the creation of binding entries is stopped when a limit is reached.

If only a policy-level value exists, the creation of binding entries is stopped when the policy-level limit is reached.

### Configuring Down, Reachable, Stale Lifetimes

When you configure a non-default value for the **down-lifetime**, or **reachable-lifetime**, or **stale-lifetime** keywords, the system reverts the lifetimes that you do not configure, to default values. The following example clarifies this behaviour: [Example: Configuring Non-Default Values for Reachable, Stale, and Down Lifetimes, on page 889](#).

To display the currently configured lifetime values, enter the **show running-config | include device-tracking** command in privileged EXEC mode.

### Configuring MAC, Port, VLAN Limits

When you configure a non-default value for the **mac-limit**, or **port-limit**, or **vlan-limit** keywords, the system reverts the limits that you do not configure, to default values.

To configure all three limits in the same command line, first configure the VLAN limit, then the port limit, and finally the MAC limit:

```
Device(config)# device-tracking binding max-entries 15 vlan-limit 2 port-limit 20 mac-limit 5
```

You can also use this system behavior when you want to reset one or more - but not *all* limits, to their default values. Although the default for all three keywords is that there is no limit, you cannot enter the number "0" to set a limit to its default value. Zero is not within the valid value range for any of the limits. To reset one or more limits to their default values, leave out the corresponding keyword. The following example clarifies this behaviour: [Example: Setting VLAN, Port, and MAC Limits to Default Values, on page 897](#).

### Enabling Logging of Binding Entry Events

When you configure the **device-tracking binding logging** global configuration command to generate logs for binding entry events, you may also have to configure a few general logging settings, depending on your requirements:

- (Required) The **logging buffered informational** command in global configuration mode.

With this command you enable message logging at a device level and you specify a severity level. Configuring the command allows logs to be copied and stored to a local, internal buffer. Specifying a severity level causes messages at that level and numerically lower levels to be logged.

Logs generated for binding entry events have a severity level of 6 (meaning, informational). For example:

```
%SISF-6-ENTRY_CREATED: Entry created IP=192.0.2.24 VLAN=200 MAC=001b.4411.4ab6 I/F=Te1/0/4
Preflevel=00FF
```

- (Optional) The **logging console** command in global configuration mode.

With this command you send the logs to the console (all available TTY lines).



#### Caution

A low severity level may cause the number of messages being displayed on the console to increase significantly. Further, the console is a slow display device. In message storms some logging messages may be silently dropped when the console queue becomes full. Set severity levels accordingly.

---

If you don't want to configure this command, you can view logs when required by entering the **show logging** command in privileged EXEC mode.

If the **logging console** command is not enabled, logs are not *displayed* on the device console, but if you have configured **device-tracking binding logging** and **logging buffered informational**, logs will be generated and available in the local buffer.

For information about the *kind* of binding entry events for which logs are generated, see the system message guide for the corresponding release: [System Message Guides](#). Search for SISF-6.

While the **device-tracking binding logging** command logs binding entry events, there is also the **device-tracking logging** command, which enables snooping security logging. The two command log different kinds of events and the generated logs have different severity levels.

#### Creating a Static Binding Entry

If there are silent but reachable hosts in the Layer 2 domain, and you want to retain binding information for these silent hosts, you can create static binding entries.

While there is no limit to the number of static entries you can create, these entries also contribute to the size of the binding table. Consider the number of such entries you require, before you create them.

You can create a static binding entry even if a policy is not attached to the interface or VLAN specified in the static binding entry.

When you configure a static binding entry followed by its settings (for example, reachable-lifetime), the configuration applies only to that static binding entry and not to any other entries, static or dynamic. The following example shows you how to created a static binding entry: [Example: Creating a Static Binding Entry, on page 892](#).

#### Examples

- [Example: Configuring Non-Default Values for Reachable, Stale, and Down Lifetimes, on page 889](#)
- [Example: Configuring a Reachable, Stale, and Down Lifetime at the Global vs Policy Level, on page 889](#)

- Example: Creating a Static Binding Entry, on page 892
- Example: Global vs Policy-Level Address Limits, on page 893
- Example: Setting VLAN, Port, and MAC Limits to Default Values, on page 897
- Example: Global vs Policy-Level Limits Relating to MAC Addresses, on page 898

### **Example: Configuring Non-Default Values for Reachable, Stale, and Down Lifetimes**

The following example clarifies system behaviour when you configure values for reachable, stale, and down lifetimes separately (the effect is not cumulative). It also shows you how to configure values in a way that configuration is retained for all the lifetimes.

In the first step of this example only a reachable-lifetime is configured. This means the down-lifetime and stale lifetime are set to default, because the **stale-lifetime** and **down-lifetime** keywords have been left out:

```
Device(config)# device-tracking binding reachable-lifetime 700
Device(config)# exit
Device# show running-config | include device-tracking
device-tracking policy sisf-01
  device-tracking attach-policy sisf-01
  device-tracking attach-policy sisf-01 vlan 200device-tracking binding reachable-lifetime
700
device-tracking binding logging
```

In the next step of this example, a stale-lifetime of 1500 seconds and a down-lifetime of 1000 seconds is configured. With this, the reachable-lifetime configured in the previous step, is set to default:

```
Device(config)# device-tracking binding stale-lifetime 1500 down-lifetime 1000
Device(config)# exit
Device# show running-config | include device-tracking
device-tracking policy sisf-01
  device-tracking attach-policy sisf-01
  device-tracking attach-policy sisf-01 vlan 200device-tracking binding stale-lifetime 1500
  down-lifetime 1000
device-tracking binding logging
```

In the next step of this example, reachable, down, and stale lifetimes of 700, 1000, and 200 respectively, are configured. With this, the value for the stale-lifetime is changed from 1500 seconds, to 1000 seconds. The down-lifetime is changed from 1000 to 200. The reachable-lifetime is configured as 700 seconds.

```
Device(config)# device-tracking binding reachable-lifetime 700 stale-lifetime 1000
  down-lifetime 200
Device(config)# exit
Device# show running-config | include device-tracking
device-tracking policy sisf-01
  device-tracking attach-policy sisf-01
  device-tracking attach-policy sisf-01 vlan 200device-tracking binding reachable-lifetime
700 stale-lifetime 1000 down-lifetime 200
device-tracking binding logging
```

If any one of the lifetimes requires a change and the values for the other lifetimes must be retained, all three keywords must be reconfigured with the required values - everytime, and in the same command line.

### **Example: Configuring a Reachable, Stale, and Down Lifetime at the Global vs Policy Level**

The following example shows you how to configure the reachable, stale, and down lifetimes for binding entries, at a global level. This example also shows you how you can then override the global setting and

**device-tracking binding**

configure a different lifetime for entries learnt on a particular interface or VLAN, by configuring a policy-level setting.

In the first part of the example, the output of the **show device-tracking policy policy-name** command shows that a policy-level value is not set and the default binding table settings are applicable to the existing entries. After a reachable, stale, and down lifetime is configured with the **device-tracking binding** command in global configuration mode, the new values are effective and are applied only to the four new entries that are added to the table.



**Note** In the output of the **show device-tracking database** command, note the `Time left` column for the binding entries. There is minor difference in the reachable lifetime of each entry. This is a system-imposed jitter (+/- 5 percent of the configured value), to ensure that system performance is not affected when a large number of entries are added to the binding table. Binding entries go through their lifecycle in a staggered manner thus preventing points of congestion.

Current configuration, which shows that policy-level reachable lifetime is not configured. The binding table entries show that the current reachable lifetime is 500 seconds (time left + age):

```
Device# show device-tracking policy sisf-01
Device-tracking policy sisf-01 configuration:
  security-level guard
  device-role node
  gleaning from Neighbor Discovery
  gleaning from DHCP6
  gleaning from ARP
  gleaning from DHCP4
  NOT gleaning from protocol unkn
Policy sisf-01 is applied on the following targets:
Target          Type Policy           Feature      Target range
Tel/0/4         PORT  sisf-01        Device-tracking vlan 200

Device# show device-tracking database
Binding Table has 4 entries, 4 dynamic (limit 200000)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match    0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk   0010:Orig trusted access 0020:DHCP assigned
0040:Cga authenticated    0080:Cert authenticated   0100:Statically assigned

Network Layer Address          Link Layer Address      Interface  vlan
prlvl   age     state   Time left    <<<
ARP 192.0.9.9                 000a.959d.6816       Tel/0/4   200
0064   40s    REACHABLE 466 s
ARP 192.0.9.8                 000a.959d.6816       Tel/0/4   200
0064   40s    REACHABLE 472 s
ARP 192.0.9.7                 000a.959d.6816       Tel/0/4   200
0064   40s    REACHABLE 470 s
ARP 192.0.9.6                 000a.959d.6816       Tel/0/4   200
0064   40s    REACHABLE 469 s
```

Configuration of reachable, stale and down lifetime at the global level. New values apply only to binding entries created after this:

```
Device(config)# device-tracking binding reachable-lifetime 700 stale-lifetime 1000
down-lifetime 200

Device # show device-tracking database
Binding Table has 8 entries, 8 dynamic (limit 200000)
```

Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol, DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created  
Preflevel flags (prlvl):  
0001:MAC and LLA match 0002:Orig trunk 0004:Orig access  
0008:Orig trusted trunk 0010:Orig trusted access 0020:DHCP assigned  
0040:Cga authenticated 0080:Cert authenticated 0100:Statically assigned

Network Layer Address prlvl	age	state	Time left	Link Layer Address	Interface	vlan
ARP 192.0.9.13		REACHABLE	699 s	000a.959d.6816	Tel/0/4	200
00C8	4s			<<< new global value applied		
ARP 192.0.9.12		REACHABLE	719 s	000a.959d.6816	Tel/0/4	200
00C8	4s			<<< new global value applied		
ARP 192.0.9.11		REACHABLE	728 s	000a.959d.6816	Tel/0/4	200
00C8	4s			<<< new global value applied		
ARP 192.0.9.10		REACHABLE	712 s	000a.959d.6816	Tel/0/4	200
00C8	4s			<<< new global value applied		
ARP 192.0.9.9		REACHABLE	try 0 1209 s	000a.959d.6816	Tel/0/4	200
0064	9mn	STALE		000a.959d.6816	Tel/0/4	200
ARP 192.0.9.8		VERIFY	5 s try 3	000a.959d.6816	Tel/0/4	200
0064	9mn			000a.959d.6816	Tel/0/4	200
ARP 192.0.9.7		VERIFY	2816 ms try 3	000a.959d.6816	Tel/0/4	200
0064	9mn			000a.959d.6816	Tel/0/4	200
ARP 192.0.9.6		VERIFY	1792 ms try 3			
0064	9mn					

In this second part of the example, a policy level value is configured and the reachable lifetime is set to 50 seconds. This new reachable lifetime is again applicable only to entries created after this.

Only a reachable lifetime is configured at the policy-level and not a stale and down lifetime. This means it is still the global values that apply if the reachable lifetime of the two new entries expires and they move to the STALE or DOWN state.

```
Device(config)# device-tracking policy sisf-01
Device(config-device-tracking)# tracking enable reachable-lifetime 50
Device# show device-tracking policy sisf-01
Device-tracking policy sisf-01 configuration:
    security-level guard
    device-role node
    gleaning from Neighbor Discovery
    gleaning from DHCP6
    gleaning from ARP
    gleaning from DHCP4
    NOT gleaning from protocol unk
    tracking enable reachable-lifetime 50      <<< new value applies only to binding entries
created after this and on interfaces and VLANs where this policy is attached.
Policy sisf-01 is applied on the following targets:
Target          Type   Policy           Feature        Target range
Tel/0/4         PORT   sisf-01        Device-tracking vlan 200

Device# show device-tracking database
Binding Table has 10 entries, 10 dynamic (limit 200000)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):  

0001:MAC and LLA match 0002:Orig trunk 0004:Orig access  

0008:Orig trusted trunk 0010:Orig trusted access 0020:DHCP assigned  

0040:Cga authenticated 0080:Cert authenticated 0100:Statically assigned
```

Network Layer Address prlvl	age	state	Time left	Link Layer Address	Interface	vlan
ARP 192.0.9.21				000a.959d.6816	Tel/0/4	200

**device-tracking binding**

```

0064      5s      REACHABLE   45 s      <<< new policy-level value applied
ARP 192.0.9.20                         000a.959d.6816      Te1/0/4    200
0064      5s      REACHABLE   46 s      <<< new policy-level value applied
ARP 192.0.9.13                         000a.959d.6816      Te1/0/4    200
00C8     14mn     STALE       try 0 865 s  000a.959d.6816      Te1/0/4    200
ARP 192.0.9.12                         000a.959d.6816      Te1/0/4    200
00C8     14mn     STALE       try 0 183 s  000a.959d.6816      Te1/0/4    200
ARP 192.0.9.11                         000a.959d.6816      Te1/0/4    200
00C8     14mn     STALE       try 0 178 s  000a.959d.6816      Te1/0/4    200
ARP 192.0.9.10                         000a.959d.6816      Te1/0/4    200
00C8     14mn     STALE       try 0 165 s  000a.959d.6816      Te1/0/4    200
ARP 192.0.9.9                          000a.959d.6816      Te1/0/4    200
0064     23mn     STALE       try 0 327 s  000a.959d.6816      Te1/0/4    200
ARP 192.0.9.8                          000a.959d.6816      Te1/0/4    200
0064     23mn     STALE       try 0 286 s  000a.959d.6816      Te1/0/4    200
ARP 192.0.9.7                          000a.959d.6816      Te1/0/4    200
0064     23mn     STALE       try 0 303 s  000a.959d.6816      Te1/0/4    200
ARP 192.0.9.6                          000a.959d.6816      Te1/0/4    200
0064     23mn     STALE       try 0 306 s

```

```

Device# show device-tracking database <<< checking binding table again after new policy-level
reachable-lifetime expires
Binding Table has 7 entries, 7 dynamic (limit 200000)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match      0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk     0010:Orig trusted access  0020:DHCP assigned
0040:Cga authenticated      0080:Cert authenticated   0100:Statically assigned

```

Network Layer Address prlvl	age	state	Time left	Link Layer Address	Interface	vlan
ARP 192.0.9.21				000a.959d.6816	Te1/0/4	200
0064	3mn	STALE	try 0 887 s	<<< global value applies for stale-lifetime;		
				policy-level value was not configured		
ARP 192.0.9.20				000a.959d.6816	Te1/0/4	200
0064	3mn	STALE	try 0 884 s	<<< global value applies for stale-lifetime;		
				policy-level value was not configured		
ARP 192.0.9.13				000a.959d.6816	Te1/0/4	200
00C8	17mn	STALE	try 0 664 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.9				000a.959d.6816	Te1/0/4	200
0064	27mn	STALE	try 0 136 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.8				000a.959d.6816	Te1/0/4	200
0064	27mn	STALE	try 0 96 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.7				000a.959d.6816	Te1/0/4	200
0064	27mn	STALE	try 0 108 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.6				000a.959d.6816	Te1/0/4	200
0064	27mn	STALE	try 0 111 s			

**Example: Creating a Static Binding Entry**

The following example shows you how to create a static binding entry. The "S" at the beginning of the entry indicates that it is a static binding entry

```

Device(config)# device-tracking binding vlan 100 192.0.2.1 interface tengigabitetherent1/0/1
 00:00:5e:00:53:af reachable-lifetime infinite
Device(config)# exit
Device# show device-tracking database
Binding Table has 2 entries, 0 dynamic (limit 200000)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match      0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk     0010:Orig trusted access  0020:DHCP assigned

```

```

0040:Cga authenticated      0080:Cert authenticated      0100:Statically assigned

      Network Layer Address          Link Layer Address      Interface   vlan
prlvl      age      state           Time left      S 192.0.2.1
          0000.5e00.53af      Tel/0/1      100      0100      14s      REACHABLE
          N/A

```

### Example: Global vs Policy-Level Address Limits

The following example show you how to assess which address limit is reached, when you configure address limits at the global level and at the policy-level.

The global level settings refer to the values configured for the following command string: **device-tracking bindingmax-entries no\_of\_entries [mac-limit no\_of\_entries | port-limit no\_of\_entries | vlan-limit no\_of\_entries]**

The policy level parameter refers to the **limit address-count** option in the device-tracking configuration mode.

For this first part of the example, the configuration is as follows:

- Global configuration: max-entries=30, vlan-limit=25, port-limit=20, mac-limit=19.
- Policy-level configuration: limit address-count=45.

The output of the **show device-tracking database details** privileged EXEC command shows that the port limit (max/port) is reached first. A maximum of 20 entries are allowed on a port or interface. No further binding entries are created after this. While the mac limit is configured with a lower absolute value (19), the output of the **show device-tracking database mac** privileged EXEC command shows that there are only 3 unique MAC address in the list of binding entries in the table - this limit is therefore not reached.

```

Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# device-tracking binding max-entries 30 vlan-limit 25 port-limit 20 mac-limit
19
Device(config)# device-tracking policy sisf-01
Device(config-device-tracking)# limit address-count 45
Device(config-device-tracking)# end
Device# show device-tracking policy sisf-01
Device-tracking policy sisf-01 configuration:
  security-level guard
  device-role node
  gleaning from Neighbor Discovery
  gleaning from DHCP6
  gleaning from ARP
  gleaning from DHCP4
  NOT gleaning from protocol unkn
  limit address-count 45
Policy sisf-01 is applied on the following targets:
Target          Type    Policy          Feature          Target range
Tel/0/4        PORT   sisf-01        Device-tracking  vlan 200

Device# show device-tracking database details
Binding table configuration:
-----
max/box : 30
max/vlan : 25
max/port : 20
max/mac  : 19

Binding table current counters:
-----
```

**device-tracking binding**

```

dynamic : 20
local   : 0
total   : 20      <<< no further entries created after this.

Binding table counters by state:
-----
REACHABLE : 20
    total : 20
<output truncated>

Device# show device-tracking database
Binding Table has 20 entries, 20 dynamic (limit 30)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match      0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk     0010:Orig trusted access  0020:DHCP assigned
0040:Cga authenticated       0080:Cert authenticated   0100:Statically assigned

Network Layer Address           Link Layer Address      Interface  vlan
prlvl   age      state        Time left
ARP 192.0.9.39                 000c.959d.6816      Te1/0/4   200
0064   14s      REACHABLE   37 s
ARP 192.0.9.38                 000b.959d.6816      Te1/0/4   200
0064   14s      REACHABLE   37 s
ARP 192.0.9.37                 000b.959d.6816      Te1/0/4   200
0064   14s      REACHABLE   36 s
ARP 192.0.9.36                 000b.959d.6816      Te1/0/4   200
0064   14s      REACHABLE   39 s
ARP 192.0.9.35                 000b.959d.6816      Te1/0/4   200
0064   14s      REACHABLE   38 s
ARP 192.0.9.34                 000b.959d.6816      Te1/0/4   200
0064   14s      REACHABLE   37 s
ARP 192.0.9.33                 000b.959d.6816      Te1/0/4   200
0064   15s      REACHABLE   36 s
ARP 192.0.9.32                 000b.959d.6816      Te1/0/4   200
0064   15s      REACHABLE   37 s
ARP 192.0.9.31                 000b.959d.6816      Te1/0/4   200
0064   15s      REACHABLE   36 s
ARP 192.0.9.30                 000b.959d.6816      Te1/0/4   200
0064   15s      REACHABLE   36 s
ARP 192.0.9.29                 000b.959d.6816      Te1/0/4   200
0064   15s      REACHABLE   35 s
ARP 192.0.9.28                 000a.959d.6816      Te1/0/4   200
0064   15s      REACHABLE   36 s
ARP 192.0.9.27                 000a.959d.6816      Te1/0/4   200
0064   16s      REACHABLE   35 s
ARP 192.0.9.26                 000a.959d.6816      Te1/0/4   200
0064   16s      REACHABLE   36 s
ARP 192.0.9.25                 000a.959d.6816      Te1/0/4   200
0064   16s      REACHABLE   34 s
ARP 192.0.9.24                 000a.959d.6816      Te1/0/4   200
0064   16s      REACHABLE   35 s
ARP 192.0.9.23                 000a.959d.6816      Te1/0/4   200
0064   16s      REACHABLE   34 s
ARP 192.0.9.22                 000a.959d.6816      Te1/0/4   200
0064   16s      REACHABLE   36 s
ARP 192.0.9.21                 000a.959d.6816      Te1/0/4   200
0064   17s      REACHABLE   33 s
ARP 192.0.9.20                 000a.959d.6816      Te1/0/4   200
0064   17s      REACHABLE   33 s

Device# show device-tracking database mac
MAC                Interface  vlan      prlvl      state      Time left

```

Policy	Input_index					
000c.959d.6816	Te1/0/4	200	NO TRUST	MAC-REACHABLE	27 s	
sisf-01	12					
000b.959d.6816	Te1/0/4	200	NO TRUST	MAC-REACHABLE	27 s	
sisf-01	12					
000a.959d.6816	Te1/0/4	200	NO TRUST	MAC-REACHABLE	27 s	
sisf-01	12					

For this second part of the example, the configuration is as follows:

- Global configuration: max-entries=30, vlan-limit=25, port-limit=20, mac-limit=19.
- Policy-level configuration: limit address-count=14.

The limit that is reached first is the policy-level, **limit address-count**. A maximum of 14 IP addresses (IPv4 and IPv6) are allowed on the port or interface where policy "sisf-01" is applied. No further binding entries are created after this. While the mac limit is configured with a lower absolute value (19), there are only 3 unique MAC address in the list of binding entries in the table - this limit is therefore not reached.

```
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# device-tracking policy sisf-01
Device(config-device-tracking)# limit address-count 14
Device(config-device-tracking)# end
Device# show device-tracking policy sisf-01
Device-tracking policy sisf-01 configuration:
    security-level guard
    device-role node
    gleaning from Neighbor Discovery
    gleaning from DHCP6
    gleaning from ARP
    gleaning from DHCP4
    NOT gleaning from protocol unkn
    limit address-count 14
Policy sisf-01 is applied on the following targets:
Target          Type   Policy           Feature      Target range
Te1/0/4         PORT   sisf-01        Device-tracking vlan 200
```

After the stale lifetime of all the existing entries has expired and the entries have been removed from the binding table, new entries are added according to the reconfigured values:

```
Device# show device-tracking database <<<checking time left for stale-lifetime to expire
for existing entries.
Binding Table has 20 entries, 20 dynamic (limit 30)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match    0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk    0010:Orig trusted access 0020:DHCP assigned
0040:Cga authenticated     0080:Cert authenticated 0100:Statically assigned

Network Layer Address          Link Layer Address      Interface  vlan
prlvl   age     state       Time left
ARP 192.0.9.39                 000c.959d.6816      Te1/0/4   200
0064   13mn   STALE        try 0 316 s
ARP 192.0.9.38                 000b.959d.6816      Te1/0/4   200
0064   13mn   STALE        try 0 279 s
ARP 192.0.9.37                 000b.959d.6816      Te1/0/4   200
0064   13mn   STALE        try 0 308 s
ARP 192.0.9.36                 000b.959d.6816      Te1/0/4   200
0064   13mn   STALE        try 0 274 s
ARP 192.0.9.35                 000b.959d.6816      Te1/0/4   200
```

**device-tracking binding**

0064	13mn	STALE	try 0 279 s	000b.959d.6816	Te1/0/4	200
ARP 192.0.9.34						
0064	13mn	STALE	try 0 261 s	000b.959d.6816	Te1/0/4	200
ARP 192.0.9.33						
0064	13mn	STALE	try 0 258 s	000b.959d.6816	Te1/0/4	200
ARP 192.0.9.32						
0064	13mn	STALE	try 0 263 s	000b.959d.6816	Te1/0/4	200
ARP 192.0.9.31						
0064	13mn	STALE	try 0 266 s	000b.959d.6816	Te1/0/4	200
ARP 192.0.9.30						
0064	13mn	STALE	try 0 273 s	000b.959d.6816	Te1/0/4	200
ARP 192.0.9.29						
0064	13mn	STALE	try 0 277 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.28						
0064	13mn	STALE	try 0 282 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.27						
0064	13mn	STALE	try 0 272 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.26						
0064	13mn	STALE	try 0 268 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.25						
0064	13mn	STALE	try 0 244 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.24						
0064	13mn	STALE	try 0 248 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.23						
0064	13mn	STALE	try 0 284 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.22						
0064	13mn	STALE	try 0 241 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.21						
0064	13mn	STALE	try 0 256 s	000a.959d.6816	Te1/0/4	200
ARP 192.0.9.20						
0064	13mn	STALE	try 0 243 s	000a.959d.6816	Te1/0/4	200

```
Device# show device-tracking database <<<no output indicates no entries in the database
```

```
Device# show device-tracking database details
```

Binding table configuration:

```
-----
max/box : 30
max/vlan : 25
max/port : 20
max/mac : 19
```

Binding table current counters:

```
-----
dynamic : 14
local   : 0
total   : 14
```

Binding table counters by state:

```
-----
REACHABLE : 14
total     : 14
<output truncated>
```

```
Device# show device-tracking database
```

Binding Table has 14 entries, 14 dynamic (limit 30)  
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,

DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created

Preflevel flags (prlvl):

0001:MAC and LLA match	0002:Orig trunk	0004:Orig access
0008:Orig trusted trunk	0010:Orig trusted access	0020:DHCP assigned
0040:Cga authenticated	0080:Cert authenticated	0100:Statically assigned

Network Layer Address prlvl	age	state	Time left	Link Layer Address	Interface	vlan
ARP 192.0.9.68				0001.5e00.53af	Tel1/0/4	200
0064 4s		REACHABLE	48 s	0001.5e00.53af	Tel1/0/4	200
ARP 192.0.9.67				0001.5e00.53af	Tel1/0/4	200
0064 4s		REACHABLE	48 s	0001.5e00.53af	Tel1/0/4	200
ARP 192.0.9.66				0001.5e00.53af	Tel1/0/4	200
0064 4s		REACHABLE	47 s	0001.5e00.53af	Tel1/0/4	200
ARP 192.0.9.65				0001.5e00.53af	Tel1/0/4	200
0064 4s		REACHABLE	48 s	0001.5e00.53af	Tel1/0/4	200
ARP 192.0.9.64				0001.5e00.53af	Tel1/0/4	200
0064 4s		REACHABLE	46 s	0000.5e00.53af	Tel1/0/4	200
ARP 192.0.9.63				0000.5e00.53af	Tel1/0/4	200
0064 7s		REACHABLE	44 s	0000.5e00.53af	Tel1/0/4	200
ARP 192.0.9.62				0000.5e00.53af	Tel1/0/4	200
0064 7s		REACHABLE	45 s	0000.5e00.53af	Tel1/0/4	200
ARP 192.0.9.61				0000.5e00.53af	Tel1/0/4	200
0064 7s		REACHABLE	43 s	0000.5e00.53af	Tel1/0/4	200
ARP 192.0.9.60				0000.5e00.53af	Tel1/0/4	200
0064 7s		REACHABLE	44 s	0000.5e00.53af	Tel1/0/4	200
ARP 192.0.9.59				0000.5e00.53af	Tel1/0/4	200
0064 7s		REACHABLE	44 s	0000.5e00.53af	Tel1/0/4	200
ARP 192.0.9.58				0000.5e00.53af	Tel1/0/4	200
0064 8s		REACHABLE	44 s	0000.5e00.53af	Tel1/0/4	200
ARP 192.0.9.57				0000.5e00.53af	Tel1/0/4	200
0064 8s		REACHABLE	44 s	0000.5e00.53af	Tel1/0/4	200
ARP 192.0.9.56				0000.5e00.53af	Tel1/0/4	200
0064 10s		REACHABLE	41 s	0000.5e00.53af	Tel1/0/4	200
ARP 192.0.9.55				0000.5e00.53af	Tel1/0/4	200
0064 10s		REACHABLE	40 s	0000.5e00.53af	Tel1/0/4	200
<b>Device# show device-tracking database mac</b>						
MAC		Interface	vlan	prlvl	state	Time left
Policy		Input_index				
0001.5e00.53af		Tel1/0/4	200	NO TRUST	MAC-REACHABLE	30 s
sisf-01	12					
0000.5e00.53af		Tel1/0/4	200	NO TRUST	MAC-REACHABLE	30 s
sisf-01	12					

### Example: Setting VLAN, Port, and MAC Limits to Default Values

The following example shows you how to reset one or more limits to their default values.

```
Device(config)# device-tracking binding max-entries 30 vlan-limit 25 port-limit 20 mac-limit
19 <<< all three limits configured.
Device(config)#exit
Device# show device-tracking database details

Binding table configuration:
-----
max/box : 30
max/vlan : 25
max/port : 20
max/mac : 19
<output truncated>

Device# configure terminal
Device(config)# device-tracking binding max-entries 30 vlan-limit 25 <<< only VLAN limit
configured; port-limit and mac-limit keywords leftout.
Device(config)# exit
Device# show device-tracking database details

Binding table configuration:
-----
```

**device-tracking binding**

```
max/box : 30
max/vlan : 25
max/port : no limit    <<<reset to default
max/mac : no limit    <<<reset to default
```

**Example: Global vs Policy-Level Limits Relating to MAC Addresses**

The following example shows how precedence is determined for global and policy-level MAC limits. The global value specifies the maximum number of entries allowed per MAC address. The policy-level IPv4 per MAC and IPv6 per MAC limits, which may be present only in a programmatic policy, specify the number of IPv4 and IPv6 addresses allowed per MAC address.

In the first part of the example, the global value (10 entries allowed per MAC address) is higher than the policy-level setting (3 IPv4 addresses allowed for each MAC address). The Binding table current counters, in the output of the **show device-tracking database details** privileged EXEC command shows that and the limit that is reached first is the policy level limit.



**Note** No configuration is displayed for the policy-level setting, because you cannot *configure* the "IPv4 per mac" or the "IPv6 per mac" in any policy. In this example, the DT-PROGRAMMATIC policy is applied to target by configuring the **ip dhcp snooping vlan** *vlan* command in global configuration mode. The IPv4 per mac limit exists, because the programmatically created policy has a limit for this parameter.

```
Device# configure terminal
Device(config)# ip dhcp snooping vlan 200
Device(config)# end
Device# show device-tracking policy DT-PROGRAMMATIC
Policy DT-PROGRAMMATIC configuration:
    security-level glean (*)
    device-role node
    gleaning from Neighbor Discovery
    gleaning from DHCP
    gleaning from ARP
    gleaning from DHCP4
    NOT gleaning from protocol unkn
    limit address-count for IPv4 per mac 3 (*)
    tracking enable
Policy DT-PROGRAMMATIC is applied on the following targets:
Target      Type      Policy           Feature          Target range
Tel1/0/4     PORT     DT-PROGRAMMATIC   Device-tracking   vlan 200

note:
Binding entry Down timer: 24 hours (*)
Binding entry Stale timer: 24 hours (*)

Device(config)# device-tracking binding max-entries 50 mac-limit 10
Device# show device-tracking database details
Binding table configuration:
-----
max/box : 50
max/vlan : no limit
max/port : no limit
max/mac : 10

Binding table current counters:
-----
dynamic : 3
local   : 0
total   : 3
```

```

Binding table counters by state:
-----
REACHABLE : 2
total     : 3

Device# show device-tracking database
Binding Table has 3 entries, 3 dynamic (limit 50)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match    0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk   0010:Orig trusted access  0020:DHCP assigned
0040:Cga authenticated    0080:Cert authenticated   0100:Statically assigned

Network Layer Address           Link Layer Address      Interface  vlan  prlvl
      age       state        Time left
ARP 192.0.9.8                  000a.959d.6816      Tel1/0/4  200  0064
      4s          REACHABLE   25 s
ARP 192.0.9.7                  000a.959d.6816      Tel1/0/4  200  0064
      4s          REACHABLE   27 s
ARP 192.0.9.6                  000a.959d.6816      Tel1/0/4  200  0064
      55s         VERIFY     5s try 2
<<<<<policy-level limit reached; only up to 3 IPv4 addresses per MAC address are allowed.

```

```

Device# show device-tracking database mac
      MAC           Interface  vlan  prlvl  state  Time left
Policy      Input_index
000a.959d.6816  Tel1/0/4    200  NO TRUST  MAC-STALE  93585 s
DT-PROGRAMMATIC          12

```

In the second part of the example, the global value (2 entries allowed per MAC address) is lower than the policy-level setting (3 IPv4 addresses allowed for each MAC address). The Binding table current counters, in the output of the **show device-tracking database details** privileged EXEC command shows that and the limit that is reached first is the policy level limit.

```

Device# show device-tracking policy DT-PROGRAMMATIC

Policy DT-PROGRAMMATIC configuration:
  security-level glean (*)
  device-role node
  gleaning from Neighbor Discovery
  gleaning from DHCP
  gleaning from ARP
  gleaning from DHCP4
  NOT gleaning from protocol unkn
  limit address-count for IPv4 per mac 3 (*)
  tracking enable

Policy DT-PROGRAMMATIC is applied on the following targets:
Target    Type    Policy          Feature          Target range
Tel1/0/4  PORT   DT-PROGRAMMATIC  Device-tracking  vlan 200

note:
Binding entry Down timer: 24 hours (*)
Binding entry Stale timer: 24 hours (*)

Device(config)# device-tracking binding max-entries 50 mac-limit 2
Device# show device-tracking database details
Binding table configuration:
-----
```

**device-tracking binding**

```

max/box : 50
max/vlan : no limit
max/port : no limit
max/mac  : 2

Binding table current counters:
-----
dynamic : 2
local   : 0
total   : 2

Binding table counters by state:
-----
REACHABLE : 2
    total : 2

Device# show device-tracking database
Binding Table has 3 entries, 3 dynamic (limit 50)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match      0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk     0010:Orig trusted access  0020:DHCP assigned
0040:Cga authenticated      0080:Cert authenticated   0100:Statically assigned

Network Layer Address           Link Layer Address       Interface  vlan  prlvl
    age      state        Time left
ARP 192.0.9.3                  000a.959d.6816        Te1/0/4   200   0064
    5s      REACHABLE    27 s
ARP 192.0.9.4                  000a.959d.6816        Te1/0/4   200   0064
    6s      REACHABLE    20 s

<<<<global limit reached; only up to 2 binding entries per MAC address is allowed.

Device# show device-tracking database mac
MAC                Interface  vlan  prlvl  state  Time left
Policy            Input_index
000a.959d.6816    Te1/0/4   200   NO TRUST  MAC-STALE  93585 s
DT-PROGRAMMATIC      12

```

# device-tracking (interface config)

To enable SISF-based device tracking and attach the *default* policy to an interface or VLAN, or to enable the feature and attach a custom policy enter the **device-tracking** command in interface configuration mode. To detach the policy from the interface or VLAN and revert to default, use the **no** form of the command.

```
device-tracking [ attach-policy policy-name ] [ vlan { vlan-id | add vlan-id | all | except vlan-id | none | remove vlan-id } ]
no device-tracking [ attach-policy policy-name ] [ vlan { vlan-id | add vlan-id | all | except vlan-id | none | remove vlan-id } ]
```

## Syntax Description

**attach-policy** *policy-name* Attaches the custom policy that you specify, to the interface and all VLANs.

**vlan** { *vlan-id* | **add** *vlan-id* } Configures the VLAN list for the policy and attaches the custom policy to the **all** | **except** *vlan-id* | **none** specified VLANs. You can specify the following particulars:  
| **remove** *vlan-id* }

- *vlan-id*: Enter one or more VLAN IDs. The custom policy is attached to all the VLAN IDs.
- **add***vlan-id*: Adds specified VLANs to the existing list of VLAN IDs. The custom policy is attached to all the VLAN IDs.
- **all**: Attaches the custom policy to all VLAN IDs. This is the default option.
- **except***vlan-id*: Attaches the custom policy to all VLAN IDs, except the ones you specify here.
- **none**: Does not attach the custom policy to any VLAN.

**remove***vlan-id*: Removes specified VLANs from the existing list of VLAN IDs. The custom policy is attached only to the VLAN IDs in the list.

## Command Default

SISF-based device tracking is disabled and a policy is not attached to the interface.

## Command Modes

Interface configuration [Device((config-if)#)]

## Command History

Release	Modification
---------	--------------

Cisco IOS XE Denali 16.1.1 This command was introduced.

## Usage Guidelines

If you enter the **device-tracking** command in the interface configuration mode, without any other keywords, the system attaches the *default* policy to the interface or VLAN. The default policy is a built-in policy with default settings; you cannot change any of the attributes of the default policy.

If you configure the **device-tracking attach-policy***policy-name* command in the interface configuration mode, you can specify a custom policy name. You must have created the custom policy in global configuration mode already. The policy is attached to the specified interface. You can then also specify the VLANs that you want to attach it to.

**device-tracking (interface config)**

If you want to change the custom policy that is attached to a target, reconfigure the **device-tracking attach-policy *policy-name*** command.

If you want to disable the feature on a particular target, enter the **no device-tracking** command in the interface configuration mode.

**Examples**

- [Example: Enabling SISF-Based Device Tracking and Attaching the Default Policy, on page 902](#)
- [Attaching a Custom Policy, on page 902](#)
- [Example: Disabling SISF-Based Device-Tracking , on page 903](#)

**Examples**

The following example shows how to enable SISF-based device tracking and attach the default policy to an interface. The default policy has default policy parameters, none of which can be changed:

```
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# interface tengigabitethernet1/0/1
Device(config-if)# device-tracking
Device(config-if)# end

Device# show device-tracking policies detail
Target          Type  Policy           Feature      Target range
Te1/0/1         PORT  default        Device-tracking vlan all
Te1/0/2         PORT  default        Device-tracking vlan all

Device-tracking policy default configuration:
  security-level guard
  device-role node
  gleaning from Neighbor Discovery
  gleaning from DHCP6
  gleaning from ARP
  gleaning from DHCP4
  NOT gleaning from protocol unkn
Policy default is applied on the following targets:
Target          Type  Policy           Feature      Target range
Te1/0/1         PORT  default        Device-tracking vlan all
Te1/0/2         PORT  default        Device-tracking vlan all
```

**Examples**

The following example shows how enable SISF-based device tracking and attach a custom policy called `sisf-01`, to the same interface as the above example, that is, `Te1/0/1`. Doing so replaces the existing default policy with custom policy `sisf-01` on `Te1/0/1`.

```
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# interface tengigabitethernet1/0/1
Device(config-if)# device-tracking attach-policy sisf-01
Device(config-if)# end

Device# show device-tracking policies detail
Target          Type  Policy           Feature      Target range
Te1/0/1         PORT  sisf-01        Device-tracking vlan all
Te1/0/2         PORT  default        Device-tracking vlan all

Device-tracking policy default configuration:
```

```

security-level guard
device-role node
gleaning from Neighbor Discovery
gleaning from DHCP6
gleaning from ARP
gleaning from DHCP4
NOT gleaning from protocol unkn
Policy default is applied on the following targets:
Target          Type   Policy           Feature        Target range
Te1/0/2         PORT   default        Device-tracking  vlan all

Device-tracking policy sisf-01 configuration:
  security-level guard
  device-role node
  gleaning from Neighbor Discovery
  gleaning from DHCP6
  gleaning from ARP
  gleaning from DHCP4
  NOT gleaning from protocol unkn
  limit address-count 3000
Policy sisf-01 is applied on the following targets:
Target          Type   Policy           Feature        Target range
Te1/0/1         PORT   sisf-01        Device-tracking  vlan all

```

**Examples**

The following example shows how to disable SISF-based device-tracking on a target. The feature is disabled on target Te1/0/1. This is the same interface where a custom policy is applied in the previous example. The default policy continues to be available on the other interface where the feature is enabled, that is, Te1/0/2.

```

Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# interface tengigabitethernet1/0/1
Device(config-if)# no device-tracking attach-policy sisf-01
Device(config-if)# end

Device# show device-tracking policies detail
Target          Type   Policy           Feature        Target range
Te1/0/2         PORT   default        Device-tracking  vlan all

Device-tracking policy default configuration:
  security-level guard
  device-role node
  gleaning from Neighbor Discovery
  gleaning from DHCP6
  gleaning from ARP
  gleaning from DHCP4
  NOT gleaning from protocol unkn
Policy default is applied on the following targets:
Target          Type   Policy           Feature        Target range
Te1/0/2         PORT   default        Device-tracking  vlan all

```

# device-tracking logging

To log snooping security events like packet drops, unresolved packets, and suspected MAC or IP theft, configure the **device-tracking logging** command in global configuration mode. To disable logging, enter the **no** form of the command.

**device-tracking logging [ packet drop | resolution-veto | theft ]**

**no device-tracking logging [ packet drop | resolution-veto | theft ]**

Syntax Description	<b>packet drop</b> Logs packet drop events. <b>resolution-veto</b> Logs unresolved packet events. <b>theft</b> Logs IP and MAC theft events.				
Command Default	Events are not logged.				
Command Modes	Global configuration [Device(config)# ]				
Command History	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.1.1	This command was introduced.
Release	Modification				
Cisco IOS XE Denali 16.1.1	This command was introduced.				

Usage Guidelines	Logs generated for snooping security events have a severity level of 4 (meaning, warnings). For example:  %SISF-4-PAK_DROP: Message dropped A=FE80::20D:FF:FE0E:F G=- V=10 I=Tu0 P=NTP::RA Reason=Packet not authorized on port
------------------	---

You can view snooping security logs by entering the **show logging | include SISF-4** command in privileged EXEC mode.

For information about the snooping events for which logs are generated, see the system message guide for the corresponding release: [System Message Guides](#). Search for **SISF-4**.

## Packet Drop Events

When you configure the **packet drop** keyword, a log is generated everytime a packet is dropped. The log also includes the reason for the packet drop. The reasons include and are not limited to the following:

- **Packet not authorized on port:** This means that a security feature dropped the packet because a packet of this kind is not expected on the port, based on the configuration. Examples of such security features and the situations in which a packet is dropped, include and are not limited to the following: The Router Advertisement Guard feature may decide to drop IPv6 Router Advertisement packets if they are received on ports that are not configured as router-facing ports. The DHCP Guard feature may drop packets from DHCP server (DHCP OFFER or DHCP REPLY) if they are received on a port which is not configured as server-facing port.
- **Packet accepted but not forwarded:** This means that the packet is not forwarded, but it is still considered valid to glean binding information from. This is usually seen when packets from a host are seen by SISF during the validation phase (while the binding is in a transitional state).

- **Malformed Packet dropped in Guard mode:** This means that the incoming packet is malformed and cannot be parsed properly.
- **Packet is throttled:** This means the packet was dropped because it exceeds the throttling limit for packets within a time interval. The system allows a maximum of 50 packets in 5 seconds.
- **Silent drop:** This happens to packets that are generated either by device-tracking instances to communicate among the different instances across multiple switches, or as a response to an action triggered by device-tracking. For instance, a response on the probe that was initiated by the device-tracking, to determine the reachability status of the host reachability.
- **Martian packet:** This means that the incoming packet was dropped because it has Martian source IP address, such as, a multicast, loopback, or unspecified address.
- **Martian mac:** This means that the incoming packet was dropped because it has a Martian MAC or Link-Layer source address.
- **Address limit per box reached:** This means that the incoming packet was dropped, because the limit configured with the **device-tracking binding max-entries no\_of\_entries** global configuration command, was reached. Enter the **show device-tracking database details** privileged EXEC command to display current limits.
- **Address limit per vlan reached:** This means that the incoming packet was dropped, because the limit configured with the **device-tracking binding max-entries no\_of\_entries vlan-limit no\_of\_entries** global configuration command, was reached. Enter the **show device-tracking database details** privileged EXEC command to display current limits.
- **Address limit per port reached:** This means that the incoming packet was dropped, because the limit configured with the **device-tracking binding max-entries no\_of\_entries port-limit no\_of\_entries** global configuration command, was reached. Enter the **show device-tracking database details** privileged EXEC command to display current limits.
- **Address limit per policy reached :** This means that the incoming packet was dropped, because the limit configured with the **limit address-count ip-per-port** keyword in the device-tracking configuration mode was reached. This is configured at a policy level. Enter the **show device-tracking policy policy-name** privileged EXEC command to display current limits.
- **Address limit per mac reached:** This means that the incoming packet was dropped, because the limit configured with the **device-tracking binding max-entries no\_of\_entries mac-limit no\_of\_entries** global configuration command, was reached. Enter the **show device-tracking database details** privileged EXEC command to display current limits.
- **Address Family limit per mac reached:** This means that the incoming packet was dropped, because the IPv4 per MAC or IPv6 per MAC limit specified in a programmatic policy was reached. You cannot configure this policy parameter; a programmatically created policy may have either an IPv4 per MAC limit, or an IPv6 per MAC limit, or both, or neither. Enter the **show device-tracking policy policy-name** privileged EXEC command to display the limit if it exists.

### Resolution Veto Events

When you configure the **resolution-veto** keyword, a log is generated for every unresolved packet. This logging option meant to be used only if the IPv6 Destination Guard feature is also enabled.

The IPv6 Destination Guard feature ensures that the device performs address resolution only for those addresses that are known to be active on the link. All destinations that are active on the link are entered in the binding

table. When a destination is not found in the binding table, address resolution is prevented. By configuring **resolution-veto** logging you can keep track of such unresolved packets.

If the **resolution-veto** keyword is configured and the the IPv6 Destination Guard feature is not, logs are not generated.

### Theft Events

When you configure the **theft** keyword, a log is generated when SISF detects an IP theft, or a MAC theft or both.

In the log, verified binding information (IP, MAC address, interface or VLAN) is preceded by the term "Known". A suspicious IP address and MAC address is preceded by the term "New" or "Cand". Interface and VLAN information is also provided along with the suspicious IP or MAC address - this helps you identify where the suspicious traffic was seen.

For example, see the following MAC theft log:

```
%SISF-4-MAC_THEFT: MAC Theft Cand IP=2001::12B VLAN=70 MAC=9cfc.e85e.139d Cand I/F=Gi1/0/4
Known IP=71.0.0.96 Known I/F=Ac0
```

These snippets of the log show the IP address of the suspicious host and the interface on which it was seen: Cand IP=2001::12B, VLAN=70, Cand I/F=Gi1/0/4.

This snippet of the log shows the *known* MAC address, which the suspicious host is using: MAC=9cfc.e85e.139d.

These snippets of the log show the IP address and interface of the existing, verified entry: Known IP=71.0.0.96 and Known I/F=Ac0.

### Examples

- [Example: Packet Drop Logs, on page 906](#)
- [Example: Theft Logs, on page 906](#)

### Example: Packet Drop Logs

The following are examples of logs generated for packet drop events:

```
%SISF-4-PAK_DROP: Message dropped A=FE80::20D:FF:FE0E:F G=- V=10 I=Tu0 P=NDP::RA Reason=Packet
not authorized on port
```

```
%SISF-4-PAK_DROP: Message dropped A=20.0.0.1 M=dead.beef.0001 V=20 I=Gi1/0/23 P=ARP
Reason=Packet accepted but not forwarded
```

### Example: Theft Logs

The following are examples of logs generated for IP and MAC theft events:

```
%SISF-4-MAC_AND_IP_THEFT: MAC_AND_IP Theft A=FE80::EE1D:8BFF:FE9B:102 V=102 I=V1102
M=ecl1d.8b9b.0102 New=Tu0
```

```
%SISF-4-MAC_THEFT: MAC Theft IP=192.2.1.2 VLAN=102 MAC=cafe.cafe.cafe I/F=Gi1/0/3 New I/F
over fabric
```

```
%SISF-4-IP_THEFT: IP Theft IP=FE80::9873:1D5E:E6E9:1F7E VLAN=20 MAC=2079.18d5.13ad IF=Ac0
New I/F over fabric
```

```
%SISF-4-IP_THEFT: IP Theft IP=10.0.187.5 VLAN=10 Cand-MAC=0069.0000.0001 Cand-I/F=Gi1/0/23  
Known MAC over-fabric Known I/F over-fabric
```

```
%SISF-4-MAC_THEFT: MAC Theft Cand IP=2001::12B VLAN=70 MAC=9cfc.e85e.139d Cand I/F=Gi1/0/4  
Known IP=71.0.0.96 Known I/F=Ac0
```

# device-tracking policy

To create a custom device-tracking policy, and to enter the device-tracking configuration mode to configure the various parameter of the policy, enter the **device-tracking policy** command in global configuration mode. To delete a device tracking policy, use the **no** form of this command.

**device-tracking policy** *policy-name*  
**no device-tracking policy** *policy-name*

<b>Syntax Description</b>	<p><i>policy-name</i> Creates a device-tracking policy with the specified name - if it doesn't already exist. You can also specify the name of a programmatically created policy.</p> <p>After you configure a policy name, the device enters the device-tracking configuration mode, where you can configure policy parameters. Enter a question mark (?) at the system prompt to see the list of policy parameters that can be configured.</p>								
<b>Command Default</b>	SISF-based device tracking is disabled.								
<b>Command Modes</b>	Global configuration [Device(config)# ]								
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td><td>This command was introduced.</td></tr> <tr> <td>Cisco IOS XE Everest 16.6.1</td><td>Option to change certain parameters of programmatic policy DT_PROGRAMMATIC was introduced.</td></tr> <tr> <td>Cisco IOS XE Fuji 16.9.1</td><td>The option to change the parameters of <i>any</i> programmatic policy was deprecated.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.1.1	This command was introduced.	Cisco IOS XE Everest 16.6.1	Option to change certain parameters of programmatic policy DT_PROGRAMMATIC was introduced.	Cisco IOS XE Fuji 16.9.1	The option to change the parameters of <i>any</i> programmatic policy was deprecated.
<b>Release</b>	<b>Modification</b>								
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Cisco IOS XE Fuji 16.9.1	The option to change the parameters of <i>any</i> programmatic policy was deprecated.								

<b>Usage Guidelines</b>	<p>When you enter the <b>device-tracking policy</b> <i>policy-name</i> command in global configuration mode, the system creates a custom policy with the specified name (if it does not already exist) and enters the device-tracking configuration mode. In this mode, you can configure policy parameters.</p> <p>After you create a policy and configure its parameters, you must attach it to an interface or VLAN. Only then does the activity of extracting binding information (IP and MAC address) from packets that enter the network and the creation of binding entries, actually begin. For more information about attaching a policy, see <a href="#">device-tracking (interface config), on page 901</a> and <a href="#">device-tracking (VLAN config), on page 927</a>.</p> <p>To display detailed information about all the policies available on the device and the targets they are attached to, enter the <b>show device-tracking policies detail</b> command in privileged EXEC mode.</p>
-------------------------	---

## Configuring Policy Parameters

You can configure the parameters of a policy only if it is a custom policy. You cannot change the parameters of a programmatic policy. You also cannot change the parameters of the `default` policy.

To display the list of parameters for a policy, enter a question mark (?) at the system prompt in device-tracking configuration mode:

```
Device(config)# device-tracking policy sisf-01
Device(config-device-tracking)# ?
device-tracking policy configuration mode:
```

data-glean	binding recovery by data traffic source address gleaning
default	Set a command to its defaults
destination-glean	binding recovery by data traffic destination address gleaning
device-role	Sets the role of the device attached to the port
distribution-switch	Distribution switch to sync with
exit	Exit from device-tracking policy configuration mode
limit	Specifies a limit
medium-type-wireless	Force medium type to wireless
no	Negate a command or set its defaults
prefix-glean	Glean prefixes in RA and DHCP-PD traffic
protocol	Sets the protocol to glean (default all)
security-level	setup security level
tracking	Override default tracking behavior
trusted-port	setup trusted port
vpc	setup vpc port

Keyword	Description
<b>data-glean</b>	<p>Enables learning of addresses from a data packet snooped from a source inside the network and populates the binding table with the data traffic source address. Enter one of these options:</p> <ul style="list-style-type: none"> <li>• <b>log-only</b>: Generates a syslog message upon data packet notification.</li> <li>• <b>recovery</b>: Uses a protocol to enable binding table recovery. Enter <b>NDP</b> or <b>DHCP</b>.</li> </ul>
<b>default</b>	<p>Sets the policy parameter to its default value. You can set these policy attributes to their default values:</p> <ul style="list-style-type: none"> <li>• <b>data-glean</b>: Source address is not learnt or gleaned.</li> <li>• <b>destination-glean</b>: Destination address is not learnt or gleaned</li> <li>• <b>device-role</b>: Node.</li> <li>• <b>distribution-switch</b>: Not supported.</li> <li>• <b>limit</b>: An address count limit is not set.</li> <li>• <b>medium-type-wireless</b>: &lt;tbd&gt;</li> <li>• <b>prefix-glean</b>: Prefixes are not learnt.</li> <li>• <b>protocol</b>: Addresses of all protocols (ARP, DHCP4, DHCP6, NDP, and UDP) are gleaned.</li> <li>• <b>security-level</b>: Guard.</li> <li>• <b>tracking</b>: Polling is disabled.</li> <li>• <b>trusted-port</b>: Disabled, that is, the guard function is enabled on the configured target)</li> <li>• <b>vpc</b>: Not supported.</li> </ul>

Keyword	Description
<b>destination-glean</b>	<p>Enables population of the binding table by gleaning the destination address of data traffic. Enter one of these options:</p> <ul style="list-style-type: none"> <li>• <b>log-only</b>: Generates a syslog message upon data packet notification.</li> <li>• <b>recovery</b>: Uses a protocol to enable binding table recovery. Enter <b>NDP</b> or <b>DHCP</b>.</li> </ul>
<b>device-role</b>	<p>Indicates the type of device that is facing the port and this can be one of the following:</p> <ul style="list-style-type: none"> <li>• <b>node</b>: Allows creation of binding entries for a port.</li> <li>• <b>switch</b>: Stops the creation of binding entries for a port. This option is suited to multi-switch set-ups, where the possibility of large device tracking tables is very high. Here, a port facing a device (an uplink trunk port) can be configured to stop creating binding entries, and the traffic arriving at such a port can be trusted, because the switch on the other side of the trunk port will have device tracking enabled and that will have checked the validity of the binding entry.</li> </ul> <p>This option is commonly used along with the <b>trusted-port</b> keyword. Configuring both the <b>device-role</b> and <b>trusted-port</b> options on an uplink trunk port helps build an efficient and scalable “secure zone”. Both parameters must be configured to achieve an efficient distribution of the creation of binding table entries (thus keeping the binding tables smaller).</p>
<b>distribution-switch</b>	Although visible on the CLI, this keyword is not supported. Any configuration does not take effect.
<b>exit</b>	Exits the device-tracking configuration mode and returns to global configuration mode.
<b>limit address-count</b>	<p>Configures the maximum number of number of IPv4 and IPv6 addresses to be allowed per port. The purpose of this limit is to ensure that binding entries are restricted to only known and expected hosts.</p> <p><i>ip-per-port</i>: Enter the maximum number of IP addresses you want to allow on a port. This limit applies to IPv4 and IPv6 addresses as a whole. When the limit is reached, no further IP addresses can be added to the binding table, and traffic from new hosts are dropped.</p> <p>Enter a value between 1 and 32000.</p>
<b>medium-type-wireless</b>	Although visible on the CLI, this keyword is not supported. Any configuration does not take effect.

Keyword	Description
<b>no</b>	<p>Negates the command, that is, reverts a policy parameter to its default value.</p> <p>For information about what the default value is, see the <b>default</b> keyword.</p> <ul style="list-style-type: none"> <li>• <b>data-glean</b></li> <li>• <b>destination-glean</b></li> <li>• <b>device-role</b></li> <li>• <b>distribution-switch</b>: Not supported.</li> <li>• <b>limit address-count</b></li> <li>• <b>medium-type-wireless</b></li> <li>• <b>prefix-glean</b></li> <li>• <b>protocol</b></li> <li>• <b>security-level</b></li> <li>• <b>tracking</b></li> <li>• <b>trusted-port</b></li> <li>• <b>vpc</b>: Not supported.</li> </ul>
<b>prefix-glean only</b>	<p>Enables learning of prefixes from either IPv6 Router Advertisements or from DHCP-PD. You have the following option:</p> <p>(Optional) <b>only</b>: Gleans only prefixes and not host addresses.</p>
<b>protocol</b>	<p>Gleans addresses of specified protocols. By default, all are gleaned. Enter one of these options:</p> <ul style="list-style-type: none"> <li>• <b>arp [prefix-list name]</b>: Gleans addresses in ARP packets. Optionally, enter the name of prefix-list that is to be matched.</li> <li>• <b>dhcp4 [prefix-list name]</b>: Gleans addresses in DHCPv4 packets. Optionally, enter the name of prefix-list that is to be matched.</li> <li>• <b>dhcp6 [prefix-list name]</b>: Gleans addresses in DHCPv6 packets. Optionally, enter the name of prefix-list that is to be matched.</li> <li>• <b>ndp [prefix-list name]</b>: Gleans addresses in NDP packets. Optionally, enter the name of prefix-list that is to be matched.</li> <li>• <b>udp [prefix-list name]</b>: Although visible on the CLI, this option is not supported. Any configuration does not take effect.</li> </ul>

Keyword	Description
<b>security-level</b>	<p>Specifies the level of security that is enforced. When a packet enters the network, SISF extracts the IP and MAC address (the source of the packet) and subsequent action, is dictated by the security level configured in the policy.</p> <p>Enter one of these options:</p> <ul style="list-style-type: none"> <li>• <b>glean</b>: Extracts the IP and MAC address and enters them into the binding table, without any verification. Use this option if you want to only <i>learn</i> about the host and not rely on SISF for authentication of the binding entry.</li> <li>• <b>guard</b>: Extracts the IP and MAC address and checks this information against the binding table. The outcome of the verification determines if a binding entry is added, or updated, or if the packet is dropped and the client is rejected</li> <li>• <b>inspect</b>: Although this keyword is available on the CLI, we recommend not using it. The <b>glean</b> and <b>guard</b> options described above address most use cases and network requirements.</li> </ul> <p>This is the default value for the security-level parameter.</p>

Keyword	Description
<b>tracking</b>	<p>Determines if an entry is polled after the reachable lifetime expires. Polling is a periodic and conditional checking of the host to see the state it is in, whether it is still connected, and whether it is communicating. For more information about polling, see the <i>Usage Guidelines</i> below.</p> <p>By default, polling is not enabled.</p> <p>Enter one of these options:</p> <ul style="list-style-type: none"> <li>• <b>disable</b> : Turns off polling action.</li> <li>[<b>stale-lifetime</b> {<i>seconds</i>   <b>infinite</b>} ]: Optionally you can also configure a stale-lifetime. If you do, configure one of the following for the stale-lifetime timer: <ul style="list-style-type: none"> <li>• <i>seconds</i>: Configure a value for the stale-lifetime timer. Enter a value between 1 and 86400 seconds. The default value is 86400 seconds (24 hours).</li> <li>• <b>infinite</b>: Disables the timer for the STALE state. This means that a timer is not started when an entry enters the STALE state and the entry remains in the STALE state, indefinitely.</li> </ul> </li> <li>• <b>enable</b>: Turns on polling action.</li> <li>[<b>reachable-lifetime</b> [ <i>seconds</i>   <b>infinite</b> ] ]: Optionally you can also configure a reachable-lifetime. If you do, configure one of the following for the reachable-lifetime timer: <ul style="list-style-type: none"> <li>• <i>seconds</i>: Configure a value for the reachable-lifetime timer. Enter a value between 1 and 86400 seconds. The default value is 300 seconds (5 minutes).</li> <li>• <b>infinite</b>: Disables the timer for the REACHABLE state. This means that a timer is not started when an entry enters the REACHABLE state and the entry remains in the REACHABLE state, indefinitely.</li> </ul> </li> </ul>
<b>trusted-port</b>	<p>This option disables the guard function on configured targets. Bindings learned through a trusted-port have preference over bindings learned through any other port. A trusted port is also given preference in case of a collision while making an entry in the table.</p> <p>This option is commonly used along with the <b>device-role</b> keyword. Configuring both the <b>device-role</b> and <b>trusted-port</b> options on an uplink trunk port helps achieve an efficient distribution of the creation of binding table entries (thus keeping the binding tables smaller).</p>
<b>vpc</b>	<p>Although visible on the CLI, this option is not supported. Any configuration does not take effect.</p>

### Global versus Poicy-Level Settings

You configure policy parameters in the device-tracking configuration mode and what you configure for a policy applies only to that policy. Some of the policy parameters have counterparts in the global configuration mode. For detailed information about the parameters that have global-level counterparts and to know which value takes precedence (whether the globally configured or the policy-level value), see: [device-tracking binding, on page 881](#).

### Polling a Host

If you configure the **tracking** policy parameter, the switch sends a polling request after the reachable lifetime expires. The switch polls the host up to 3 times at fixed, system-determined intervals. You can also specify an interval by using the **device-tracking tracking retry-interval seconds** command in global configuration mode. The polling request is in the form of an Address Resolution Protocol (ARP) probe or a Neighbor Solicitation message. During this time the state of the entry changes to VERIFY.

If a polling response is received (thus confirming reachability of the host), the state of the entry changes back to REACHABLE. If the switch does not receive a polling response after 3 attempts, the entry changes to the STALE state.



**Note** Using the **tracking** policy parameter, you can enable or disable polling at a policy-level regardless of whether the polling is enabled or disabled at the global configuration level (the **device-tracking tracking** command in global configuration mode). See [Example: Disabling Polling at a Policy-Level, on page 915](#) and [device-tracking tracking, on page 921](#).

### Changing the Limit Address-Count

If you configure a limit using the **limit address-count** policy parameter and then change it - the new limit is applicable only to entries learned after the change. Further, regardless of whether the new limit is higher or lower than the previous limit, existing entries are not affected and are allowed to go through their binding entry lifecycle.

If the binding table is full (in accordance with the previous limit), any new entries are not added until the existing entries complete their lifecycle. SISF attempts to create space for new entries by identifying and removing only *inactive* entries . But if the entries are active, they are not removed and are allowed to go through their binding entry lifecycle.

If you want to make the new lower limit take effect immediately, you can use either one of these options:

- Enter the **clear device-tracking database** command in privileged EXEC mode and specify an interface or VLAN. This removes all existing entries from the database of only the specified target. New entries are then learned and added as per the current limit address-count settings. See [Example: Changing the Address Count Limit, on page 915](#).
- Remove and reattach the policy on the required target. Enter the **no device-tracking policy***policy-name* command in interface or VLAN configuration mode to remove the policy. Removing the policy from an interface or VLAN removes the bindings that are attached to the target. Enter the **device-tracking policy***policy-name* command in interface or VLAN configuration mode to reattach it. Reattaching the policy causes learning of all the binding entries according to the new limit.

### Examples

- [Example: Disabling Polling at a Policy-Level, on page 915](#)
- [Example: Changing the Address Count Limit, on page 915](#)

### Example: Disabling Polling at a Policy-Level

The following example shows how you can disable polling at the policy-level even if polling is enabled at the global level. Here, polling is disabled for all interfaces and VLANs were policy `sisf-01` is applied.

```
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# device-tracking tracking
Device(config)# exit
Device# show running-config | include device-tracking device-tracking tracking
device-tracking policy sisf-01
  device-tracking attach-policy sisf-01
  device-tracking attach-policy sisf-01 vlan 200
device-tracking binding reachable-lifetime 700 stale-lifetime 1000 down-lifetime 200
device-tracking binding logging

Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# device-tracking policy sisf-01
Device(config-device-tracking)# tracking disable
Device(config-device-tracking)# end
Device# show device-tracking policy sisf-01
Device-tracking policy sisf-01 configuration:
  security-level guard
  device-role node
  gleanning from Neighbor Discovery
  gleanning from DHCP6
  gleanning from ARP
  gleanning from DHCP4
  NOT gleanning from protocol unkn
  limit address-count 5
  tracking disable
Policy sisf-01 is applied on the following targets:
Target          Type    Policy           Feature      Target range
Te1/0/4         PORT    sisf-01        Device-tracking vlan 200
vlan 200        VLAN    sisf-01        Device-tracking vlan all
```

### Example: Changing the Address Count Limit

The following example shows you how to make a change in the `limit address-count` policy parameter setting take effect immediately. In this example, the `clear` command is used to remove all entries from the binding table for the changed settings to take effect immediately.

```
Device# show device-tracking policy sisf-01
Device-tracking policy sisf-01 configuration:
  security-level guard
  device-role node
  gleanning from Neighbor Discovery
  gleanning from DHCP6
  gleanning from ARP
  gleanning from DHCP4
  NOT gleanning from protocol unkn
  limit address-count 25
Policy sisf-01 is applied on the following targets:
Target          Type    Policy           Feature      Target range
Te1/0/4         PORT    sisf-01        Device-tracking vlan 200
vlan 200        VLAN    sisf-01        Device-tracking vlan all

Device# show running-config | include device-tracking
```

**device-tracking policy**

```

device-tracking policy sisf-01
  device-tracking attach-policy sisf-01
    device-tracking attach-policy sisf-01 vlan 200
  device-tracking binding reachable-lifetime 700 stale-lifetime 1000 down-lifetime 200
  device-tracking binding logging

*Dec 13 15:08:50.723: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.25 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.723: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.26 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.724: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.27 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.724: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.28 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.724: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.29 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.724: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.30 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.725: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.31 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.725: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.32 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.725: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.33 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.725: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.34 VLAN=200
MAC=001c.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.726: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.35 VLAN=200
MAC=001c.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.726: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.36 VLAN=200
MAC=001c.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.726: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.37 VLAN=200
MAC=001c.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.726: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.38 VLAN=200
MAC=001c.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.727: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.39 VLAN=200
MAC=001c.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.727: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.40 VLAN=200
MAC=001c.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.727: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.41 VLAN=200
MAC=001c.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.727: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.42 VLAN=200
MAC=001c.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.728: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.43 VLAN=200
MAC=001c.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.728: %SISF-6-ENTRY_MAX_ORANGE: Reaching 80% of max adr allowed per policy
(25) V=200 I=Te1/0/4 M=001d.4411.3ab7
*Dec 13 15:08:50.728: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.44 VLAN=200
MAC=001d.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.728: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.45 VLAN=200
MAC=001d.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.728: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.46 VLAN=200
MAC=001d.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.729: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.47 VLAN=200
MAC=001d.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.729: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.48 VLAN=200
MAC=001d.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF
*Dec 13 15:08:50.729: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.49 VLAN=200
MAC=001d.4411.3ab7 I/F=Te1/0/4 Preflevel=0FFF

Device# show device-tracking database Binding Table has 25 entries, 25 dynamic (limit 200000)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):

```

0001:MAC and LLA match	0002:Orig trunk	0004:Orig access
0008:Orig trusted trunk	0010:Orig trusted access	0020:DHCP assigned
0040:Cga authenticated	0080:Cert authenticated	0100:Statically assigned

Network Layer Address prlvl	age	state	Time left	Link Layer Address	Interface	vlan
ARP 192.0.9.49		REACHABLE	699 s	001d.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	691 s	001d.4411.3ab7	Tel/0/4	200
ARP 192.0.9.48		REACHABLE	687 s	001d.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	714 s	001d.4411.3ab7	Tel/0/4	200
ARP 192.0.9.47		REACHABLE	692 s	001d.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	702 s	001c.4411.3ab7	Tel/0/4	200
ARP 192.0.9.46		REACHABLE	680 s	001c.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	708 s	001c.4411.3ab7	Tel/0/4	200
ARP 192.0.9.45		REACHABLE	683 s	001c.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	710 s	001c.4411.3ab7	Tel/0/4	200
ARP 192.0.9.44		REACHABLE	697 s	001c.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	704 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.43		REACHABLE	696 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	701 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.42		REACHABLE	695 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	709 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.41		REACHABLE	688 s	001c.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	705 s	001c.4411.3ab7	Tel/0/4	200
ARP 192.0.9.40		REACHABLE	693 s	001c.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	707 s	001c.4411.3ab7	Tel/0/4	200
ARP 192.0.9.39		REACHABLE	685 s	001c.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	713 s	001c.4411.3ab7	Tel/0/4	200
ARP 192.0.9.38		REACHABLE	690 s	001c.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	706 s	001c.4411.3ab7	Tel/0/4	200
ARP 192.0.9.37		REACHABLE	682 s	001c.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	703 s	001c.4411.3ab7	Tel/0/4	200
ARP 192.0.9.36		REACHABLE	694 s	001c.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	708 s	001c.4411.3ab7	Tel/0/4	200
ARP 192.0.9.35		REACHABLE	686 s	001c.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	702 s	001c.4411.3ab7	Tel/0/4	200
ARP 192.0.9.34		REACHABLE	691 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	707 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.33		REACHABLE	684 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	700 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.32		REACHABLE	692 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	698 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.31		REACHABLE	687 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	705 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.30		REACHABLE	679 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	693 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.29		REACHABLE	681 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	708 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.28		REACHABLE	675 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	712 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.27		REACHABLE	677 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	709 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.26		REACHABLE	673 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	714 s	001b.4411.3ab7	Tel/0/4	200
ARP 192.0.9.25		REACHABLE	671 s	001b.4411.3ab7	Tel/0/4	200
00FF 22s		REACHABLE	706 s	001b.4411.3ab7	Tel/0/4	200

The address count limit is changed from 25 to a lower limit of 5. But because the existing entries have not completed their binding entry lifecycle, they are not deleted from the binding table. In order to make the new address count limit of 5 take effect immediately, the **clear device-tracking database** command is used to delete all existing entries. New entries are then learned and added as per the current limit address-count settings.

**device-tracking policy**

```

Device# configure terminal
Device(config)# device-tracking policy sisf-01
Device(config-device-tracking)# limit address-count 5
Device(config-device-tracking)# end
Device# show device-tracking policy sisf-01
Device-tracking policy sisf-01 configuration:
    security-level guard
    device-role node
    gleaning from Neighbor Discovery
    gleaning from DHCP6
    gleaning from ARP
    gleaning from DHCP4
    NOT gleaning from protocol unkn
    limit address-count 5
Policy sisf-01 is applied on the following targets:
Target          Type   Policy           Feature          Target range
Tel/0/4         PORT   sisf-01        Device-tracking vlan 200
vlan 200        VLAN   sisf-01        Device-tracking vlan all

Device# show device-tracking database
Binding Table has 25 entries, 25 dynamic (limit 200000)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match      0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk     0010:Orig trusted access  0020:DHCP assigned
0040:Cga authenticated      0080:Cert authenticated   0100:Statically assigned

      Network Layer Address          Link Layer Address      Interface  vlan
prlvl   age       state      Time left
ARP 192.0.9.49          REACHABLE  654 s   001d.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.48          REACHABLE  646 s   001d.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.47          REACHABLE  642 s   001d.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.46          REACHABLE  669 s   001d.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.45          REACHABLE  647 s   001d.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.44          REACHABLE  657 s   001d.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.43          REACHABLE  635 s   001c.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.42          REACHABLE  663 s   001c.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.41          REACHABLE  638 s   001c.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.40          REACHABLE  663 s   001c.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.39          REACHABLE  665 s   001c.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.38          REACHABLE  652 s   001c.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.37          REACHABLE  652 s   001c.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.36          REACHABLE  662 s   001c.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.35          REACHABLE  650 s   001c.4411.3ab7  Tel/0/4   200
00FF   67s
ARP 192.0.9.34          REACHABLE  663 s   001c.4411.3ab7  Tel/0/4   200
00FF   67s

```

ARP 192.0.9.33			001b.4411.3ab7	Tel/0/4	200
00FF 67s	REACHABLE	637 s			
ARP 192.0.9.32			001b.4411.3ab7	Tel/0/4	200
00FF 67s	REACHABLE	652 s			
ARP 192.0.9.31			001b.4411.3ab7	Tel/0/4	200
00FF 67s	REACHABLE	638 s			
ARP 192.0.9.30			001b.4411.3ab7	Tel/0/4	200
00FF 67s	REACHABLE	633 s			
ARP 192.0.9.29			001b.4411.3ab7	Tel/0/4	200
00FF 67s	REACHABLE	651 s			
ARP 192.0.9.28			001b.4411.3ab7	Tel/0/4	200
00FF 67s	REACHABLE	658 s			
ARP 192.0.9.27			001b.4411.3ab7	Tel/0/4	200
00FF 67s	REACHABLE	668 s			
ARP 192.0.9.26			001b.4411.3ab7	Tel/0/4	200
00FF 67s	REACHABLE	650 s			
ARP 192.0.9.25			001b.4411.3ab7	Tel/0/4	200
00FF 67s	REACHABLE	641 s			

Device# **clear device-tracking database**

```
*Dec 13 15:10:22.837: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.49 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.838: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.48 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.838: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.47 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.838: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.46 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.839: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.45 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.839: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.44 VLAN=200
MAC=001d.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.839: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.43 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.839: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.42 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.840: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.41 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.840: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.40 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.840: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.39 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.841: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.38 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.841: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.37 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.841: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.36 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.842: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.35 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.842: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.34 VLAN=200
MAC=001c.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.842: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.33 VLAN=200
MAC=001b.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.842: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.32 VLAN=200
MAC=001b.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.843: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.31 VLAN=200
MAC=001b.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.843: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.30 VLAN=200
MAC=001b.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.843: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.29 VLAN=200
MAC=001b.4411.3ab7 I/F=Tel/0/4 Preflevel=0OFF
*Dec 13 15:10:22.844: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.28 VLAN=200
```

## device-tracking policy

```

MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF
*Dec 13 15:10:22.844: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.27 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF
*Dec 13 15:10:22.844: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.26 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF
*Dec 13 15:10:22.844: %SISF-6-ENTRY_DELETED: Entry deleted IP=192.0.9.25 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF

Device# show device-tracking database
<no output; binding table cleared>

*Dec 13 15:11:38.346: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.25 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF
*Dec 13 15:11:38.346: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.26 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF
*Dec 13 15:11:38.347: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.27 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF
*Dec 13 15:11:38.347: %SISF-6-ENTRY_MAX_ORANGE: Reaching 80% of max adr allowed per policy
(5) V=200 I=Te1/0/4 M=001b.4411.3ab7
*Dec 13 15:11:38.347: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.28 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF
*Dec 13 15:11:38.347: %SISF-6-ENTRY_CREATED: Entry created IP=192.0.9.29 VLAN=200
MAC=001b.4411.3ab7 I/F=Te1/0/4 Preflevel=0OFF

Device# show device-tracking database
Binding Table has 5 entries, 5 dynamic (limit 200000)
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match      0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk     0010:Orig trusted access  0020:DHCP assigned
0040:Cga authenticated      0080:Cert authenticated   0100:Statically assigned

Network Layer Address           Link Layer Address       Interface  vlan
prlvl    age      state        Time left
ARP 192.0.9.29                  001b.4411.3ab7      Te1/0/4   200
0OFF    15s     REACHABLE    716 s
ARP 192.0.9.28                  001b.4411.3ab7      Te1/0/4   200
0OFF    15s     REACHABLE    702 s
ARP 192.0.9.27                  001b.4411.3ab7      Te1/0/4   200
0OFF    15s     REACHABLE    705 s
ARP 192.0.9.26                  001b.4411.3ab7      Te1/0/4   200
0OFF    15s     REACHABLE    716 s
ARP 192.0.9.25                  001b.4411.3ab7      Te1/0/4   200
0OFF    15s     REACHABLE    718 s

```

# device-tracking tracking

To enable polling for IPv4 and IPv6 and configure the polling parameters, configure the **device-tracking tracking** command in global configuration mode. To disable polling, enter the **no** form of the command.



**Note** This command does not enable the SISF-based device-tracking feature. It enables configuration of polling parameters on a device where the device-tracking feature is enabled.

---

**device-tracking tracking [ auto-source [ fallback *ipv4\_and\_fallback\_source\_mask ip\_prefix\_mask* [ override ] | retry-interval *seconds* ] ]**

**no device-tracking tracking [ auto-source | retry-interval ]**

Syntax Description	auto-source	Causes the source address of an Address Resolution Protocol (ARP) probe to be sourced in the following order of preference:
	<b>fallback</b> <i>ipv4_and_fallback_source_mask ip_prefix_mask</i>	Causes the source address of an ARP probe to be sourced in the following order of preference: <ul style="list-style-type: none"><li>• The first preference is to set the source address to the VLAN SVI, if an SVI is configured.</li><li>• The second preference is to locate an IP-MAC binding entry in device-tracking table, from same subnet and use that as the source address.</li><li>• The third and last preference is to use 0.0.0.0 as the source address.</li></ul>
		 The source MAC address is taken from the MAC address of the switchport facing the client.  If you configure the <b>fallback</b> keyword, you must also specify an IP address and mask.

---

<b>override</b>	Causes the source address of an ARP probe to be sourced in the following order of preference: <ul style="list-style-type: none"> <li>The first preference is to set the source address to the VLAN SVI, if this is configured.</li> <li>The second and last preference is to use 0.0.0.0 as the source address.</li> </ul>
<b>retry-interval seconds</b>	<p><b>Note</b> This keyword configures SISF to <i>not</i> select the source address from the binding table. We do not recommend using this option if an SVI is not configured.</p> <p>Configures a multiplicative factor or "base value", for the backoff algorithm. The backoff algorithm determines the wait time between the 3 polling attempts that occur after reachable lifetime expiry.</p> <p>Enter a value between 1 and 3600 seconds. The default value is one.</p> <p>When polling, there is an increasing wait time between the 3 polling attempts or retries. The backoff algorithm determines this wait time. The value you configure for the retry interval is multiplied by the backoff algorithm's wait time.</p> <p>For example, if the backoff algorithm determines a wait time of 2, 4, and 6 seconds between the 3 attempts respectively, and you configure a retry interval of 2 seconds, the actual interval you will observe is as follows: 2*2 seconds of wait time before the first polling attempt, 2*4 seconds for the second polling attempt and 2*6 for the third polling attempt.</p> <p>If polling is enabled, but a retry interval is not configured, the switch polls the host up to 3 times at system-determined intervals.</p> <p>This configuration applies to ARP probes and Neighbor Solicitation messages.</p>

---

**Command Default** Polling is disabled by default.

**Command Modes** Global configuration [Device(config)# ]

<b>Release</b>	<b>Modification</b>
----------------	---------------------

Cisco IOS XE Denali 16.1.1 This command was introduced.

## Usage Guidelines

Polling is a periodic and conditional checking of the host to see the state it is in, whether it is still connected, and whether it is communicating. Polling enables you to assess the continued presence of a tracked device.

Polling occurs at these junctures: 3 times after the reachable lifetime timer expires, and a final attempt at stale lifetime expiry.

- In an IPv4 network, polling is in the form of an ARP probe. Here, the switch sends unicast ARP probes to the connected host, to determine the host's reachability status. When sending ARP probes, the system constructs packets according to [RFC 5227](#) specifications.
- In an IPv6 network, polling is in the form of a Neighbor Solicitation message. Here, the switch verifies reachability of a connected host by using the unicast address of the connected host as the destination address.

Configure the **device-tracking tracking** command in global configuration mode, to enable polling for IPv4 and IPv6.

Also configure the **retry-interval seconds** to configure the polling interval after reachable lifetime timer expiry.



**Note** The **auto-source**, **fallback ipv4\_and\_fallback\_source\_maskip\_prefix\_mask**, and **override** keywords apply only to ARP probes and not Neighbor Solicitation messages.

The value you configure for **retry-interval seconds** keywords applies to both IPv4 and IPv6.

---

Enter the **show running-config | include device-tracking** display current polling settings. For example:

```
Device# show running-config | include device-tracking
device-tracking tracking retry-interval 2
device-tracking policy sisf-01
  device-tracking attach-policy sisf-01 vlan 200
device-tracking binding reachable-lifetime 50 stale-lifetime 150 down-lifetime 30
device-tracking binding logging
```

Enter the **show device-tracking database** command in privileged EXEC mode, to display the duration of the various lifetimes of an entry. While polling, the system changes the state of the entry to VERIFY. Check the **Time left** column in the output to observe the duration.

When you track the reachable and stale lifetime of an entry with the **show device-tracking database** command, and polling is enabled, you may notice that the STALE lifetime is sometimes shorter than what you have configured. This is because the time required for polling is *subtracted* from the stale lifetime.

### Global versus Policy-Level Settings for Polling

After you configure **device-tracking tracking** command in global configuration mode, you still have the flexibility to turn polling on or off, for individual interfaces and VLANs. For this you must enable or disable polling in the policy. Note how the global and policy-level settings interact:

Global Setting	Policy-Level Setting	Result
Polling is enabled at the global level.  Device (config) # device-tracking tracking	Polling is enabled on an interface or VLAN.  Device (config-device-tracking) # tracking enable	Polling is effective on the interface or VLAN.
	Polling is disabled on an interface or VLAN.  Device (config-device-tracking) # tracking disable	Polling is not effective on the interface or VLAN.
	Default polling is configured on the interface or VLAN.  Device (config-device-tracking) # default tracking	Because polling is enabled at the <i>global</i> config level, polling is effective on the interface or VLAN.
	The <b>no</b> form of the command is configured on the interface or VLAN.  Device (config-device-tracking) # no tracking	The <b>no</b> form of the command sets the command to its default. But because polling is enabled at the <i>global</i> config level, polling is effective on the interface or VLAN.
Polling is disabled at the global level.  Device (config) # no device-tracking tracking	Polling is enabled on an interface or VLAN.  Device (config-device-tracking) # tracking enable	Polling is effective on the interface or VLAN.
	Polling is disabled on an interface or VLAN.  Device (config-device-tracking) # tracking disable	Polling is not effective on the interface or VLAN.
	Default polling is configured on the interface or VLAN.  Device (config-device-tracking) # default tracking	Polling is not effective on the interface or VLAN.
	The <b>no</b> form of the command is configured on the interface or VLAN.  Device (config-device-tracking) # no tracking	Polling is not effective on the interface or VLAN.

# device-tracking upgrade-cli

To convert legacy IP Device Tracking (IPDT) and IPv6 Snooping commands to SISF commands, configure the **device-tracking upgrade-cli** command in global configuration mode. To revert to legacy commands, enter the **no** form of the command.

**device-tracking upgrade-cli [ force | revert ]**

**no device-tracking upgrade-cli [ force | revert ]**

<b>Syntax Description</b>	<b>force</b> Skips the confirmation step and converts legacy IPDT and IPv6 Snooping commands to SISF commands. <b>revert</b> Reverts to legacy IPDT and IPv6 Snooping commands.				
<b>Command Default</b>	Legacy IPDT and IPv6 Snooping commands remain as-is.				
<b>Command Modes</b>	Global configuration [Device(config)#]				
<b>Command History</b>	<table> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.1.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Denali 16.1.1	This command was introduced.				

## Only IPDT Configuration Exists

If your device has only IPDT configuration, running the **device-tracking upgrade-cli** command converts the configuration to use the new SISF policy that is created and attached to the interface. You can then update this SISF policy.

If you continue to use the legacy commands, this restricts you to operate in a legacy mode where only the legacy IPDT and IPv6 snooping commands are available on the device.

## Only IPv6 Snooping Configuration Exists

On a device with existing IPv6 snooping configuration, the old IPv6 Snooping commands are available for further configuration. The following options are available:

- (Recommended) Use the **device-tracking upgrade-cli** command to convert all your legacy configuration to the new SISF-based device tracking commands. After conversion, only the new device tracking commands will work on your device.
- Use the legacy IPv6 Snooping commands for your future configuration and do not run the **device-tracking upgrade-cli** command. With this option, only the legacy IPv6 Snooping commands are available on your device, and you cannot use the new SISF-based device tracking CLI commands.

## Both IPDT and IPv6 Snooping Configuration Exist

On a device that has both legacy IPDT configuration and IPv6 snooping configuration, you can convert legacy commands to the SISF-based device tracking CLI commands. However, note that only one snooping policy can be attached to an interface, and the IPv6 snooping policy parameters override the IPDT settings.



- Note** If you do not migrate to the new SISF-based commands and continue to use the legacy IPv6 snooping or IPDT commands, your IPv4 device tracking configuration information may be displayed in the IPv6 snooping commands, as the SISF-based device tracking feature handles both IPv4 and IPv6 configuration. To avoid this, we recommend that you convert your legacy configuration to SISF-based device tracking commands.

## No IPDT or IPv6 Snooping Configuration Exists

If your device has no legacy IP Device Tracking or IPv6 Snooping configurations, you can use only the new SISF-based device tracking commands for all your future configuration. The legacy IPDT commands and IPv6 snooping commands are not available.

### Examples

The following example shows you how to convert IPv6 Snooping commands to SISF-based device-tracking commands.

```
Device# show ipv6 snooping features
Feature name      priority state
Device-tracking    128     READY
Source guard       32      READY

Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# device-tracking upgrade-cli
IPv6 Snooping and IPv4 device tracking CLI will be
converted to the new top level device-tracking CLI
Are you sure ? [yes]: yes
Number of Snooping Policies Upgraded: 2
Device(config)# exit
```

After conversion, only the new SISF-based device-tracking commands will work on your device:

```
Device# show ipv6 snooping features
^
% Invalid input detected at '^' marker.

Device# show device-tracking features
Feature name      priority state
Device-tracking    128     READY
Source guard       32      READY

Device# show device-tracking policies
Target           Type   Policy          Feature           Target range
Te1/0/4          PORT   sisf-01        Device-tracking  vlan 200
vlan 200          VLAN   sisf-01        Device-tracking  vlan all
```

# device-tracking (VLAN config)

To enable Switch Integrated Security Features (SISF)-based device tracking and attach the *default* policy to a VLAN, or to enable the feature, attach a custom policy to a VLAN, and specify policy priority, enter the **device-tracking** command in VLAN configuration mode. To detach the policy from a VLAN and revert to default, use the **no** form of the command.

**device-tracking [ attach-policy *policy-name* ] [ priority *priority-value* ]**

<b>Syntax Description</b>	<b>attach-policy <i>policy-name</i></b> Attaches the custom policy that you specify, to the VLAN.	
	<b>priority <i>priority-value</i></b>	<b>Note</b> Although visible on the CLI, configuring this command has no effect. Policy priority is system-determined. You cannot change this.

<b>Command Default</b>	SISF-based device tracking is disabled.	
<b>Command Modes</b>	VLAN configuration mode [Device((config-vlan-config)#)]	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced

<b>Usage Guidelines</b>	If you enter the <b>device-tracking</b> command in VLAN configuration mode, without any other keywords, the system attaches the <i>default</i> policy to the VLAN. The default policy is a built-in policy with default settings; you cannot change any of the parameters of the default policy.  If you configure the <b>device-tracking attach-policy <i>policy-name</i></b> command in VLAN configuration mode, the custom policy you specify is attached to the VLAN. With a custom policy, you can configure certain parameters of a custom policy.
	You can enable the feature and attach a policy - custom or default - to one or more VLANs or a range of VLANs.

## Examples

- [Example: Enabling SISF-Based Device Tracking and Attaching the Default Policy, on page 927](#)
- [Example: Attaching a Custom Policy to a VLAN, on page 928](#)
- [Example: Attaching a Custom Policy to a Range of VLANs, on page 928](#)

<b>Examples</b>	The following example shows how to enable SISF-based device tracking and attach the default policy to VLAN 500:
	<pre>Device# show device-tracking policies Target          Type    Policy           Feature           Target range Tel1/0/1        PORT   sisf-03         Device-tracking  vlan all</pre>

**device-tracking (VLAN config)**

```

Tel1/0/1           PORT default          Address Resolution Relay vlan all
Tel1/0/2           PORT default          Device-tracking vlan all
vlan 333          VLAN sisf-01         Device-tracking vlan all

Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#vlan configuration 500
Device(config-vlan-config)# device-tracking
Device(config-vlan-config)# end

Device#show device-tracking policies
Target            Type   Policy          Feature      Target range
Tel1/0/1          PORT   sisf-03        Device-tracking vlan all
Tel1/0/1          PORT   default        Address Resolution Relay vlan all
Tel1/0/2          PORT   default        Device-tracking vlan all
vlan 333          VLAN   sisf-01        Device-tracking vlan allvlan 500
VLAN default          Device-tracking vlan all

```

**Examples**

The following example shows how to attach a custom policy called sisf-03, to the same VLAN as the above example, that is, VLAN 500. Doing so replaces the existing default policy with custom policy sisf-03 on the VLAN:

```

Device# show device-tracking policies
Target            Type   Policy          Feature      Target range
Tel1/0/1          PORT   sisf-03        Device-tracking vlan all
Tel1/0/1          PORT   default        Address Resolution Relay vlan all
Tel1/0/2          PORT   default        Device-tracking vlan all
vlan 333          VLAN   sisf-01        Device-tracking vlan all
vlan 500          VLAN   default        Device-tracking vlan all

Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# vlan configuration 500
Device(config-vlan-config)# device-tracking attach-policy sisf-03
Device(config-vlan-config)# end

Device# show device-tracking policies
Target            Type   Policy          Feature      Target range
Tel1/0/1          PORT   sisf-03        Device-tracking vlan all
Tel1/0/1          PORT   default        Address Resolution Relay vlan all
Tel1/0/2          PORT   default        Device-tracking vlan all
vlan 333          VLAN   sisf-01        Device-tracking vlan allvlan 500
VLAN sisf-03          Device-tracking vlan all

```

**Examples**

The following example shows how to attach a custom policy to a range of VLANs (VLANs 10 to 15):

```

Device(config)# vlan configuration 10-15
Device(config-vlan-config)#device-tracking attach-policy sisf-01
Device(config-vlan-config)#end

Device# show device-tracking policies
Target            Type   Policy          Feature      Target range
Tel1/0/2          PORT   default        Device-tracking vlan all
vlan 10           VLAN   sisf-01        Device-tracking vlan all
vlan 11           VLAN   sisf-01        Device-tracking vlan all
vlan 12           VLAN   sisf-01        Device-tracking vlan all
vlan 13           VLAN   sisf-01        Device-tracking vlan all

```

```
vlan 14           VLAN  sisf-01      Device-tracking vlan all
vlan 15           VLAN  sisf-01      Device-tracking vlan all
```

# dot1x critical (global configuration)

To configure the IEEE 802.1X critical authentication parameters, use the **dot1x critical** command in global configuration mode.

## dot1x critical eapol

<b>Syntax Description</b>	<b>eapol</b> Specifies that the switch send an EAPOL-Success message when the switch successfully authenticates the critical port.				
<b>Command Default</b>	<b>eapol</b> is disabled				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

This example shows how to specify that the switch sends an EAPOL-Success message when the switch successfully authenticates the critical port:

```
Device(config)# dot1x critical eapol
```

# dot1x max-start

To set the maximum number of Extensible Authentication Protocol over LAN (EAPOL) start frames that a supplicant sends (assuming that no response is received) to the client before concluding that the other end is 802.1X unaware, use the **dot1x max-start** command in interface configuration mode. To remove the maximum number-of-times setting, use the **no** form of this command.

**dot1x max-start *number***  
**no dot1x max-start**

<b>Syntax Description</b>	<i>number</i> Maximum number of times that the router sends an EAPOL start frame. The value is from 1 to 10. The default is 3.				
<b>Command Default</b>	The default maximum number setting is 3.				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** You must enter the **switchport mode access** interface configuration command on a switch port before entering this command.

The following example shows that the maximum number of EAPOL Start requests has been set to 5:

```
Device(config)# interface g1/0/3
Device(config-if)# dot1x max-start 5
```

# dot1x pae

To set the Port Access Entity (PAE) type, use the **dot1x pae** command in interface configuration mode. To disable the PAE type that was set, use the **no** form of this command.

```
dot1x pae {supplicant | authenticator | both}
no dot1x pae {supplicant | authenticator | both}
```

<b>Syntax Description</b>	<b>supplicant</b> The interface acts only as a supplicant and will not respond to messages that are meant for an authenticator. <b>authenticator</b> The interface acts only as an authenticator and will not respond to any messages meant for a supplicant. <b>both</b> (Optional) The interface behaves both as a supplicant and as an authenticator and thus will respond to all dot1x messages.						
<b>Command Default</b>	PAE type is not set.						
<b>Command Modes</b>	Interface configuration						
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> <tr> <td>Cisco IOS XE Denali 16.3.1</td><td>This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.x</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.	Cisco IOS XE Denali 16.3.1	This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.x
<b>Release</b>	<b>Modification</b>						
Cisco IOS XE 3.2SE	This command was introduced.						
Cisco IOS XE Denali 16.3.1	This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.x						

**Usage Guidelines** Use the **no dot1x pae** interface configuration command to disable IEEE 802.1x authentication on the port. When you configure IEEE 802.1x authentication on a port, such as by entering the **dot1x port-control** interface configuration command, the switch automatically configures the port as an IEEE 802.1x authenticator. After the **no dot1x pae** interface configuration command is entered, the Authenticator PAE operation is disabled.

The following example shows that the interface has been set to act as a supplicant:

```
Device(config)# interface g1/0/3
Device(config-if)# dot1x pae supplicant
```

# dot1x supplicant controlled transient

To control access to an 802.1x supplicant port during authentication, use the **dot1x supplicant controlled transient** command in global configuration mode. To open the supplicant port during authentication, use the **no** form of this command.

**dot1x supplicant controlled transient**  
**no dot1x supplicant controlled transient**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Access is allowed to 802.1x supplicant ports during authentication.

**Command Modes** Global configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.
	Cisco IOS XE Denali 16.3.1	This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.x

**Usage Guidelines** In the default state, when you connect a supplicant switch to an authenticator switch that has BPCU guard enabled, the authenticator port could be error-disabled if it receives a Spanning Tree Protocol (STP) bridge protocol data unit (BPDU) packets before the supplicant switch has authenticated. Beginning with Cisco IOS Release 15.0(1)SE, you can control traffic exiting the supplicant port during the authentication period. Entering the **dot1x supplicant controlled transient** global configuration command temporarily blocks the supplicant port during authentication to ensure that the authenticator port does not shut down before authentication completes. If authentication fails, the supplicant port opens. Entering the **no dot1x supplicant controlled transient** global configuration command opens the supplicant port during the authentication period. This is the default behavior.

We strongly recommend using the **dot1x supplicant controlled transient** command on a supplicant switch when BPDU guard is enabled on the authenticator switch port with the **spanning-tree bpduguard enable** interface configuration command.

This example shows how to control access to 802.1x supplicant ports on a switch during authentication:

```
Device(config)# dot1x supplicant controlled transient
```

**dot1x supplicant force-multicast**

# dot1x supplicant force-multicast

To force a supplicant switch to send only multicast Extensible Authentication Protocol over LAN (EAPOL) packets whenever it receives multicast or unicast EAPOL packets, use the **dot1x supplicant force-multicast** command in global configuration mode. To return to the default setting, use the **no** form of this command.

```
dot1x supplicant force-multicast
no dot1x supplicant force-multicast
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** The supplicant switch sends unicast EAPOL packets when it receives unicast EAPOL packets. Similarly, it sends multicast EAPOL packets when it receives multicast EAPOL packets.

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
	Cisco IOS XE Denali 16.3.1	This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.x

**Usage Guidelines** Enable this command on the supplicant switch for Network Edge Access Topology (NEAT) to work in all host modes.

This example shows how force a supplicant switch to send multicast EAPOL packets to the authenticator switch:

```
Device(config)# dot1x supplicant force-multicast
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>cisp enable</b>	Enable Client Information Signalling Protocol (CISP) on the authenticator to a supplicant switch.
	<b>dot1x credentials</b>	Configure the 802.1x supplicant credentials.
	<b>dot1x pae supplicant</b>	Configure an interface to act only as a supplicant.

# dot1x test eapol-capable

To monitor IEEE 802.1x activity on all the switch ports and to display information about the devices that are connected to the ports that support IEEE 802.1x, use the **dot1x test eapol-capable** command in privileged EXEC mode on the switch stack or on a standalone switch.

**dot1x test eapol-capable [interface *interface-id*]**

<b>Syntax Description</b>	<b>interface <i>interface-id</i></b>	(Optional) Port to be queried.				
<b>Command Default</b>	There is no default setting.					
<b>Command Modes</b>	Privileged EXEC					
<b>Command History</b>	<b>Release</b>	<b>Modification</b>				
	Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	Use this command to test the IEEE 802.1x capability of the devices connected to all ports or to specific ports on a switch.  There is not a no form of this command.					
	This example shows how to enable the IEEE 802.1x readiness check on a switch to query a port. It also shows the response received from the queried port verifying that the device connected to it is IEEE 802.1x-capable:					
	<pre>Device# dot1x test eapol-capable interface gigabitethernet1/0/13 DOT1X_PORT_EAPOL_CAPABLE:DOT1X: MAC 00-01-02-4b-f1-a3 on gigabitethernet1/0/13 is EAPOL capable</pre>					
<b>Related Commands</b>	<table border="1"> <thead> <tr> <th><b>Command</b></th><th><b>Description</b></th></tr> </thead> <tbody> <tr> <td><b>dot1x test timeout <i>timeout</i></b></td><td>Configures the timeout used to readiness query.</td></tr> </tbody> </table>		<b>Command</b>	<b>Description</b>	<b>dot1x test timeout <i>timeout</i></b>	Configures the timeout used to readiness query.
<b>Command</b>	<b>Description</b>					
<b>dot1x test timeout <i>timeout</i></b>	Configures the timeout used to readiness query.					

# dot1x test timeout

To configure the timeout used to wait for EAPOL response from a port being queried for IEEE 802.1x readiness, use the **dot1x test timeout** command in global configuration mode on the switch stack or on a standalone switch.

**dot1x test timeout *timeout***

<b>Syntax Description</b>	<i>timeout</i>	Time in seconds to wait for an EAPOL response. The range is from 1 to 65535 seconds.				
<b>Command Default</b>	The default setting is 10 seconds.					
<b>Command Modes</b>	Global configuration					
<b>Command History</b>	<b>Release</b>	<b>Modification</b>				
	Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	Use this command to configure the timeout used to wait for EAPOL response. There is not a no form of this command.					
	This example shows how to configure the switch to wait 27 seconds for an EAPOL response:					
	Device# <b>dot1x test timeout 27</b>					
	You can verify the timeout configuration status by entering the <b>show run</b> privileged EXEC command.					
<b>Related Commands</b>	<table border="1"> <thead> <tr> <th>Command</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td><b>dot1x test eapol-capable [interface <i>interface-id</i>]</b></td> <td>Checks for IEEE 802.1x readiness on devices connected to all or to specified IEEE 802.1x-capable ports.</td> </tr> </tbody> </table>		Command	Description	<b>dot1x test eapol-capable [interface <i>interface-id</i>]</b>	Checks for IEEE 802.1x readiness on devices connected to all or to specified IEEE 802.1x-capable ports.
Command	Description					
<b>dot1x test eapol-capable [interface <i>interface-id</i>]</b>	Checks for IEEE 802.1x readiness on devices connected to all or to specified IEEE 802.1x-capable ports.					

# dot1x timeout

To configure the value for retry timeouts, use the **dot1x timeout** command in global configuration or interface configuration mode. To return to the default value for retry timeouts, use the **no** form of this command.

```
dot1x timeout {auth-period seconds | held-period seconds | quiet-period seconds | ratelimit-period seconds | server-timeout seconds | start-period seconds | supp-timeout seconds | tx-period seconds}
```

Syntax Description		
	<b>auth-period</b> <i>seconds</i>	Configures the time, in seconds for which a supplicant will stay in the HELD state (that is, the length of time it will wait before trying to send the credentials again after a failed attempt).  The range is from 1 to 65535. The default is 30.
	<b>held-period</b> <i>seconds</i>	Configures the time, in seconds for which a supplicant will stay in the HELD state (that is, the length of time it will wait before trying to send the credentials again after a failed attempt).  The range is from 1 to 65535. The default is 60
	<b>quiet-period</b> <i>seconds</i>	Configures the time, in seconds, that the authenticator (server) remains quiet (in the HELD state) following a failed authentication exchange before trying to reauthenticate the client.  The range is from 1 to 65535. The default is 60
	<b>ratelimit-period</b> <i>seconds</i>	Throttles the EAP-START packets that are sent from misbehaving client PCs (for example, PCs that send EAP-START packets that result in the wasting of switch processing power). <ul style="list-style-type: none"> <li>The authenticator ignores EAPOL-Start packets from clients that have successfully authenticated for the rate-limit period duration.</li> <li>The range is from 1 to 65535. By default, rate limiting is disabled.</li> </ul>
	<b>server-timeout</b> <i>seconds</i>	Configures the interval, in seconds, between two successive EAPOL-Start frames when they are being retransmitted. <ul style="list-style-type: none"> <li>The range is from 1 to 65535. The default is 30.</li> </ul> If the server does not send a response to an 802.1X packet within the specified period, the packet is sent again.
	<b>start-period</b> <i>seconds</i>	Configures the interval, in seconds, between two successive EAPOL-Start frames when they are being retransmitted.  The range is from 1 to 65535. The default is 30.  In Cisco IOS Release 15.2(5)E, this command is only available in the supplicant mode. If the command is applied in any other mode, the command misses from the configuration.

<b>supp-timeout</b> <i>seconds</i>	Sets the authenticator-to-suppliant retransmission time for all EAP messages other than EAP Request ID.  The range is from 1 to 65535. The default is 30.				
<b>tx-period</b> <i>seconds</i>	Configures the number of seconds between retransmission of EAP request ID packets (assuming that no response is received) to the client. <ul style="list-style-type: none"> <li>• The range is from 1 to 65535. The default is 30.</li> <li>• If an 802.1X packet is sent to the supplicant and the supplicant does not send a response after the retry period, the packet will be sent again.</li> </ul>				
<b>Command Default</b>	Periodic reauthentication and periodic rate-limiting are done.				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	You should change the default value of this command only to adjust for unusual circumstances such as unreliable links or specific behavioral problems with certain clients and authentication servers.
	The <b>dot1x timeout reauth-period</b> interface configuration command affects the behavior of the switch only if you have enabled periodic re-authentication by using the <b>dot1x reauthentication</b> interface configuration command.
	During the quiet period, the switch does not accept or initiate any authentication requests. If you want to provide a faster response time to the user, enter a number smaller than the default.

When the **ratelimit-period** is set to 0 (the default), the switch does not ignore EAPOL packets from clients that have been successfully authenticated and forwards them to the RADIUS server.

The following example shows that various 802.1X retransmission and timeout periods have been set:

```
Device(config)# configure terminal
Device(config)# interface g1/0/3
Device(config-if)# dot1x port-control auto
Device(config-if)# dot1x timeout auth-period 2000
Device(config-if)# dot1x timeout held-period 2400
Device(config-if)# dot1x timeout quiet-period 600
Device(config-if)# dot1x timeout start-period 90
Device(config-if)# dot1x timeout supp-timeout 300
Device(config-if)# dot1x timeout tx-period 60
Device(config-if)# dot1x timeout server-timeout 60
```

# enable password

To set a local password to control access to various privilege levels, use the **enable password** command in global configuration mode. To remove the password requirement, use the **noform** of this command.

```
enable password [level level] {[0] unencrypted-password | [ encryption-type] encrypted-password}
no enable password [level level]
```

Syntax Description	<table border="1"> <tr> <td><b>level</b> <i>level</i></td><td>(Optional) Level for which the password applies. You can specify up to 16 privilege levels, using numbers 0 through 15. Level 1 is normal EXEC-mode user privileges. If this argument is not specified in the command or the <b>no</b> form of the command, the privilege level defaults to 15 (traditional enable privileges).</td></tr> <tr> <td><b>0</b></td><td>(Optional) Specifies an unencrypted clear-text password. The password is converted to a Secure Hash Algorithm (SHA) 256 secret and gets stored in the device.</td></tr> <tr> <td><i>unencrypted-password</i></td><td>Password users type to enter enable mode.</td></tr> <tr> <td><i>encryption-type</i></td><td>(Optional) Cisco-proprietary algorithm used to encrypt the password. If you specify <i>encryption-type</i>, the next argument you supply must be an encrypted password (a password already encrypted by a Cisco device). You can specify type 7, which indicates a hidden password will follow.</td></tr> <tr> <td><i>encrypted-password</i></td><td>Encrypted password you enter, copied from another device configuration.</td></tr> </table>	<b>level</b> <i>level</i>	(Optional) Level for which the password applies. You can specify up to 16 privilege levels, using numbers 0 through 15. Level 1 is normal EXEC-mode user privileges. If this argument is not specified in the command or the <b>no</b> form of the command, the privilege level defaults to 15 (traditional enable privileges).	<b>0</b>	(Optional) Specifies an unencrypted clear-text password. The password is converted to a Secure Hash Algorithm (SHA) 256 secret and gets stored in the device.	<i>unencrypted-password</i>	Password users type to enter enable mode.	<i>encryption-type</i>	(Optional) Cisco-proprietary algorithm used to encrypt the password. If you specify <i>encryption-type</i> , the next argument you supply must be an encrypted password (a password already encrypted by a Cisco device). You can specify type 7, which indicates a hidden password will follow.	<i>encrypted-password</i>	Encrypted password you enter, copied from another device configuration.
<b>level</b> <i>level</i>	(Optional) Level for which the password applies. You can specify up to 16 privilege levels, using numbers 0 through 15. Level 1 is normal EXEC-mode user privileges. If this argument is not specified in the command or the <b>no</b> form of the command, the privilege level defaults to 15 (traditional enable privileges).										
<b>0</b>	(Optional) Specifies an unencrypted clear-text password. The password is converted to a Secure Hash Algorithm (SHA) 256 secret and gets stored in the device.										
<i>unencrypted-password</i>	Password users type to enter enable mode.										
<i>encryption-type</i>	(Optional) Cisco-proprietary algorithm used to encrypt the password. If you specify <i>encryption-type</i> , the next argument you supply must be an encrypted password (a password already encrypted by a Cisco device). You can specify type 7, which indicates a hidden password will follow.										
<i>encrypted-password</i>	Encrypted password you enter, copied from another device configuration.										

**Command Default** No password is defined. The default is level 15.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

## Usage Guidelines



**Caution** If neither the enable password command nor the enable secret command is configured, and if there is a line password configured for the console, the console line password will serve as the enable password for all VTY (Telnet and Secure Shell [SSH]) sessions.

Use this command with the **level** option to define a password for a specific privilege level. After you specify the level and the password, give the password to the users who need to access this level. Use the **privilege level** configuration command to specify commands accessible at various levels.

You will not ordinarily enter an encryption type. Typically you enter an encryption type only if you copy and paste into this command a password that has already been encrypted by a Cisco device.

**enable password**

**Caution** If you specify an encryption type and then enter a clear text password, you will not be able to reenter enable mode. You cannot recover a lost password that has been encrypted by any method.

If the **service password-encryption** command is set, the encrypted form of the password you create with the **enable password** command is displayed when a **more nvram:startup-config** command is entered.

You can enable or disable password encryption with the **service password-encryption** command.

An enable password is defined as follows:

- Must contain from 1 to 25 uppercase and lowercase alphanumeric characters.
- Can have leading spaces, but they are ignored. However, intermediate and trailing spaces are recognized.
- Can contain the question mark (?) character if you precede the question mark with the key combination Ctrl-v when you create the password; for example, to create the password *abc?123*, do the following:
  - Enter **abc**.
  - Type **Ctrl-v**.
  - Enter **?123**.

When the system prompts you to enter the enable password, you need not precede the question mark with the Ctrl-v; you can simply enter *abc?123* at the password prompt.

**Examples**

The following example enables the password “pswd2” for privilege level 2:

```
Device(config)# enable password level 2 pswd2
```

The following example sets the encrypted password “\$1\$i5Rkls3LoyxzS8t9”, which has been copied from a device configuration file, for privilege level 2 using encryption type 7:

```
Device(config)# enable password level 2 5 $1$i5Rkls3LoyxzS8t9
```

**Related Commands**

Command	Description
<b>enable secret</b>	Specifies an additional layer of security over the <b>enable password</b> command.

# enable secret

To specify an additional layer of security over the **enable password** command, use the **enable secret** command in global configuration mode. To turn off the **enable secret** function, use the **no** form of this command.

```
enable secret [level level] {[0] unencrypted-password | encryption-type encrypted-password}
no enable secret [level level] [encryption-type encrypted-password]
```

Syntax Description	<b>level</b> <i>level</i> (Optional) Specifies the level for which the password applies. You can specify up to 15 privilege levels, using numerals 1 through 15. Level 1 is normal EXEC-mode user privileges. If the <i>level</i> argument is not specified in the command or in the <b>no</b> form of the command, the privilege level defaults to 15 (traditional enable privileges).
<b>0</b>	(Optional) Specifies an unencrypted clear-text password. The password is converted to a Secure Hash Algorithm (SHA) 256 secret and gets stored in the device.
<i>unencrypted-password</i>	Password for users to enter enable mode. This password should be different from the password created with the <b>enable password</b> command.
<i>encryption-type</i>	Cisco-proprietary algorithm used to hash the password. <ul style="list-style-type: none"> <li>• <b>5</b>—Specifies a message digest algorithm 5 (MD5) encrypted secret.</li> <li>• <b>8</b>—Specifies a Password-Based Key Derivation Function 2 (PBKDF2) with SHA-256 hashed secret.</li> <li>• <b>9</b>—Specifies a scrypt hashed secret.</li> </ul>
<i>encrypted-password</i>	Hashed password that is copied from another device configuration.

**Command Default** No password is defined.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

## Usage Guidelines



**Caution** If neither the **enable password** command or the **enable secret** command is configured, and if a line password is configured for the console, the console line password will serve as the enable password for all vty (Telnet and Secure Shell [SSH]) sessions.

Use the **enable secret** command to provide an additional layer of security over the enable password. The **enable secret** command provides better security by storing the enable secret password using a nonreversible

cryptographic function. The added layer of security encryption provides is useful in environments where the password crosses the network or is stored on a TFTP server.

Typically you enter an encryption type only when you paste an encrypted password that you copied from a device configuration file into this command.



**Caution** If you specify an encryption type and then enter a clear-text password, you will not be able to reenter enable mode. You cannot recover a lost password that has been encrypted by any method.

If you use the same password for the **enable password** and **enable secret** commands, you receive an error message warning that this practice is not recommended, but the password will be accepted. By using the same password, however, you undermine the additional security the **enable secret** command provides.



**Note** After you set a password using the **enable secret** command, a password set using the **enable password** command works only if the **enable secret** is disabled or an older version of Cisco IOS software is being used, such as when running an older rxboot image. Additionally, you cannot recover a lost password that has been encrypted by any method.

If the **service password-encryption** command is set, the encrypted form of the password you create is displayed when the **more nvram:startup-config** command is entered.

You can enable or disable password encryption with the **service password-encryption** command.

An enable password is defined as follows:

- Must contain 1 to 25 alphanumeric characters, both uppercase and lowercase.
- Can have leading spaces, but they are ignored. However, intermediate and trailing spaces are recognized.
- Can contain the question mark (?) character if you precede the question mark with the key combination Crtl-v when you create the password; for example, to create the password *abc?123*, do the following:
  - Enter **abc**.
  - Press **Crtl-v**.
  - Enter **?123**.

When the system prompts you to enter the enable password, you need not precede the question mark with the Ctrl-v; you can enter **abc?123** at the password prompt.



**Note** If you use type 8 or type 9 passwords and then downgrade to an older version of Cisco IOS software that does not support type 8 and type 9 passwords, you must reconfigure the passwords to use type 5 hashing before downgrading. If not, you are locked out of the device and password recovery is required. If you are using an external AAA server to manage privilege levels, you are not locked out of the device.

## Examples

The following example shows how to specify the password with the **enable secret** command:

```
Device> enable
```

```
Device# configure terminal
Device(config)# enable secret password
```

After specifying a password with the **enable secret** command, users must enter this password to gain access. Any passwords set through **enable password** command will no longer work.

```
Password: password
```

The following example shows how to enable the encrypted password “\$1\$FaD0\$Xyti5Rkls3LoyxzS8”, which has been copied from a device configuration file, for privilege level 2 using the encryption type 4:

```
Device> enable
Device# configure terminal
Device(config)# enable password level 2 4 $1$FaD0$Xyti5Rkls3LoyxzS8
```

The following example shows the sample warning message that is displayed when a user enters the **enable secret 4 encrypted-password** command:

```
Device# configure terminal
Device(config)# enable secret 4 tnhtc92DXBhelxjYk8LWJrPV36S2i4ntXrbp4RFmfqY
```

WARNING: Command has been added to the configuration but Type 4 passwords have been deprecated.

Migrate to a supported password type

```
Device(config)# end
Device# show running-config | inc secret

enable secret 4 tnhtc92DXBhelxjYk8LWJrPV36S2i4ntXrbp4RFmfqY
```

## Related Commands

Command	Description
<b>enable password</b>	Sets a local password to control access to various privilege levels.
<b>more nvram:startup-config</b>	Displays the startup configuration file contained in NVRAM or specified by the CONFIG_FILE environment variable.
<b>service password-encryption</b>	Encrypt passwords.

**epm access-control open**

## epm access-control open

To configure an open directive for ports that do not have an access control list (ACL) configured, use the **epm access-control open** command in global configuration mode. To disable the open directive, use the **no** form of this command.

**epm access-control open**  
**no epm access-control open**

**Syntax Description** This command has no arguments or keywords.

**Command Default** The default directive applies.

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Use this command to configure an open directive that allows hosts without an authorization policy to access ports configured with a static ACL. If you do not configure this command, the port applies the policies of the configured ACL to the traffic. If no static ACL is configured on a port, both the default and open directives allow access to the port.

You can verify your settings by entering the **show running-config** privileged EXEC command.

This example shows how to configure an open directive.

```
Device(config)# epm access-control open
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>show running-config</b>	Displays the contents of the current running configuration file.

# ip access-list role-based

To create a role-based (security group) access control list (RBACL) and enter role-based ACL configuration mode, use the **ip access-list role-based** command in global configuration mode. To remove the configuration, use the **no** form of this command.

```
ip access-list role-based access-list-name
no ip access-list role-based access-list-name
```

<b>Syntax Description</b>	<i>access-list-name</i> Name of the security group access control list (SGACL).
---------------------------	---

<b>Command Default</b>	Role-based ACLs are not configured.
------------------------	-------------------------------------

<b>Command Modes</b>	Global configuration (config)
----------------------	-------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

<b>Usage Guidelines</b>	For SGACL logging, you must configure the <b>permit ip log</b> command. Also, this command must be configured in Cisco Identity Services Engine (ISE) to enable logging for dynamic SGACLs.
-------------------------	---

The following example shows how to define an SGACL that can be applied to IPv4 traffic and enter role-based access list configuration mode:

```
Switch(config)# ip access-list role-based rbac11
Switch(config-rb-acl)# permit ip log
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>permit ip log</b>	Permits logging that matches the configured entry.
	<b>show ip access-list</b>	Displays contents of all current IP access lists.

# ip admission

To enable web authentication, use the **ip admission** command in interface configuration mode. You can also use this command in fallback-profile configuration mode. To disable web authentication, use the **no** form of this command.

```
ip admission rule
no ip admission rule
```

<b>Syntax Description</b>	<i>rule</i> IP admission rule name.				
<b>Command Default</b>	Web authentication is disabled.				
<b>Command Modes</b>	Interface configuration Fallback-profile configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** The **ip admission** command applies a web authentication rule to a switch port.

This example shows how to apply a web authentication rule to a switchport:

```
Device# configure terminal
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip admission rule1
```

This example shows how to apply a web authentication rule to a fallback profile for use on an IEEE 802.1x enabled switch port.

```
Device# configure terminal
Device(config)# fallback profile profile1
Device(config-fallback-profile)# ip admission rule1
```

# ip admission name

To enable web authentication, use the **ip admission name** command in global configuration mode. To disable web authentication, use the **no** form of this command.

```
ip admission name name {consent | proxy http} [absolute timer minutes | inactivity-time minutes | list {acl | acl-name} | service-policy type tag service-policy-name]  

no ip admission name name {consent | proxy http} [absolute timer minutes | inactivity-time minutes | list {acl | acl-name} | service-policy type tag service-policy-name]
```

Syntax Description		
<i>name</i>		Name of network admission control rule.
<b>consent</b>		Associates an authentication proxy consent web page with the IP admission rule specified using the <i>admission-name</i> argument.
<b>proxy http</b>		Configures web authentication custom page.
<b>absolute-timer</b> <i>minutes</i>		(Optional) Elapsed time, in minutes, before the external server times out.
<b>inactivity-time</b> <i>minutes</i>		(Optional) Elapsed time, in minutes, before the external file server is deemed unreachable.
<b>list</b>		(Optional) Associates the named rule with an access control list (ACL).
<i>acl</i>		Applies a standard, extended list to a named admission control rule. The value ranges from 1 through 199, or from 1300 through 2699 for expanded range.
<i>acl-name</i>		Applies a named access list to a named admission control rule.
<b>service-policy type tag</b>		(Optional) A control plane service policy is to be configured.
<i>service-policy-name</i>		Control plane tag service policy that is configured using the <b>policy-map type control tag</b> <i>policyname</i> command, keyword, and argument. This policy map is used to apply the actions on the host when a tag is received.
<b>Command Default</b>	Web authentication is disabled.	
<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**ip admission name****Usage Guidelines**

The **ip admission name** command globally enables web authentication on a switch.

After you enable web authentication on a switch, use the **ip access-group in** and **ip admission web-rule** interface configuration commands to enable web authentication on a specific interface.

**Examples**

This example shows how to configure only web authentication on a switch port:

```
Device# configure terminal
Device(config) ip admission name http-rule proxy http
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip access-group 101 in
Device(config-if)# ip admission rule
Device(config-if)# end
```

This example shows how to configure IEEE 802.1x authentication with web authentication as a fallback mechanism on a switch port:

```
Device# configure terminal
Device(config) ip admission name rule2 proxy http
Device(config) fallback profile profile1
Device(config) ip access group 101 in
Device(config) ip admission name rule2
Device(config) interface gigabitethernet1/0/1
Device(config-if) dot1x port-control auto
Device(config-if) dot1x fallback profile1
Device(config-if) end
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>dot1x fallback</b>	Configures a port to use web authentication as a fallback method for clients that do not support IEEE 802.1x authentication.
<b>fallback profile</b>	Creates a web authentication fallback profile.
<b>ip admission</b>	Enables web authentication on a port.
<b>show authentication sessions interface <i>interface</i> detail</b>	Displays information about the web authentication session status.
<b>show ip admission</b>	Displays information about NAC cached entries or the NAC configuration.

# ip dhcp snooping database

To configure the Dynamic Host Configuration Protocol (DHCP)-snooping database, use the **ip dhcp snooping database** command in global configuration mode. To disable the DHCP-snooping database, use the **no** form of this command.

```
ip dhcp snooping database { crashinfo:url | flash:url | ftp:url | http:url | https:url | rcp:url
| scp:url | tftp:url | timeout seconds | usbflash0:url | write-delay seconds}
no ip dhcp snooping database [ timeout | write-delay ]
```

Syntax Description		
	<b>crashinfo:url</b>	Specifies the database URL for storing entries using crashinfo.
	<b>flash:url</b>	Specifies the database URL for storing entries using flash.
	<b>ftp:url</b>	Specifies the database URL for storing entries using FTP.
	<b>http:url</b>	Specifies the database URL for storing entries using HTTP.
	<b>https:url</b>	Specifies the database URL for storing entries using secure HTTP (https).
	<b>rcp:url</b>	Specifies the database URL for storing entries using remote copy (rcp).
	<b>scp:url</b>	Specifies the database URL for storing entries using Secure Copy (SCP).
	<b>tftp:url</b>	Specifies the database URL for storing entries using TFTP.
	<b>timeout seconds</b>	Specifies the timeout interval; valid values are from 0 to 86400 seconds.
	<b>usbflash0:url</b>	Specifies the database URL for storing entries using USB flash.
	<b>write-delay seconds</b>	Specifies the amount of time before writing the DHCP-snooping entries to an external server after a change is seen in the local DHCP-snooping database; valid values are from 15 to 86400 seconds.

## Command Default

The DHCP-snooping database is not configured.

**ip dhcp snooping database**

<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** You must enable DHCP snooping on the interface before entering this command. Use the **ip dhcp snooping** command to enable DHCP snooping.

This example shows how to specify the database URL using TFTP:

```
Device(config)# ip dhcp snooping database tftp://10.90.90.90/snooping-rp2
```

This example shows how to specify the amount of time before writing DHCP snooping entries to an external server:

```
Device(config)# ip dhcp snooping database write-delay 15
```

# ip dhcp snooping information option format remote-id

To configure the option-82 remote-ID suboption, use the **ip dhcp snooping information option format remote-id** command in global configuration mode on the switch to configure the option-82 remote-ID suboption. To configure the default remote-ID suboption, use the **no** form of this command.

```
ip dhcp snooping information option format remote-id {hostname | string string}
no ip dhcp snooping information option format remote-id {hostname | string string}
```

## Syntax Description

**hostname** Specify the switch hostname as the remote ID.

**string string** Specify a remote ID, using from 1 to 63 ASCII characters (no spaces).

## Command Default

The switch MAC address is the remote ID.

## Command Modes

Global configuration

## Command History

### Release

### Modification

Cisco IOS XE 3.2SE

This command was introduced.

## Usage Guidelines

You must globally enable DHCP snooping by using the **ip dhcp snooping** global configuration command for any DHCP snooping configuration to take effect.

When the option-82 feature is enabled, the default remote-ID suboption is the switch MAC address. This command allows you to configure either the switch hostname or a string of up to 63 ASCII characters (but no spaces) to be the remote ID.



**Note** If the hostname exceeds 63 characters, it will be truncated to 63 characters in the remote-ID configuration.

This example shows how to configure the option- 82 remote-ID suboption:

```
Device(config)# ip dhcp snooping information option format remote-id hostname
```

```
ip dhcp snooping verify no-relay-agent-address
```

## ip dhcp snooping verify no-relay-agent-address

To disable the DHCP snooping feature from verifying that the relay agent address (giaddr) in a DHCP client message matches the client hardware address on an untrusted port, use the **ip dhcp snooping verify no-relay-agent-address** command in global configuration mode. To enable verification, use the **no** form of this command.

```
ip dhcp snooping verify no-relay-agent-address
no ip dhcp snooping verify no-relay-agent-address
```

<b>Syntax Description</b>	This command has no arguments or keywords.	
<b>Command Default</b>	The DHCP snooping feature verifies that the relay-agent IP address (giaddr) field in DHCP client message on an untrusted port is 0.	
<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	By default, the DHCP snooping feature verifies that the relay-agent IP address (giaddr) field in DHCP client message on an untrusted port is 0; the message is dropped if the giaddr field is not 0. Use the <b>ip dhcp snooping verify no-relay-agent-address</b> command to disable the verification. Use the <b>no ip dhcp snooping verify no-relay-agent-address</b> to reenable verification.
-------------------------	--

This example shows how to enable verification of the giaddr in a DHCP client message:

```
Device(config)# no ip dhcp snooping verify no-relay-agent-address
```

# ip http access-class

To specify the access list that should be used to restrict access to the HTTP server, use the **ip http access-class** command in global configuration mode. To remove a previously configured access list association, use the **no** form of this command.



**Note** The existing **ip http access-class *access-list-number*** command is currently supported, but is going to be deprecated. Use the **ip http access-class **ipv4** { *access-list-number* | *access-list-name* }** and **ip http access-class **ipv6** *access-list-name*** instead.

---

```
ip http access-class { access-list-number | ipv4 { access-list-number | access-list-name } |  
          ipv6 access-list-name }  
no ip http access-class { access-list-number | ipv4 { access-list-number | access-list-name } |  
          ipv6 access-list-name }
```

---

Syntax Description	<b>ipv4</b>	Specifies the IPv4 access list to restrict access to the secure HTTP server.
	<b>ipv6</b>	Specifies the IPv6 access list to restrict access to the secure HTTP server.
	<i>access-list-number</i>	Standard IP access list number in the range 0 to 99, as configured by the <b>access-list</b> global configuration command.
	<i>access-list-name</i>	Name of a standard IPv4 access list, as configured by the <b>ip access-list</b> command.

**Command Default** No access list is applied to the HTTP server.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Denali 16.3.1	This command was modified. The <b>ipv4</b> and <b>ipv6</b> keyword were added.
	Cisco IOS XE Release 3.3SE	This command was introduced.

**Usage Guidelines** If this command is configured, the specified access list is assigned to the HTTP server. Before the HTTP server accepts a connection, it checks the access list. If the check fails, the HTTP server does not accept the request for a connection.

**Examples** The following example shows how to define an access list as 20 and assign it to the HTTP server:

```
Device(config)# ip access-list standard 20  
Device(config-std-nacl)# permit 209.165.202.130 0.0.0.255  
Device(config-std-nacl)# permit 209.165.201.1 0.0.255.255
```

**ip http access-class**

```
Device(config-std-nacl)# permit 209.165.200.225 0.255.255.255
Device(config-std-nacl)# exit
Device(config)# ip http access-class 20
```

The following example shows how to define an IPv4 named access list as and assign it to the HTTP server.

```
Device(config)# ip access-list standard Internet_filter
Device(config-std-nacl)# permit 1.2.3.4
Device(config-std-nacl)# exit
Device(config)# ip http access-class ipv4 Internet_filter
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip access-list</b>	Assigns an ID to an access list and enters access list configuration mode.
<b>ip http server</b>	Enables the HTTP 1.1 server, including the Cisco web browser user interface.

# ip radius source-interface

To force RADIUS to use the IP address of a specified interface for all outgoing RADIUS packets, use the **ip radius source-interface** command in global configuration mode. To prevent RADIUS from using the IP address of a specified interface for all outgoing RADIUS packets, use the no form of this command.

**ip radius source-interface *interface-name* [vrf *vrf-name*]**  
**no ip radius source-interface**

<b>Syntax Description</b>	<i>interface-name</i>	Name of the interface that RADIUS uses for all of its outgoing packets.
	<b>vrf <i>vrf-name</i></b>	(Optional) Per virtual route forwarding (VRF) configuration.

**Command Default** No default behavior or values.

**Command Modes** Global configuration (config)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

**Usage Guidelines** Use this command to set the IP address of an interface to be used as the source address for all outgoing RADIUS packets. The IP address is used as long as the interface is in the *up* state. The RADIUS server can use one IP address entry for every network access client instead of maintaining a list of IP addresses. Radius uses the IP address of the interface that it is associated to, regardless of whether the interface is in the *up* or *down* state.

The **ip radius source-interface** command is especially useful in cases where the router has many interfaces and you want to ensure that all RADIUS packets from a particular router have the same IP address.

The specified interface should have a valid IP address and should be in the *up* state for a valid configuration. If the specified interface does not have a valid IP address or is in the *down* state, RADIUS selects a local IP that corresponds to the best possible route to the AAA server. To avoid this, add a valid IP address to the interface or bring the interface to the *up* state.

Use the **vrf *vrf-name*** keyword and argument to configure this command per VRF, which allows multiple disjoined routing or forwarding tables, where the routes of one user have no correlation with the routes of another user.

**Examples** The following example shows how to configure RADIUS to use the IP address of interface s2 for all outgoing RADIUS packets:

```
ip radius source-interface s2
```

The following example shows how to configure RADIUS to use the IP address of interface Ethernet0 for VRF definition:

**ip radius source-interface**

```
ip radius source-interface Ethernet0 vrf vrf1
```

# ip source binding

To add a static IP source binding entry, use the **ip source binding** command. Use the **no** form of this command to delete a static IP source binding entry.

```
ip source binding mac-address vlan vlan-id ip-address interface interface-id
no ip source binding mac-address vlan vlan-id ip-address interface interface-id
```

<b>Syntax Description</b>	<i>mac-address</i>	Binding MAC address.
	<b>vlan</b> <i>vlan-id</i>	Specifies the Layer 2 VLAN identification; valid values are from 1 to 4094.
	<i>ip-address</i>	Binding IP address.
	<b>interface</b> <i>interface-id</i>	ID of the physical interface.

**Command Default** No IP source bindings are configured.

**Command Modes** Global configuration.

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** You can use this command to add a static IP source binding entry only.

The **no** format deletes the corresponding IP source binding entry. It requires the exact match of all required parameter in order for the deletion to be successful. Note that each static IP binding entry is keyed by a MAC address and a VLAN number. If the command contains the existing MAC address and VLAN number, the existing binding entry is updated with the new parameters instead of creating a separate binding entry.

This example shows how to add a static IP source binding entry:

```
Device# configure terminal
Deviceconfig) ip source binding 0100.0230.0002 vlan 11 10.0.0.4 interface gigabitethernet1/0/1
```

# ip ssh source-interface

To specify the IP address of an interface as the source address for a Secure Shell (SSH) client device, use the **ip ssh source-interface** command in global configuration mode. To remove the IP address as the source address, use the **no** form of this command.

```
ip ssh source-interface interface
no ip ssh source-interface interface
```

<b>Syntax Description</b>	<i>interface</i> The interface whose address is used as the source address for the SSH client.						
<b>Command Default</b>	The address of the closest interface to the destination is used as the source address (the closest interface is the output interface through which the SSH packet is sent).						
<b>Command Modes</b>	Global configuration (config)						
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Gibraltar 16.10.1</td><td>This command was introduced.</td></tr> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td><td></td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Gibraltar 16.10.1	This command was introduced.	Cisco IOS XE Gibraltar 16.11.1	
Release	Modification						
Cisco IOS XE Gibraltar 16.10.1	This command was introduced.						
Cisco IOS XE Gibraltar 16.11.1							
<b>Usage Guidelines</b>	By specifying this command, you can force the SSH client to use the IP address of the source interface as the source address.						

**Examples** In the following example, the IP address assigned to GigabitEthernet interface 1/0/1 is used as the source address for the SSH client:

```
Device> enable
Device# configure terminal
Device(config)# ip ssh source-interface GigabitEthernet 1/0/1
Device(config)# exit
```

# ip verify source

To enable IP source guard on an interface, use the **ip verify source** command in interface configuration mode. To disable IP source guard, use the **no** form of this command.

```
ip verify source [mac-check] [tracking]
no ip verify source
```

<b>mac-check</b>	(Optional) Enables IP source guard with MAC address verification.
<b>tracking</b>	(Optional) Enables IP port security to learn static IP address learning on a port.

**Command Default** IP source guard is disabled.

**Command Modes** Interface configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** To enable IP source guard with source IP address filtering, use the **ip verify source** interface configuration command.

To enable IP source guard with source IP address filtering and MAC address verification, use the **ip verify source mac-check** interface configuration command.

**Examples** This example shows how to enable IP source guard with source IP address filtering on an interface:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip verify source
```

This example shows how to enable IP source guard with MAC address verification:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# ip verify source mac-check
```

You can verify your settings by entering the **show ip verify source** privileged EXEC command.

# ipv6 access-list

To define an IPv6 access list and to place the device in IPv6 access list configuration mode, use the **ipv6 access-list** command in global configuration mode. To remove the access list, use the **no** form of this command.

```
ipv6 access-list access-list-name | match-local-traffic | log-update threshold threshold-in-msgs | role-based list-name
noipv6 access-list access-list-name | client permit-control-packets | log-update threshold | role-based list-name
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>ipv6</b> <i>access-list-name</i></td><td>Creates a named IPv6 ACL (up to 64 characters in length) and enters IPv6 ACL configuration mode.  <i>access-list-name</i> - Name of the IPv6 access list. Names cannot contain a space or quotation mark, or begin with a numeric.</td></tr> <tr> <td><b>match-local-traffic</b></td><td>Enables matching for locally-generated traffic.</td></tr> <tr> <td><b>log-update threshold</b> <i>threshold-in-msgs</i></td><td>Determines how syslog messages are generated after the initial packet match.  <i>threshold-in-msgs</i>- Number of packets generated.</td></tr> <tr> <td><b>role-based</b> <i>list-name</i></td><td>Creates a role-based IPv6 ACL.</td></tr> </table>	<b>ipv6</b> <i>access-list-name</i>	Creates a named IPv6 ACL (up to 64 characters in length) and enters IPv6 ACL configuration mode.  <i>access-list-name</i> - Name of the IPv6 access list. Names cannot contain a space or quotation mark, or begin with a numeric.	<b>match-local-traffic</b>	Enables matching for locally-generated traffic.	<b>log-update threshold</b> <i>threshold-in-msgs</i>	Determines how syslog messages are generated after the initial packet match.  <i>threshold-in-msgs</i> - Number of packets generated.	<b>role-based</b> <i>list-name</i>	Creates a role-based IPv6 ACL.
<b>ipv6</b> <i>access-list-name</i>	Creates a named IPv6 ACL (up to 64 characters in length) and enters IPv6 ACL configuration mode.  <i>access-list-name</i> - Name of the IPv6 access list. Names cannot contain a space or quotation mark, or begin with a numeric.								
<b>match-local-traffic</b>	Enables matching for locally-generated traffic.								
<b>log-update threshold</b> <i>threshold-in-msgs</i>	Determines how syslog messages are generated after the initial packet match.  <i>threshold-in-msgs</i> - Number of packets generated.								
<b>role-based</b> <i>list-name</i>	Creates a role-based IPv6 ACL.								

**Command Default** No IPv6 access list is defined.

**Command Modes** Global configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.x

**Usage Guidelines** IPv6 ACLs are defined by using the **ipv6 access-list** command in global configuration mode and their permit and deny conditions are set by using the **deny** and **permit** commands in IPv6 access list configuration mode. Configuring the **ipv6 access-list** command places the device in IPv6 access list configuration mode--the device prompt changes to Device(config-ipv6-acl)#. From IPv6 access list configuration mode, permit and deny conditions can be set for the defined IPv6 ACL.



**Note** IPv6 ACLs are defined by a unique name (IPv6 does not support numbered ACLs). An IPv4 ACL and an IPv6 ACL cannot share the same name.

IPv6 is automatically configured as the protocol type in **permit any any** and **deny any any** statements that are translated from global configuration mode to IPv6 access list configuration mode.

Every IPv6 ACL has implicit **permit icmp any any nd-na**, **permit icmp any any nd-ns**, and **deny ipv6 any any** statements as its last match conditions. (The former two match conditions allow for ICMPv6 neighbor discovery.) An IPv6 ACL must contain at least one entry for the implicit **deny ipv6 any any** statement to take effect. The IPv6 neighbor discovery process makes use of the IPv6 network layer service; therefore, by default, IPv6 ACLs implicitly allow IPv6 neighbor discovery packets to be sent and received on an interface. In IPv4, the Address Resolution Protocol (ARP), which is equivalent to the IPv6 neighbor discovery process, makes use of a separate data link layer protocol; therefore, by default, IPv4 ACLs implicitly allow ARP packets to be sent and received on an interface.

Use the **ipv6 traffic-filter** interface configuration command with the *access-list-name* argument to apply an IPv6 ACL to an IPv6 interface. Use the **ipv6 access-class** line configuration command with the *access-list-name* argument to apply an IPv6 ACL to incoming and outgoing IPv6 virtual terminal connections to and from the device.

An IPv6 ACL applied to an interface with the **ipv6 traffic-filter** command filters traffic that is forwarded, not originated, by the device.

## Examples

The example configures the IPv6 ACL list named list1 and places the device in IPv6 access list configuration mode.

```
Device(config)# ipv6 access-list list1
Device(config-ipv6-acl) #
```

The following example configures the IPv6 ACL named list2 and applies the ACL to outbound traffic on Ethernet interface 0. Specifically, the first ACL entry keeps all packets from the network FEC0:0:0:2::/64 (packets that have the site-local prefix FEC0:0:0:2 as the first 64 bits of their source IPv6 address) from exiting out of Ethernet interface 0. The second entry in the ACL permits all other traffic to exit out of Ethernet interface 0. The second entry is necessary because an implicit deny all condition is at the end of each IPv6 ACL.

```
Device(config)# ipv6 access-list list2 deny FEC0:0:0:2::/64 any
Device(config)# ipv6 access-list list2 permit any any
Device(config)# interface ethernet 0
Device(config-if)# ipv6 traffic-filter list2 out
```

# ipv6 snooping policy

**Note**

All existing IPv6 Snooping commands (prior to Cisco IOS XE Denali 16.1.1) now have corresponding SISF-based device-tracking commands that allow you to apply your configuration to both IPv4 and IPv6 address families. For more information, see the [device-tracking policy, on page 908](#) and [device-tracking upgrade-cli, on page 925](#) commands.

To configure an IPv6 snooping policy and enter IPv6 snooping configuration mode, use the **ipv6 snooping policy** command in global configuration mode. To delete an IPv6 snooping policy, use the **no** form of this command.

**ipv6 snooping policy** *snooping-policy*  
**no ipv6 snooping policy** *snooping-policy*

<b>Syntax Description</b>	<i>snooping-policy</i>	User-defined name of the snooping policy. The policy name can be a symbolic string (such as Engineering) or an integer (such as 0).
<b>Command Default</b>	An IPv6 snooping policy is not configured.	
<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	Use the <b>ipv6 snooping policy</b> command to create an IPv6 snooping policy. When the <b>ipv6 snooping policy</b> command is enabled, the configuration mode changes to IPv6 snooping configuration mode. In this mode, the administrator can configure the following IPv6 first-hop security commands: <ul style="list-style-type: none"> <li>The <b>device-role</b> command specifies the role of the device attached to the port.</li> <li>The <b>limit address-count</b> <i>maximum</i> command limits the number of IPv6 addresses allowed to be used on the port.</li> <li>The <b>protocol</b> command specifies that addresses should be gleaned with Dynamic Host Configuration Protocol (DHCP) or Neighbor Discovery Protocol (NDP).</li> <li>The <b>security-level</b> command specifies the level of security enforced.</li> <li>The <b>tracking</b> command overrides the default tracking policy on a port.</li> <li>The <b>trusted-port</b> command configures a port to become a trusted port; that is, limited or no verification is performed when messages are received.</li> </ul>
-------------------------	---

This example shows how to configure an IPv6 snooping policy:

```
Device(config)# ipv6 snooping policy policy1
```

```
Device(config-ipv6-snooping) #
```

# key chain macsec

To configure a MACsec key chain name on a device interface to fetch a Pre Shared Key (PSK), use the **key chain macsec** command in global configuration mode. To disable it, use the **no** form of this command.

**key chain *name* macsec {description | key | exit}**

<b>Syntax Description</b>	<table border="0"> <tr> <td><b>name</b></td><td>Name of a key chain to be used to get keys.</td></tr> <tr> <td><b>description</b></td><td>Provides description of the MACsec key chain.</td></tr> <tr> <td><b>key</b></td><td>Configure a MACsec key.</td></tr> <tr> <td><b>exit</b></td><td>Exits from the MACsec key-chain configuration mode.</td></tr> <tr> <td><b>no</b></td><td>Negates the command or sets the default values.</td></tr> </table>	<b>name</b>	Name of a key chain to be used to get keys.	<b>description</b>	Provides description of the MACsec key chain.	<b>key</b>	Configure a MACsec key.	<b>exit</b>	Exits from the MACsec key-chain configuration mode.	<b>no</b>	Negates the command or sets the default values.
<b>name</b>	Name of a key chain to be used to get keys.										
<b>description</b>	Provides description of the MACsec key chain.										
<b>key</b>	Configure a MACsec key.										
<b>exit</b>	Exits from the MACsec key-chain configuration mode.										
<b>no</b>	Negates the command or sets the default values.										
<b>Command Default</b>	key chain macsec is disabled.										
<b>Command Modes</b>	Global configuration										
<b>Command History</b>	<table border="0"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.1	This command was introduced.						
<b>Release</b>	<b>Modification</b>										
Cisco IOS XE Denali 16.3.1	This command was introduced.										

This example shows how to configure MACsec key chain to fetch a 128-bit Pre Shared Key (PSK):

```
Switch#configure terminal
Switch(config)#key chain kc1 macsec
Switch(config-keychain-macsec)#key 1000
Switch(config-keychain-macsec)#cryptographic-algorithm aes-128-cmac
Switch(config-keychain-macsec-key)# key-string fb63e0269e2768c49bab8ee9a5c2258f
Switch(config-keychain-macsec-key)#end
Switch#
```

This example shows how to configure MACsec key chain to fetch a 256-bit Pre Shared Key (PSK):

```
Switch#configure terminal
Switch(config)#key chain kc1 macsec
Switch(config-keychain-macsec)#key 2000
Switch(config-keychain-macsec)#cryptographic-algorithm aes-256-cmac
Switch(config-keychain-macsec-key)# key-string
c865632acb269022447c417504a1bf5db1c296449b52627ba01f2ba2574c2878
Switch(config-keychain-macsec-key)#end
Switch#
```

# key config-key password-encrypt

To store a type 6 encryption key in private NVRAM, use the **key config-key password-encrypt** command in global configuration mode. To disable the encryption, use the **no** form of this command.

**key config-key password-encrypt** [*text*]  
**no key config-key password-encrypt** [*text*]

## Syntax Description

<i>text</i>	(Optional) Password or master key.
<b>Note</b>	It is recommended that you do not use the <i>text</i> argument but instead use interactive mode (using the enter key after you enter the <b>key config-key password-encrypt</b> command) so that the preshared key will not be printed anywhere and, therefore, cannot be seen.

## Command Default

No type 6 password encryption

## Command Modes

Global configuration (config)

## Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

## Usage Guidelines

You can securely store plain text passwords in type 6 format in NVRAM using a command-line interface (CLI). Type 6 passwords are encrypted. Although the encrypted passwords can be seen or retrieved, it is difficult to decrypt them to find out the actual password. Use the **key config-key password-encrypt** command with the **password encryption aes** command to configure and enable the password (symmetric cipher Advanced Encryption Standard [AES] is used to encrypt the keys). The password (key) configured using the **key config-key password-encrypt** command is the primary encryption key that is used to encrypt all other keys in the device.

If you configure the **password encryption aes** command without configuring the **key config-key password-encrypt** command, the following message is printed at startup or during any nonvolatile generation (NVGEN) process, such as when the **show running-config** or **copy running-config startup-config** commands have been configured:

"Can not encrypt password. Please configure a configuration-key with 'key config-key'"

## Changing a Password

If the password (primary key) is changed, or reencrypted, using the **key config-key password-encryption** command, the list registry passes the old key and the new key to the application modules that are using type 6 encryption.

## Deleting a Password

If the primary key that was configured using the **key config-key password-encrypt** command is deleted from the system, a warning is printed (and a confirm prompt is issued) that states that all type 6 passwords will become useless. As a security measure, after the passwords have been encrypted, they will never be decrypted in the Cisco IOS software. However, passwords can be reencrypted as explained in the previous paragraph.

**key config-key password-encrypt**



**Caution** If the password configured using the **key config-key password-encrypt** command is lost, it cannot be recovered. The password should be stored in a safe location.

### Unconfiguring Password Encryption

If you later unconfigure password encryption using the **no password encryption aes** command, all existing type 6 passwords are left unchanged, and as long as the password (primary key) that was configured using the **key config-key password-encryption** command exists, the type 6 passwords will be decrypted as and when required by the application.

### Storing Passwords

Because no one can “read” the password (configured using the **key config-key password-encrypt** command), there is no way that the password can be retrieved from the device. Existing management stations cannot “know” what it is unless the stations are enhanced to include this key somewhere, in which case the password needs to be stored securely within the management system. If configurations are stored using TFTP, the configurations are not standalone, meaning that they cannot be loaded onto a device. Before or after the configurations are loaded onto a device, the password must be manually added (using the **key config-key password-encrypt** command). The password can be manually added to the stored configuration but is not recommended because adding the password manually allows anyone to decrypt all passwords in that configuration.

### Configuring New or Unknown Passwords

If you enter or cut and paste cipher text that does not match the primary key, or if there is no primary key, the cipher text is accepted or saved, but an alert message is printed. The alert message is as follows:

“ciphertext>[for username bar]> is incompatible with the configured master key.”

If a new primary key is configured, all the plain keys are encrypted and made type 6 keys. The existing type 6 keys are not encrypted. The existing type 6 keys are left as is.

If the old primary key is lost or unknown, you have the option of deleting the primary key using the **no key config-key password-encrypt** command. Deleting the primary key using the **no key config-key password-encrypt** command causes the existing encrypted passwords to remain encrypted in the device configuration. The passwords will not be decrypted.

### Examples

The following example shows that a type 6 encryption key is to be stored in NVRAM:

```
Device (config)# key config-key password-encrypt
```

### Related Commands

Command	Description
<b>password encryption aes</b>	Enables a type 6 encrypted preshared key.

# limit address-count

To limit the number of IPv6 addresses allowed to be used on the port, use the **limit address-count** command in Neighbor Discovery Protocol (NDP) inspection policy configuration mode or IPv6 snooping configuration mode. To return to the default, use the **no** form of this command.

**limit address-count** *maximum*  
**no limit address-count**

<b>Syntax Description</b>	<i>maximum</i> The number of addresses allowed on the port. The range is from 1 to 10000.
---------------------------	---

<b>Command Default</b>	The default is no limit.
------------------------	--------------------------

<b>Command Modes</b>	ND inspection policy configuration IPv6 snooping configuration
----------------------	---

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	The <b>limit address-count</b> command limits the number of IPv6 addresses allowed to be used on the port on which the policy is applied. Limiting the number of IPv6 addresses on a port helps limit the binding table size. The range is from 1 to 10000.
-------------------------	---

This example shows how to define an NDP policy name as policy1, place the switch in NDP inspection policy configuration mode, and limit the number of IPv6 addresses allowed on the port to 25:

```
Device(config)# ipv6 nd inspection policy policy1
Device(config-nd-inspection)# limit address-count 25
```

This example shows how to define an IPv6 snooping policy name as policy1, place the switch in IPv6 snooping policy configuration mode, and limit the number of IPv6 addresses allowed on the port to 25:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# limit address-count 25
```

# mab request format attribute 32

To enable VLAN ID-based MAC authentication on a switch, use the **mab request format attribute 32 vlan access-vlan** command in global configuration mode. To return to the default setting, use the **no** form of this command.

```
mab request format attribute 32 vlan access-vlan
no mab request format attribute 32 vlan access-vlan
```

<b>Syntax Description</b>	This command has no arguments or keywords.	
<b>Command Default</b>	VLAN-ID based MAC authentication is disabled.	
<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.
<b>Usage Guidelines</b>	<p>Use this command to allow a RADIUS server to authenticate a new user based on the host MAC address and VLAN.</p> <p>Use this feature on networks with the Microsoft IAS RADIUS server. The Cisco ACS ignores this command.</p>	

This example shows how to enable VLAN-ID based MAC authentication on a switch:

```
Device(config)# mab request format attribute 32 vlan access-vlan
```

Related Commands	Command	Description
	<b>authentication event</b>	Sets the action for specific authentication events.
	<b>authentication fallback</b>	Configures a port to use web authentication as a fallback method for clients that do not support IEEE 802.1x authentication.
	<b>authentication host-mode</b>	Sets the authorization manager mode on a port.
	<b>authentication open</b>	Enables or disables open access on a port.
	<b>authentication order</b>	Sets the order of authentication methods used on a port.
	<b>authentication periodic</b>	Enables or disables reauthentication on a port.
	<b>authentication port-control</b>	Enables manual control of the port authorization state.
	<b>authentication priority</b>	Adds an authentication method to the port-priority list.
	<b>authentication timer</b>	Configures the timeout and reauthentication parameters for an 802.1x-enabled port.

Command	Description
<b>authentication violation</b>	Configures the violation modes that occur when a new device connects to a port or when a new device connects to a port with the maximum number of devices already connected to that port.
<b>mab</b>	Enables MAC-based authentication on a port.
<b>mab eap</b>	Configures a port to use the Extensible Authentication Protocol (EAP).
<b>show authentication</b>	Displays information about authentication manager events on the switch.

# macsec network-link

To enable MKA MACsec configuration on the uplink interfaces, use the **macsec network-link** command on the interface. To disable it, use the **no** form of this command.

## macsec network-link

<b>Syntax Description</b>	<b>macsec network-link</b> Enables MKA MACsec configuration on device interfaces using EAP-TLS authentication protocol.
---------------------------	---

<b>Command Default</b>	macsec network-link is disabled.
------------------------	----------------------------------

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

This example shows how to configure MACsec MKA on an interface using the EAP-TLS authentication protocol:

```
Switch#configure terminal
Switch(config)# int G1/0/20
Switch(config-if)# macsec network-link
Switch(config-if)# end
Switch#
```

# match (access-map configuration)

To set the VLAN map to match packets against one or more access lists, use the **match** command in access-map configuration mode on the switch stack or on a standalone switch. To remove the match parameters, use the **no** form of this command.

```
match {ip address {namenumber} [{namenumber}] [{namenumber}]... | ipv6 address {namenumber} [{namenumber}] [{namenumber}]... | mac address {name} [{name}] [{name}]...}
no match {ip address {namenumber} [{namenumber}] [{namenumber}]... | ipv6 address {namenumber} [{namenumber}] [{namenumber}]... | mac address {name} [{name}] [{name}]...}
```

## Syntax Description

<b>ip address</b>	Sets the access map to match packets against an IP address access list.
<b>ipv6 address</b>	Sets the access map to match packets against an IPv6 address access list.
<b>mac address</b>	Sets the access map to match packets against a MAC address access list.
<b>name</b>	Name of the access list to match packets against.
<b>number</b>	Number of the access list to match packets against. This option is not valid for MAC access lists.

## Command Default

The default action is to have no match parameters applied to a VLAN map.

## Command Modes

Access-map configuration

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

You enter access-map configuration mode by using the **vlan access-map** global configuration command.

You must enter one access list name or number; others are optional. You can match packets against one or more access lists. Matching any of the lists counts as a match of the entry.

In access-map configuration mode, use the **match** command to define the match conditions for a VLAN map applied to a VLAN. Use the **action** command to set the action that occurs when the packet matches the conditions.

Packets are matched only against access lists of the same protocol type; IP packets are matched against IP access lists, IPv6 packets are matched against IPv6 access lists, and all other packets are matched against MAC access lists.

IP, IPv6, and MAC addresses can be specified for the same map entry.

This example shows how to define and apply a VLAN access map vmap4 to VLANs 5 and 6 that will cause the interface to drop an IP packet if the packet matches the conditions defined in access list al2:

```
Device(config)# vlan access-map vmap4
Device(config-access-map)# match ip address al2
Device(config-access-map)# action drop
```

match (access-map configuration)

```
Device(config-access-map)# exit
Device(config)# vlan filter vmap4 vlan-list 5-6
```

You can verify your settings by entering the **show vlan access-map** privileged EXEC command.

# mka policy (global configuration)

To create a MACsec Key Agreement (MKA) protocol policy and to enter MKA policy configuration mode, use the **no** form of this command. **mka policy** command in global configuration mode. To delete the policy, use the **no** form of this command.

**mka policy** *policy-name*  
**no mka policy** *policy-name*

<b>Syntax Description</b>	<i>policy-name</i>	Identifies an MKA policy and enters MKA policy configuration mode. The maximum length for the policy name is 16 characters.
---------------------------	--------------------	---

**Command Default** No MKA policies are created.

**Command Modes** Global configuration (config)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
Cisco IOS XE Denali 16.3.1		This command was introduced.

**Usage Guidelines** If you enter the name of an existing policy, you see a warning that any changes to the policy deletes all active MKA sessions with that policy. Whenever you change an MKA policy, active MKA sessions with that policy applied are cleared. If you try to create a policy name with more than 16 characters, you see a warning message, and the policy is not created.

If you enter the **no mka policy** *policy-name* command to delete a policy that is applied to at least one interface, you are prompted to first remove the policy from all interfaces that it is applied to and then to reenter the command. If you attempt to delete a policy and the policy name does not exist, you are notified.

When you enter MKA policy mode, these commands are available:

- **confidentiality-offset**—Sets the confidentiality offset for MACsec operation
- **replay-protection**—Configures MKA to use replay protection for MACsec operation

## Examples

The following example shows how to configure an MKA policy and what you see if you create a policy name that already exists:

```
Device(config)# mka policy test-policy
Device(config-mka-policy)# exit
Device(config)# mka policy test-policy
%MKA policy "test-policy" may have associated active MKA Sessions.
Changes to MKA Policy "test-policy" values
will cause all associated active MKS Sessions to be cleared.
```

**mka policy (global configuration)**

Related Commands	Command	Description
	<b>mka policy (interface configuration)</b>	Applies an MKA policy to an interface.
	<b>show mka policy</b>	Displays information about defined MKA protocol policies.

# mka pre-shared-key

To configure MKA MACsec on a device interface using a Pre Shared Key (PSK), use the **mka pre-shared-key key-chain *key-chain name*** command in global configuration mode. To disable it, use the **no** form of this command.

**mka pre-shared-key key-chain *key-chain-name***

<b>Syntax Description</b>	<b>mka pre-shared-key key-chain</b> Enables MACsec MKA configuration on device interfaces using a PSK.				
<b>Command Default</b>	mka pre-shared-key is disabled.				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE Denali 16.3.1</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Denali 16.3.1	This command was introduced.				

This example shows how to configure MKA MACsec on an interface using a PSK:

```
Switch#  
Switch(config)# int G1/0/20  
Switch(config-if)# mka pre-shared-key key-chain kc1  
Switch(config-if)# end  
Switch#
```

**authentication logging verbose**

# authentication logging verbose

To filter detailed information from authentication system messages, use the **authentication logging verbose** command in global configuration mode on the switch stack or on a standalone switch.

**authentication logging verbose**  
**no authentication logging verbose**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Detailed logging of system messages is not enabled.

**Command Modes** Global configuration (config)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** This command filters details, such as anticipated success, from authentication system messages. Failure messages are not filtered.

To filter verbose authentication system messages:

```
Device(config)# authentication logging verbose
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>authentication logging verbose</b>	Filters details from authentication system messages.
	<b>dot1x logging verbose</b>	Filters details from IEEE 802.1X authentication system messages.
	<b>mab logging verbose</b>	Filters details from IEEE 802.11 MAC authentication system messages.

# dot1x logging verbose

To filter detailed information from 802.1x system messages, use the **dot1x logging verbose** command in global configuration mode on the switch stack or on a standalone switch.

**dot1x logging verbose**  
**no dot1x logging verbose**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Detailed logging of system messages is not enabled.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** This command filters details, such as anticipated success, from 802.1x system messages. Failure messages are not filtered.

To filter verbose 802.1x system messages:

```
Device(config)# dot1x logging verbose
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

Related Commands	Command	Description
	<b>authentication logging verbose</b>	Filters details from authentication
	<b>dot1x logging verbose</b>	Filters details from 802.1x system
	<b>mab logging verbose</b>	Filters details from MAC authentic

**mab logging verbose**

# mab logging verbose

To filter detailed information from MAC authentication bypass (MAB) system messages, use the **mab logging verbose** command in global configuration mode on the switch stack or on a standalone switch.

**mab logging verbose**  
**no mab logging verbose**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Detailed logging of system messages is not enabled.

**Command Modes** Global configuration (config)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** This command filters details, such as anticipated success, from MAC authentication bypass (MAB) system messages. Failure messages are not filtered.

To filter verbose MAB system messages:

```
Device(config)# mab logging verbose
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>authentication logging verbose</b>	Filters details from authentication system messages.
	<b>dot1x logging verbose</b>	Filters details from 802.1x system messages.
	<b>mab logging verbose</b>	Filters details from MAC authentication bypass (MAB) system messages.

# password encryption aes

To enable a type 6 encrypted preshared key, use the **password encryption aes** command in global configuration mode. To disable password encryption, use the **no** form of this command.

```
password encryption aes
no password encryption aes
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** Preshared keys are not encrypted.

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

**Usage Guidelines** You can securely store plain text passwords in type 6 format in NVRAM using a command-line interface (CLI). Type 6 passwords are encrypted. Although the encrypted passwords can be seen or retrieved, it is difficult to decrypt them to find out the actual password. Use the **key config-key password-encrypt** command with the **password encryption aes** command to configure and enable the password (symmetric cipher Advanced Encryption Standard [AES] is used to encrypt the keys). The password (key) configured using the **key config-key password-encrypt** command is the primary encryption key that is used to encrypt all other keys in the router.

If you configure the **password encryption aes** command without configuring the **key config-key password-encrypt** command, the following message is printed at startup or during any nonvolatile generation (NVGEN) process, such as when the **show running-config** or **copy running-config startup-config** commands have been configured:

"Can not encrypt password. Please configure a configuration-key with 'key config-key'"

## Changing a Password

If the password (primary key) is changed, or reencrypted, using the **key config-key password-encrypt** command, the list registry passes the old key and the new key to the application modules that are using type 6 encryption.

## Deleting a Password

If the primary key that was configured using the **key config-key password-encrypt** command is deleted from the system, a warning is printed (and a confirm prompt is issued) that states that all type 6 passwords will become useless. As a security measure, after the passwords have been encrypted, they will never be decrypted in the Cisco IOS software. However, passwords can be reencrypted as explained in the previous paragraph.



**Caution** If the password configured using the **key config-key password-encrypt** command is lost, it cannot be recovered. The password should be stored in a safe location.

**password encryption aes**

## Unconfiguring Password Encryption

If you later unconfigure password encryption using the **no password encryption aes** command, all existing type 6 passwords are left unchanged, and as long as the password (primary key) that was configured using the **key config-key password-encrypt** command exists, the type 6 passwords will be decrypted as and when required by the application.

## Storing Passwords

Because no one can “read” the password (configured using the **key config-key password-encrypt** command), there is no way that the password can be retrieved from the router. Existing management stations cannot “know” what it is unless the stations are enhanced to include this key somewhere, in which case the password needs to be stored securely within the management system. If configurations are stored using TFTP, the configurations are not standalone, meaning that they cannot be loaded onto a router. Before or after the configurations are loaded onto a router, the password must be manually added (using the **key config-key password-encrypt** command). The password can be manually added to the stored configuration but is not recommended because adding the password manually allows anyone to decrypt all passwords in that configuration.

## Configuring New or Unknown Passwords

If you enter or cut and paste cipher text that does not match the primary key, or if there is no primary key, the cipher text is accepted or saved, but an alert message is printed. The alert message is as follows:

“ciphertext>[for username bar]> is incompatible with the configured master key.”

If a new primary key is configured, all the plain keys are encrypted and made type 6 keys. The existing type 6 keys are not encrypted. The existing type 6 keys are left as is.

If the old primary key is lost or unknown, you have the option of deleting the primary key using the **no key config-key password-encrypt** command. Deleting the primary key using the **no key config-key password-encrypt** command causes the existing encrypted passwords to remain encrypted in the router configuration. The passwords will not be decrypted.

## Examples

The following example shows that a type 6 encrypted preshared key has been enabled:

```
Device (config)# password encryption aes
```

## Related Commands

Command	Description
<b>key config-key password-encrypt</b>	Stores a type 6 encryption key in private NVRAM.

# permit (MAC access-list configuration)

To allow non-IP traffic to be forwarded if the conditions are matched, use the **permit** MAC access-list configuration command on the switch stack or on a standalone switch. To remove a permit condition from the extended MAC access list, use the **no** form of this command.

```
{permit {any | hostsrc-MAC-addr | src-MAC-addr mask} {any | hostdst-MAC-addr | dst-MAC-addr mask} [type mask | aarp | amber | appletalk | dec-spanning | decnet-iv | diagnostic | dsm | etype-6000 | etype-8042 | lat | lavc-sca | lsapsap mask | mop-console | mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp] [coscos]
nopermit {any | host src-MAC-addr | src-MAC-addr mask} {any | host dst-MAC-addr | dst-MAC-addr mask} [type mask | aarp | amber | appletalk | dec-spanning | decnet-iv | diagnostic | dsm | etype-6000 | etype-8042 | lat | lavc-sca | lsap lsap mask | mop-console | mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp] [coscos]}
```

Syntax Description		
	<b>any</b>	Denies any source or destination MAC address.
	<b>host src-MAC-addr   src-MAC-addr mask</b>	Specifies a host MAC address and optional subnet mask. Denies non-IP traffic from that address.
	<b>host dst-MAC-addr   dst-MAC-addr mask</b>	Specifies a destination MAC address and optional subnet mask. Denies non-IP traffic to that address.
	<b>type mask</b>	(Optional) Specifies the EtherType number of a packet. This value identifies the protocol of the packet. <ul style="list-style-type: none"> <li>• <i>type</i> is 0 to 65535, specified in hexadecimal.</li> <li>• <i>mask</i> is a mask of don't care bits applied to the EtherType number.</li> </ul>
	<b>aarp</b>	(Optional) Specifies EtherType AppleTalk Address Resolution Protocol (ARP) to a network address.
	<b>amber</b>	(Optional) Specifies EtherType DEC-Amber.
	<b>appletalk</b>	(Optional) Specifies EtherType AppleTalk/EtherTalk.
	<b>dec-spanning</b>	(Optional) Specifies EtherType Digital Equipment Corporation (DEC) Spanning Tree.
	<b>decnet-iv</b>	(Optional) Specifies EtherType DECnet Phase IV protocol.
	<b>diagnostic</b>	(Optional) Specifies EtherType DEC-Diagnostic.
	<b>dsm</b>	(Optional) Specifies EtherType DEC-DSM.
	<b>etype-6000</b>	(Optional) Specifies EtherType 0x6000.
	<b>etype-8042</b>	(Optional) Specifies EtherType 0x8042.
	<b>lat</b>	(Optional) Specifies EtherType DEC-LAT.
	<b>lavc-sca</b>	(Optional) Specifies EtherType DEC-LAVC-SCA.

**permit (MAC access-list configuration)**

<b>lsap lsap-number mask</b>	(Optional) Specifies the LSAP number (0 to 65535) of a the protocol of the packet. The <i>mask</i> is a mask of don't care bits applied to the LSA.
<b>mop-console</b>	(Optional) Specifies EtherType DEC-MOP Remote Cons
<b>mop-dump</b>	(Optional) Specifies EtherType DEC-MOP Dump.
<b>msdos</b>	(Optional) Specifies EtherType DEC-MSDOS.
<b>mumps</b>	(Optional) Specifies EtherType DEC-MUMPS.
<b>netbios</b>	(Optional) Specifies EtherType DEC- Network Basic Inp
<b>vines-echo</b>	(Optional) Specifies EtherType Virtual Integrated Network
<b>vines-ip</b>	(Optional) Specifies EtherType VINES IP.
<b>xns-idp</b>	(Optional) Specifies EtherType Xerox Network Systems
<b>cos cos</b>	(Optional) Specifies an arbitrary class of service (CoS) n CoS can be performed only in hardware. A warning mess

**Command Default** This command has no defaults. However, the default action for a MAC-named ACL is to deny.

**Command Modes** Mac-access list configuration

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Though visible in the command-line help strings, **appletalk** is not supported as a matching condition.

You enter MAC access-list configuration mode by using the **mac access-list extended** global configuration command.

If you use the **host** keyword, you cannot enter an address mask; if you do not use the **any** or **host** keywords, you must enter an address mask.

After an access control entry (ACE) is added to an access control list, an implied **deny-any-any** condition exists at the end of the list. That is, if there are no matches, the packets are denied. However, before the first ACE is added, the list permits all packets.

To filter IPX traffic, you use the *type mask* or **lsap lsap mask** keywords, depending on the type of IPX encapsulation being used. Filter criteria for IPX encapsulation types as specified in Novell terminology and Cisco IOS terminology are listed in the following table.

**Table 53: IPX Filtering Criteria**

IPX Encapsulation Type		Filter Criterion
Cisco IOS Name	Novell Name	
arpa	Ethernet II	EtherType 0x8137

IPX Encapsulation Type		Filter Criterion
Cisco IOS Name	Novell Name	
snap	Ethernet-snap	EtherType 0x8137
sap	Ethernet 802.2	LSAP 0xE0E0
novell-ether	Ethernet 802.3	LSAP 0xFFFF

This example shows how to define the MAC-named extended access list to allow NetBIOS traffic from any source to MAC address 00c0.00a0.03fa. Traffic matching this list is allowed.

```
Device(config-ext-macl)# permit any host 00c0.00a0.03fa netbios
```

This example shows how to remove the permit condition from the MAC-named extended access list:

```
Device(config-ext-macl)# no permit any 00c0.00a0.03fa 0000.0000.0000 netbios
```

This example permits all packets with EtherType 0x4321:

```
Device(config-ext-macl)# permit any any 0x4321 0
```

You can verify your settings by entering the **show access-lists** privileged EXEC command.

Related Commands	Command	Description
	<b>deny</b>	Denies from the MAC address specified in the access list to non-IP traffic to be forwarded.
	<b>mac access-list extended</b>	Creates an access list to filter IP traffic based on source and destination MAC addresses.
	<b>show access-lists</b>	Displays access control lists.

# protocol (IPv6 snooping)

To specify that addresses should be gleaned with Dynamic Host Configuration Protocol (DHCP) or Neighbor Discovery Protocol (NDP), or to associate the protocol with an IPv6 prefix list, use the **protocol** command. To disable address gleaning with DHCP or NDP, use the **no** form of the command.

```
protocol {dhcp | ndp}
no protocol {dhcp | ndp}
```

## Syntax Description

<b>dhcp</b>	Specifies that addresses should be gleaned in Dynamic Host Configuration Protocol (DHCP) packets.
<b>ndp</b>	Specifies that addresses should be gleaned in Neighbor Discovery Protocol (NDP) packets.

## Command Default

Snooping and recovery are attempted using both DHCP and NDP.

## Command Modes

IPv6 snooping configuration mode

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

If an address does not match the prefix list associated with DHCP or NDP, then control packets will be dropped and recovery of the binding table entry will not be attempted with that protocol.

- Using the **no protocol {dhcp | ndp}** command indicates that a protocol will not be used for snooping or gleaning.
- If the **no protocol dhcp** command is used, DHCP can still be used for binding table recovery.
- Data glean can recover with DHCP and NDP, though destination guard will only recovery through DHCP.

This example shows how to define an IPv6 snooping policy name as policy1, place the switch in IPv6 snooping policy configuration mode, and configure the port to use DHCP to glean addresses:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# protocol dhcp
```

# radius server



**Note** Starting from Cisco IOS 15.2(5)E release, the **radius server** command replaces the **radius-server host** command, being used in releases prior to Cisco IOS Release 15.2(5)E. The old command has been deprecated.

Use the **radius server** configuration sub-mode command on the switch stack or on a standalone switch to configure the RADIUS server parameters, including the RADIUS accounting and authentication. Use the **no** form of this command to return to the default settings.

```
radius server name
address {ipv4 | ipv6} ip{address / hostname} auth-port udp-port acct-port udp-port
key string
automate tester name | retransmit value | timeout seconds
no radius server name
```

Syntax Description		
<b>address {ipv4   ipv6}</b> <i>ip{address / hostname}</i>	Specify the IP address of the RADIUS server.	
<b>auth-port</b> <i>udp-port</i>	(Optional) Specify the UDP port for the RADIUS authentication server. The range is from 0 to 65536.	
<b>acct-port</b> <i>udp-port</i>	(Optional) Specify the UDP port for the RADIUS accounting server. The range is from 0 to 65536.	
<b>key</b> <i>string</i>	(Optional) Specify the authentication and encryption key for all RADIUS communication between the switch and the RADIUS daemon.	
	<b>Note</b> The key is a text string that must match the encryption key used on the RADIUS server. Always configure the key as the last item in this command. Leading spaces are ignored, but spaces within and at the end of the key are used. If there are spaces in your key, do not enclose the key in quotation marks unless the quotation marks are part of the key.	
<b>automate tester</b> <i>name</i>	(Optional) Enable automatic server testing of the RADIUS server status, and specify the username to be used.	
<b>retransmit</b> <i>value</i>	(Optional) Specifies the number of times a RADIUS request is resent when the server is not responding or responding slowly. The range is 1 to 100. This setting overrides the radius-server retransmit global configuration command setting.	
<b>timeout</b> <i>seconds</i>	(Optional) Specifies the time interval that the Switch waits for the RADIUS server to reply before sending a request again. The range is 1 to 1000. This setting overrides the radius-server timeout global configuration command setting.	
<b>no radius server</b> <i>name</i>	Returns to the default settings	

**Command Default**

- The UDP port for the RADIUS accounting server is 1646.
- The UDP port for the RADIUS authentication server is 1645.
- Automatic server testing is disabled.
- The timeout is 60 minutes (1 hour).
- When the automatic testing is enabled, testing occurs on the accounting and authentication UDP ports.
- The authentication and encryption key ( string) is not configured.

**Command Modes**

Radius server sub-mode configuration

**Command History**

<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE	This command was introduced to replace the <b>radius-server host</b> command.

**Usage Guidelines**

- We recommend that you configure the UDP port for the RADIUS accounting server and the UDP port for the RADIUS authentication server to non-default values.
- You can configure the authentication and encryption key by using the **key string** sub-mode configuration command. Always configure the key as the last item in this command.
- Use the **automate-tester name** keywords to enable automatic server testing of the RADIUS server status and to specify the username to be used.

This example shows how to configure 1645 as the UDP port for the authentication server and 1646 as the UDP port for the accounting server, and configure a key string:

```
Device(config)# radius server ISE
Device(config-radius-server)# address ipv4 10.1.1 auth-port 1645 acct-port 1646
Device(config-radius-server)# key cisco123
```

# sap mode-list (cts manual)

To select the Security Association Protocol (SAP) authentication and encryption modes (prioritized from highest to lowest) used to negotiate link encryption between two interfaces, use the **sap mode-list** command in Cisco TrustSec dot1x interface configuration mode. To remove a mode-list and revert to the default, use the **no** form of this command.

Use the **sap mode-list** command to manually specify the PMK and the Security Association Protocol (SAP) authentication and encryption modes to negotiate MACsec link encryption between two interfaces. Use the **no** form of the command to disable the configuration.

```
sap pmk mode-list {gcm-encrypt | gmac | no-encap | null} [gcm-encrypt | gmac | no-encap | null]
```

```
no sap pmk mode-list {gcm-encrypt | gmac | no-encap | null} [gcm-encrypt | gmac | no-encap | null]
```

<b>Syntax Description</b>	<p><b>pmk <i>hex_value</i></b></p> <p>Specifies the Hex-data PMK (without leading 0x; enter even number of hex characters, or else the last character is prefixed with 0.).</p>
	<p><b>mode-list</b></p> <p>Specifies the list of advertised modes (prioritized from highest to lowest).</p>
	<p><b>gcm-encrypt</b></p> <p>Specifies GMAC authentication, GCM encryption.</p>
	<p><b>gmac</b></p> <p>Specifies GMAC authentication only, no encryption.</p>
	<p><b>no-encap</b></p> <p>Specifies no encapsulation.</p>
	<p><b>null</b></p> <p>Specifies encapsulation present, no authentication, no encryption.</p>

**Command Default** The default encryption is **sap pmk mode-list gcm-encrypt null**. When the peer interface does not support 802.1AE MACsec or 802.REV layer-2 link encryption, the default encryption is **null**.

**Command Modes** CTS manual interface configuration (config-if-cts-manual)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

**Usage Guidelines** Use the **sap pmk mode-list** command to specify the authentication and encryption method.

**sap mode-list (cts manual)**

The Security Association Protocol (SAP) is an encryption key derivation and exchange protocol based on a draft version of the 802.11i IEEE protocol. SAP is used to establish and maintain the 802.1AE link-to-link encryption (MACsec) between interfaces that support MACsec.

SAP and PMK can be manually configured between two interfaces with the **sap pmk mode-list** command. When using 802.1X authentication, both sides (supplicant and authenticator) receive the PMK and the MAC address of the peer's port from the Cisco Secure Access Control Server.

If a device is running Cisco TrustSec-aware software but the hardware is not Cisco TrustSec-capable, disallow encapsulation with the **sap mode-list no-encap** command.

**Examples**

The following example shows how to configure SAP on a Gigabit Ethernet interface:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet 2/1
Switch(config-if)# cts manual
Switch(config-if-cts-manual)# sap pmk FFFEE mode-list gcm-encrypt
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>cts manual</b>	Enables an interface for Cisco TrustSec.
<b>propagate sgt (cts manual)</b>	Enables SGT propagation at Layer 2 on Cisco TrustSec Security interfaces.
<b>show cts interface</b>	Displays Cisco TrustSec interface configuration statistics.

# security level (IPv6 snooping)

To specify the level of security enforced, use the **security-level** command in IPv6 snooping policy configuration mode.

**security level {glean | guard | inspect}**

<b>Syntax Description</b>	<b>glean</b> Extracts addresses from the messages and installs them into the binding table without performing any verification.				
	<b>guard</b> Performs both glean and inspect. Additionally, RA and DHCP server messages are rejected unless they are received on a trusted port or another policy authorizes them.				
	<b>inspect</b> Validates messages for consistency and conformance; in particular, address ownership is enforced. Invalid messages are dropped.				
<b>Command Default</b>	The default security level is guard.				
<b>Command Modes</b>	IPv6 snooping configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

This example shows how to define an IPv6 snooping policy name as policy1, place the device in IPv6 snooping configuration mode, and configure the security level as inspect:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# security-level inspect
```

# security passthru

To modify the IPsec pass-through, use the **security passthru** command. To disable, use the no form of the command.

```
security passthru ip-address
no security passthru
```

## Syntax Description

*ip-address* IP address of the IPsec gateway (router) that is terminating the VPN tunnel.

## Command Default

None.

## Command Modes

wlan

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

None.

This example shows how to modify IPSec pass-through.

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#security passthrough 10.1.1.1
```

# server-private (RADIUS)

To configure the IP address of the private RADIUS server for the group server, use the **server-private** command in RADIUS server-group configuration mode. To remove the associated private server from the authentication, authorization, and accounting (AAA) group server, use the **no** form of this command.

```
server-private ip-address [{auth-port port-number | acct-port port-number}] [non-standard] [timeout seconds] [retransmit retries] [key string]
no server-private ip-address [{auth-port port-number | acct-port port-number}] [non-standard] [timeout seconds] [retransmit retries] [key string]
```

Syntax Description	<i>ip-address</i>	IP address of the private RADIUS server host.
	<b>auth-port</b> <i>port-number</i>	(Optional) User Datagram Protocol (UDP) destination port for authentication requests. The default value is 1645.
	<b>acct-port</b> <i>port-number</i>	(Optional) UDP destination port for accounting requests. The default value is 1646.
	<b>non-standard</b>	(Optional) RADIUS server is using vendor-proprietary RADIUS attributes.
	<b>timeout</b> <i>seconds</i>	(Optional) Time interval (in seconds) that the router waits for the RADIUS server to reply before retransmitting. This setting overrides the global value of the <b>radius-server timeout</b> command. If no timeout value is specified, the global value is used.
	<b>retransmit</b> <i>retries</i>	(Optional) Number of times a RADIUS request is resent to a server, if that server is not responding or responding slowly. This setting overrides the global setting of the <b>radius-server retransmit</b> command.
	<b>key</b> <i>string</i>	(Optional) Authentication and encryption key used between the router and the RADIUS daemon running on the RADIUS server. This key overrides the global setting of the <b>radius-server key</b> command. If no key string is specified, the global value is used.  The <i>string</i> can be <b>0</b> (specifies that an unencrypted key follows), <b>6</b> (specifies that an advanced encryption scheme [AES] encrypted key follows), <b>7</b> (specifies that a hidden key follows), or a line specifying the unencrypted (clear-text) server key.

**Command Default** If server-private parameters are not specified, global configurations will be used; if global configurations are not specified, default values will be used.

**Command Modes** RADIUS server-group configuration (config-sg-radius)

Command History	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

**server-private (RADIUS)****Usage Guidelines**

Use the **server-private** command to associate a particular private server with a defined server group. To prevent possible overlapping of private addresses between virtual route forwarding (VRF) instances, private servers (servers with private addresses) can be defined within the server group and remain hidden from other groups, while the servers in the global pool (default "radius" server group) can still be referred to by IP addresses and port numbers. Thus, the list of servers in server groups includes references to the hosts in the global configuration and the definitions of private servers.

**Note**

- If the **radius-server directed-request** command is configured, then a private RADIUS server cannot be used as the group server by configuring the **server-private (RADIUS)** command.
- Creating or updating AAA server statistics record for private RADIUS servers are not supported. If private RADIUS servers are used, then error messages and tracebacks will be encountered, but these error messages or tracebacks do not have any impact on the AAA RADIUS functionality. To avoid these error messages and tracebacks, configure public RADIUS server instead of private RADIUS server.

Use the **password encryption aes** command to configure type 6 AES encrypted keys.

**Examples**

The following example shows how to define the sg\_water RADIUS group server and associate private servers with it:

```
Device> enable
Device# configure terminal
Device(config)# aaa new-model
Device(config)# aaa group server radius sg_water
Device(config-sg-radius)# server-private 10.1.1.1 timeout 5 retransmit 3 key xyz
Device(config-sg-radius)# server-private 10.2.2.2 timeout 5 retransmit 3 key xyz
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>aaa group server</b>	Groups different server hosts into distinct lists and distinct methods.
<b>aaa new-model</b>	Enables the AAA access control model.
<b>password encryption aes</b>	Enables a type 6 encrypted preshared key.
<b>radius-server host</b>	Specifies a RADIUS server host.
<b>radius-server directed-request</b>	Allows users to log in to a Cisco NAS and select a RADIUS server for authentication.

# show aaa clients

To show AAA client statistics, use the **show aaa clients** command.

**show aaa clients [detailed]**

<b>Syntax Description</b>	<b>detailed</b> (Optional) Shows detailed AAA client statistics.	
<b>Command Modes</b>	User EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

This is an example of output from the **show aaa clients** command:

```
Device# show aaa clients
Dropped request packets: 0
```

**show aaa command handler**

# show aaa command handler

To show AAA command handler statistics, use the **show aaa command handler** command.

## show aaa command handler

**Syntax Description** This command has no arguments or keywords.

**Command Modes** User EXEC

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

This is an example of output from the **show aaa command handler** command:

```
Device# show aaa command handler

AAA Command Handler Statistics:
  account-logon: 0, account-logoff: 0
  account-query: 0, pod: 0
  service-logon: 0, service-logoff: 0
  user-profile-push: 0, session-state-log: 0
  reauthenticate: 0, bounce-host-port: 0
  disable-host-port: 0, update-rbacl: 0
  update-sgt: 0, update-cts-policies: 0
  invalid commands: 0
  async message not sent: 0
```

# show aaa local

To show AAA local method options, use the **show aaa local** command.

**show aaa local {netuser {name | all} | statistics | user lockout}**

<b>Syntax Description</b>	<b>netuser</b> Specifies the AAA local network or guest user database. <b>name</b> Network user name. <b>all</b> Specifies the network and guest user information. <b>statistics</b> Displays statistics for local authentication. <b>user lockout</b> Specifies the AAA local locked-out user.
---------------------------	---

<b>Command Modes</b>	User EXEC
----------------------	-----------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

This is an example of output from the **show aaa local statistics** command:

```
Device# show aaa local statistics

Local EAP statistics

EAP Method      Success      Fail
-----
Unknown          0            0
EAP-MD5         0            0
EAP-GTC         0            0
LEAP             0            0
PEAP             0            0
EAP-TLS          0            0
EAP-MSCHAPV2     0            0
EAP-FAST         0            0

Requests received from AAA:          0
Responses returned from EAP:        0
Requests dropped (no EAP AVP):      0
Requests dropped (other reasons):   0
Authentication timeouts from EAP:   0

Credential request statistics
Requests sent to backend:           0
Requests failed (unable to send):   0
Authorization results received

Success:                           0
Fail:                             0
```

**show aaa servers**

## show aaa servers

To shows all AAA servers as seen by the AAA server MIB, use the **show aaa servers** command.

**show aaa servers [ private | public | [ detailed ] ]**

<b>Syntax Description</b>	<b>detailed</b> (Optional) Displays private AAA servers as seen by the AAA Server MIB.  <b>public</b> (Optional) Displays public AAA servers as seen by the AAA Server MIB.  <b>detailed</b> (Optional) Displays detailed AAA server statistics.				
<b>Command Modes</b>	User EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

This is an example of output from the **show aaa servers** command:

```
Device# show aaa servers
RADIUS: id 1, priority 1, host 172.20.128.2, auth-port 1645, acct-port 1646
State: current UP, duration 9s, previous duration 0s
Dead: total time 0s, count 0
Quarantined: No
Authen: request 0, timeouts 0, failover 0, retransmission 0
Response: accept 0, reject 0, challenge 0
Response: unexpected 0, server error 0, incorrect 0, time 0ms
Transaction: success 0, failure 0
Throttled: transaction 0, timeout 0, failure 0
Author: request 0, timeouts 0, failover 0, retransmission 0
Response: accept 0, reject 0, challenge 0
Response: unexpected 0, server error 0, incorrect 0, time 0ms
Transaction: success 0, failure 0
Throttled: transaction 0, timeout 0, failure 0
Account: request 0, timeouts 0, failover 0, retransmission 0
Request: start 0, interim 0, stop 0
Response: start 0, interim 0, stop 0
Response: unexpected 0, server error 0, incorrect 0, time 0ms
Transaction: success 0, failure 0
Throttled: transaction 0, timeout 0, failure 0
Elapsed time since counters last cleared: 0m
Estimated Outstanding Access Transactions: 0
Estimated Outstanding Accounting Transactions: 0
Estimated Throttled Access Transactions: 0
Estimated Throttled Accounting Transactions: 0
Maximum Throttled Transactions: access 0, accounting 0
```

# show aaa sessions

To show AAA sessions as seen by the AAA Session MIB, use the **show aaa sessions** command.

## show aaa sessions

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Modes</b>	User EXEC
----------------------	-----------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

This is an example of output from the **show aaa sessions** command:

```
Device# show aaa sessions
Total sessions since last reload: 7
Session Id: 4007
  Unique Id: 4025
  User Name: *not available*
  IP Address: 0.0.0.0
  Idle Time: 0
  CT Call Handle: 0
```

**show authentication brief**

# show authentication brief

To display brief information about authentication sessions for a given interface, use the **show authentication brief** command in either user EXEC or privileged EXEC mode.

```
show authentication brief[switch{switch-number|active|standby} {R0}]
```

<b>Syntax Description</b>	<b>switch-number</b> <b>R0</b> <b>active</b> <b>standby</b>	Valid values for the <i>switch-number</i> variable are from 1 to 9. Displays information about the Route Processor (RP) slot 0. Specifies the active instance. Specifies the standby instance.
<b>Command Modes</b>	Privileged EXEC (#) User EXEC (>)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Fuji 16.9.1	This command was introduced in a release prior to 16.9.1

The following is a sample output from the **show authentication brief** command:

```
Device# show authentication brief
```

Interface	MAC Address	AuthC	AuthZ	Fg	Uptime
Gi2/0/14	0002.0002.0001	m:NA d:OK	AZ: SA-	X	281s
Gi2/0/14	0002.0002.0002	m:NA d:OK	AZ: SA-	X	280s
Gi2/0/14	0002.0002.0003	m:NA d:OK	AZ: SA-	X	279s
Gi2/0/14	0002.0002.0004	m:NA d:OK	AZ: SA-	X	278s
Gi2/0/14	0002.0002.0005	m:NA d:OK	AZ: SA-	X	278s
Gi2/0/14	0002.0002.0006	m:NA d:OK	AZ: SA-	X	277s
Gi2/0/14	0002.0002.0007	m:NA d:OK	AZ: SA-	X	276s
Gi2/0/14	0002.0002.0008	m:NA d:OK	AZ: SA-	X	276s
Gi2/0/14	0002.0002.0009	m:NA d:OK	AZ: SA-	X	275s
Gi2/0/14	0002.0002.000a	m:NA d:OK	AZ: SA-	X	275s
Gi2/0/14	0002.0002.000b	m:NA d:OK	AZ: SA-	X	274s
Gi2/0/14	0002.0002.000c	m:NA d:OK	AZ: SA-	X	274s
Gi2/0/14	0002.0002.000d	m:NA d:OK	AZ: SA-	X	273s
Gi2/0/14	0002.0002.000e	m:NA d:OK	AZ: SA-	X	273s
Gi2/0/14	0002.0002.000f	m:NA d:OK	AZ: SA-	X	272s
Gi2/0/14	0002.0002.0010	m:NA d:OK	AZ: SA-	X	272s
Gi2/0/14	0002.0002.0011	m:NA d:OK	AZ: SA-	X	271s
Gi2/0/14	0002.0002.0012	m:NA d:OK	AZ: SA-	X	271s
Gi2/0/14	0002.0002.0013	m:NA d:OK	AZ: SA-	X	270s
Gi2/0/14	0002.0002.0014	m:NA d:OK	AZ: SA-	X	270s
Gi2/0/14	0002.0002.0015	m:NA d:OK	AZ: SA-	X	269s

The following is a sample output from the **show authentication brief** command for active instances:

```
Device# show authentication brief switch active R0
```

Interface	MAC Address	AuthC	AuthZ	Fg	Uptime
Gi2/0/14	0002.0002.0001	m:NA d:OK	AZ: SA-	X	1s
Gi2/0/14	0002.0002.0002	m:NA d:OK	AZ: SA-	X	0s
Gi2/0/14	0002.0002.0003	m:NA d:OK	AZ: SA-	X	299s
Gi2/0/14	0002.0002.0004	m:NA d:OK	AZ: SA-	X	298s
Gi2/0/14	0002.0002.0005	m:NA d:OK	AZ: SA-	X	298s
Gi2/0/14	0002.0002.0006	m:NA d:OK	AZ: SA-	X	297s
Gi2/0/14	0002.0002.0007	m:NA d:OK	AZ: SA-	X	296s
Gi2/0/14	0002.0002.0008	m:NA d:OK	AZ: SA-	X	296s
Gi2/0/14	0002.0002.0009	m:NA d:OK	AZ: SA-	X	295s
Gi2/0/14	0002.0002.000a	m:NA d:OK	AZ: SA-	X	295s
Gi2/0/14	0002.0002.000b	m:NA d:OK	AZ: SA-	X	294s
Gi2/0/14	0002.0002.000c	m:NA d:OK	AZ: SA-	X	294s
Gi2/0/14	0002.0002.000d	m:NA d:OK	AZ: SA-	X	293s
Gi2/0/14	0002.0002.000e	m:NA d:OK	AZ: SA-	X	293s
Gi2/0/14	0002.0002.000f	m:NA d:OK	AZ: SA-	X	292s
Gi2/0/14	0002.0002.0010	m:NA d:OK	AZ: SA-	X	292s
Gi2/0/14	0002.0002.0011	m:NA d:OK	AZ: SA-	X	291s
Gi2/0/14	0002.0002.0012	m:NA d:OK	AZ: SA-	X	291s
Gi2/0/14	0002.0002.0013	m:NA d:OK	AZ: SA-	X	290s
Gi2/0/14	0002.0002.0014	m:NA d:OK	AZ: SA-	X	290s
Gi2/0/14	0002.0002.0015	m:NA d:OK	AZ: SA-	X	289s
Gi2/0/14	0002.0002.0016	m:NA d:OK	AZ: SA-	X	289s

The following is a sample output from the **show authentication brief** command for standby instances:

```
Device# show authentication brief switch standby R0
```

No sessions currently exist

The table below describes the significant fields shown in the displays.

**Table 54: show authentication brief Field Descriptions**

Field	Description
Interface	The type and number of the authentication interface.
MAC Address	The MAC address of the client.
AuthC	Indicates authentication status.
AuthZ	Indicates authorization status.

**show authentication brief**

<b>Field</b>	<b>Description</b>
Fg	<p>Flag indicates the current status. The valid values are:</p> <ul style="list-style-type: none"> <li>• A—Applying policy (multi-line status for details)</li> <li>• D—Awaiting removal</li> <li>• F—Final removal in progress</li> <li>• I—Awaiting IIF ID allocation</li> <li>• P—Pushed session</li> <li>• R—Removing user profile (multi-line status for details)</li> <li>• U—Applying user profile (multi-line status for details)</li> <li>• X—Unknown blocker</li> </ul>
Uptime	Indicates the duration since which the session came up

# show authentication history

To display the authenticated sessions alive on the device, use the **show authentication history** command.

**show authentication history [min-upptime seconds]**

<b>Syntax Description</b>	<b>min-upptime</b> <i>seconds</i> (Optional) Displays sessions within the minimum uptime. The range is from 1 through 4294967295 seconds.				
<b>Command Modes</b>	User EXEC				
<b>Command History</b>	<table><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	Use the <b>show authentication history</b> command to display the authenticated sessions alive on the device.				

This is an example of output from the **show authentication history** command:

```
Device# show authentication history
Interface  MAC Address      Method  Domain  Status   Uptime
Gi3/0/2    0021.d864.07c0  dot1x   DATA    Auth     38s

Session count = 1
```

**show authentication sessions**

# show authentication sessions

To display information about current Auth Manager sessions, use the **show authentication sessions** command.

```
show authentication sessions [database] [handle handle-id [details]] [[interface type number]
[details] [mac mac-address [interface type number]] [method method-name [interface type number]
[details]] [session-id session-id [details]]]
```

## Syntax Description

<b>database</b>	(Optional) Shows only data stored in session database.
<b>handle handle-id</b>	(Optional) Specifies the particular handle for which Auth Manager information is to be displayed.
<b>details</b>	(Optional) Shows detailed information.
<b>interface type number</b>	(Optional) Specifies a particular interface type and number for which Auth Manager information is to be displayed.
<b>mac mac-address</b>	(Optional) Specifies the particular MAC address for which you want to display information.
<b>method method-name</b>	(Optional) Specifies the particular authentication method for which Auth Manager information is to be displayed. If you specify a method ( <b>dot1x</b> , <b>mab</b> , or <b>webauth</b> ), you may also specify an interface.
<b>session-id session-id</b>	(Optional) Specifies the particular session for which Auth Manager information is to be displayed.

## Command Modes

User EXEC

## Command History

### Release

### Modification

Cisco IOS XE 3.2SE

This command was introduced.

## Usage Guidelines

Use the **show authentication sessions** command to display information about all current Auth Manager sessions. To display information about specific Auth Manager sessions, use one or more of the keywords.

This table shows the possible operating states for the reported authentication sessions.

**Table 55: Authentication Method States**

State	Description
Not run	The method has not run for this session.
Running	The method is running for this session.
Failed over	The method has failed and the next method is expected to provide a result.

State	Description
Success	The method has provided a successful authentication result for the session.
Authc Failed	The method has provided a failed authentication result for the session.

This table shows the possible authentication methods.

**Table 56: Authentication Method States**

State	Description
dot1x	802.1X
mab	MAC authentication bypass
webauth	web authentication

The following example shows how to display all authentication sessions on the switch:

```
Device# show authentication sessions
Interface      MAC Address      Method     Domain      Status      Session ID
Gi1/0/48       0015.63b0.f676   dot1x      DATA        Authz Success  0A3462B1000000102983C05C
Gi1/0/5        000f.23c4.a401   mab        DATA        Authz Success  0A3462B10000000D24F80B58
Gi1/0/5        0014.bf5d.d26d   dot1x      DATA        Authz Success  0A3462B10000000E29811B94
```

The following example shows how to display all authentication sessions on an interface:

```
Device# show authentication sessions interface gigabitethernet2/0/47
          Interface: GigabitEthernet2/0/47
          MAC Address: Unknown
          IP Address: Unknown
          Status: Authz Success
          Domain: DATA
          Oper host mode: multi-host
          Oper control dir: both
          Authorized By: Guest Vlan
          Vlan Policy: 20
          Session timeout: N/A
          Idle timeout: N/A
          Common Session ID: 0A3462C80000000000002763C
          Acct Session ID: 0x00000002
          Handle: 0x25000000
          Runnable methods list:
          Method      State
          mab        Failed over
          dot1x      Failed over
-----
          Interface: GigabitEthernet2/0/47
          MAC Address: 0005.5e7c.da05
          IP Address: Unknown
          User-Name: 00055e7cda05
          Status: Authz Success
          Domain: VOICE
          Oper host mode: multi-domain
```

**show authentication sessions**

```
Oper control dir: both
    Authorized By: Authentication Server
    Session timeout: N/A
        Idle timeout: N/A
    Common Session ID: 0A3462C8000000010002A238
        Acct Session ID: 0x00000003
            Handle: 0x91000001
Runnable methods list:
    Method      State
    mab        Authc Success
    dot1x     Not run
```

# show cisp

To display CISP information for a specified interface, use the **show cisp** command in privileged EXEC mode.

**show cisp { [clients | interface *interface-id*] | registrations | summary}**

<b>Syntax Description</b>	<b>clients</b> (Optional) Display CISP client details. <b>interface <i>interface-id</i></b> (Optional) Display CISP information about the specified interface channels. <b>registrations</b> Displays CISP registrations. <b>summary</b> (Optional) Displays CISP summary.						
<b>Command Modes</b>	Privileged EXEC						
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> <tr> <td>Cisco IOS XE Denali 16.3.1</td><td>This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.x</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.	Cisco IOS XE Denali 16.3.1	This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.x
<b>Release</b>	<b>Modification</b>						
Cisco IOS XE 3.2SE	This command was introduced.						
Cisco IOS XE Denali 16.3.1	This command was reintroduced. This command was not supported in Cisco IOS XE Denali 16.1.x and Cisco IOS XE Denali 16.2.x						

This example shows output from the **show cisp interface** command:

```
Device# show cisp interface fast 0
CISP not enabled on specified interface
```

This example shows output from the **show cisp registration** command:

```
Device# show cisp registrations
Interface(s) with CISP registered user(s):
-----
Fa1/0/13
Auth Mgr (Authenticator)
Gi2/0/1
Auth Mgr (Authenticator)
Gi2/0/2
Auth Mgr (Authenticator)
Gi2/0/3
Auth Mgr (Authenticator)
Gi2/0/5
Auth Mgr (Authenticator)
Gi2/0/9
Auth Mgr (Authenticator)
Gi2/0/11
Auth Mgr (Authenticator)
Gi2/0/13
```

**show cisp**

Auth Mgr (Authenticator)  
Gi3/0/3  
Gi3/0/5  
Gi3/0/23

**Related Commands**

Command	Description
<b>cisp enable</b>	Enable Client Information Signalling Protocol (CISP)
<b>dot1x credentials <i>profile</i></b>	Configure a profile on a supplicant switch

# show device-tracking capture-policy

To display the rules that the system pushes to the hardware (forwarding layer), enter the **show device-tracking capture-policy** command in privileged EXEC mode. These rules determine which packets are punted to SISF for further action. These rules are a translation of the policy that is applied to the interface or VLAN.

**show device-tracking capture-policy [ interface *interface\_type\_no* | vlan *vlan\_id* ]**

<b>Syntax Description</b>	<b>interface <i>interface_type_no</i></b> Displays message capture policy information for the interface you specify. Enter an interface type and number.  Use the question mark (?) online help function to display the types of interfaces on the device.
	<b>vlan <i>vlan_id</i></b> Displays message capture policy information for the VLAN ID you specify. The valid value range is from 1 to 4095.

**Command Modes** Privileged EXEC (#)

Command History	Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.	

**Usage Guidelines** The output of this command is used by the technical support team, for troubleshooting.

## Examples

The following is sample output from the **show device-tracking capture-policy** command:

```
Device# show device-tracking capture-policy interface tengigabitethernet1/0/1

HW Target Te1/0/1 HW policy signature 0001DF9F policies#:1 rules 14 sig 0001DF9F
  SW policy sisf-01 feature Device-tracking - Active

    Rule DHCP4 CLIENT Protocol UDP mask 00000400 action PUNT match1 0 match2 67#feat:1
      feature Device-tracking
    Rule DHCP4 SERVER SOURCE Protocol UDP mask 00001000 action PUNT match1 0 match2
      68#feat:1
      feature Device-tracking
    Rule DHCP4 SERVER Protocol UDP mask 00000800 action PUNT match1 67 match2 0#feat:1
      feature Device-tracking
    Rule ARP Protocol IPV4 mask 00004000 action PUNT match1 0 match2 0#feat:1
      feature Device-tracking
    Rule DHCP SERVER SOURCE Protocol UDP mask 00000200 action PUNT match1 0 match2
      546#feat:1
      feature Device-tracking
    Rule DHCP CLIENT Protocol UDP mask 00000080 action PUNT match1 0 match2 547#feat:1
      feature Device-tracking
    Rule DHCP SERVER Protocol UDP mask 00000100 action PUNT match1 547 match2 0#feat:1
      feature Device-tracking
    Rule RS Protocol ICMPV6 mask 00000004 action PUNT match1 133 match2 0#feat:1
      feature Device-tracking
    Rule RA Protocol ICMPV6 mask 00000008 action PUNT match1 134 match2 0#feat:1
```

```
■ show device-tracking capture-policy
```

```
        feature Device-tracking
Rule NS Protocol ICMPV6 mask 00000001 action PUNT match1 135 match2 0#feat:1
        feature Device-tracking
Rule NA Protocol ICMPV6 mask 00000002 action PUNT match1 136 match2 0#feat:1
        feature Device-tracking
Rule REDIR Protocol ICMPV6 mask 00000010 action PUNT match1 137 match2 0#feat:1
        feature Device-tracking
Rule DAR Protocol ICMPV6 mask 00008000 action PUNT match1 157 match2 0#feat:1
        feature Device-tracking
Rule DAC Protocol ICMPV6 mask 00010000 action PUNT match1 158 match2 0#feat:1
        feature Device-tracking
```

# show device-tracking counters

To display information about the number of broadcast, multicast, bridged, unicast, probe, dropped device-tracking messages and faults received on an interface or VLAN or both, enter the **show device-tracking counters** command in privileged EXEC mode. Where applicable, the messages are categorized by protocol. The list of protocols include Address Resolution Protocol (ARP), Neighbor Discovery Protocol (NDP), DHCPv6, DHCPv4, Address Collision Detection (ACD), and Duplicate Address Detection (DAD).

**show device-tracking counters [ all | interface *interface\_type\_no* | vlan *vlan\_id* ]**

<b>Syntax Description</b>	<p><b>all</b> Displays information for all interfaces and VLANs on the device where a policy is attached.</p> <p><b>interface <i>interface_type_no</i></b> Displays information for the specified interface. Enter an interface type and number. Use the question mark (?) online help function to display the types of interfaces on the device.</p> <p><b>vlan <i>vlan_id</i></b> Displays information for the VLAN ID you specify. The range is from 1 to 4095.</p>
---------------------------	--

<b>Command Modes</b>	Privileged EXEC (#)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	When you enter the <b>show device-tracking counters</b> command, you must enter one of the keywords that follow, that is, <b>all</b> , or <b>interface <i>interface_type_no</i></b> , or <b>vlan <i>vlan_id</i></b> .
-------------------------	---

If you specify an interface or VLAN where a policy is not attached, the following message is displayed: % no ipv6 snooping policy attached on <interface number or VLAN ID>

## Examples

The following is sample output from the **show device-tracking counters** command. Information relating to a particular VLAN (VLAN 10) is displayed here:

```
Device# show device-tracking counters vlan 10
Received messages on vlan 10    :
Protocol      Protocol message
NDP          RA[2479] NS[1757] NA[2794]
DHCPv6
ARP          REP[878]
DHCPv4
ACD&DAD     --[3]

Received Broadcast/Multicast messages on vlan 10    :
Protocol      Protocol message
NDP          RA[2479] NS[3] NA[5]
DHCPv6
```

**show device-tracking counters**

```

ARP REP[1]
DHCPv4

Bridged messages from vlan 10 :
Protocol Protocol message
NDP RA[1238] NS[1915] NA[878]
DHCPv6
ARP REQ[877]
DHCPv4
ACD&DAD --[1]

Broadcast/Multicast converted to unicast messages from vlan 10 :
Protocol Protocol message
NDP
DHCPv6
ARP
DHCPv4
ACD&DAD

Probe message on vlan 10 :
Type Protocol message
PROBE_SEND NS[1037] REQ[877]
PROBE_REPLY NA[1037] REP[877]

Limited Broadcast to Local message on vlan 10 :
Type Protocol message
NDP
DHCPv6
ARP
DHCPv4

Dropped messages on vlan 10 :
Feature Protocol Msg [Total dropped]
Device-tracking: NDP RA [1241]
reason: Packet not authorized on port [1241]

NS [2]
reason: Silent drop [2]

NA [1039]
reason: Silent drop [1037]
reason: Packet accepted but not forwarded [2]

ARP REP [878]
reason: Silent drop [877]
reason: Packet accepted but not forwarded [1]

ACD&DAD: -- -- [2]

Faults on vlan 10 :

```

# show device-tracking database

To display details of the binding table database, enter the **show device-tracking database** command in privileged EXEC mode.

```
show device-tracking database [ address { hostname_address | all } [ interface interface_type_no ] [ vlanid vlan ] [ details ] | details | interface interface_type_no [ details ] [ vlanid vlan ] | mac [ 48_bit_hw_add ] [ details ] [ interface interface_type_no ] [ vlanid vlan ] | prefix [ prefix_address | all ] [ details ] [ interface interface_type_no ] | vlanid vlanid [ details ] ]
```

<b>Syntax Description</b>	<b>address {hostname_address   all}</b> Displays binding table information for a particular IP address or for all addresses
	<b>interface interface_type_no</b> Displays binding table information for the specified interface. Enter an interface type and number.  Use the question mark (?) online help function to display the types of interfaces on the device.
	<b>vlanid vlan</b> Displays binding table information for the VLAN ID you specify. The valid value range is from 1 to 4095.
	<b>details</b> Displays detailed information.
	<b>mac</b> Displays binding table information for the MAC address you specify.
	<b>48_bit_hw_add</b> Enter a 48-bit hardware address.
	<b>prefix</b> Displays binding table information for the IPv6 prefix you specify.
	<b>prefix_address</b> Enter an IPv6 prefix.
	<b>all</b> Displays binding table information for all the available IPv6 prefixes.

<b>Command Modes</b>	Privileged EXEC (#)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

## Examples

The following is sample output for the **show device-tracking database details** command. The accompanying table describes the significant fields shown in the display.

```
Device# show device-tracking database details

Binding table configuration:
-----
max/box : no limit
max/vlan : no limit
```

**show device-tracking database**

```

max/port : no limit
max/mac  : no limit

Binding table current counters:
-----
dynamic   : 5
local     : 1
total     : 5

Binding table counters by state:
-----
REACHABLE  : 5
    DOWN    : 1
    total   : 6

Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol,
DH4 - IPv4 DHCP, DH6 - IPv6 DHCP, PKT - Other Packet, API - API created
Preflevel flags (prlvl):
0001:MAC and LLA match      0002:Orig trunk          0004:Orig access
0008:Orig trusted trunk     0010:Orig trusted access 0020:DHCP assigned
0040:Cga authenticated       0080:Cert authenticated 0100:Statically assigned

Network Layer Address      Link Layer Address      Interface mode      vlan(prim) prlvl
age      state      Time left     Filter     In Crimson Client ID
Policy (feature)
ARP 192.0.9.29              001b.4411.3ab7(S)    Tel1/0/4   trunk      200 ( 200) 0003
6mn      REACHABLE  331 s      no        yes           0000.0000.0000 (unspecified)
sisf-01 (Device-tracking)
ARP 192.0.9.28              001b.4411.3ab7(S)    Tel1/0/4   trunk      200 ( 200) 0003
6mn      REACHABLE  313 s      no        yes           0000.0000.0000 (unspecified)
sisf-01 (Device-tracking)
ARP 192.0.9.27              001b.4411.3ab7(S)    Tel1/0/4   trunk      200 ( 200) 0003
6mn      REACHABLE  323 s      no        yes           0000.0000.0000 (unspecified)
sisf-01 (Device-tracking)
ARP 192.0.9.26              001b.4411.3ab7(S)    Tel1/0/4   trunk      200 ( 200) 0003
6mn      REACHABLE  311 s      no        yes           0000.0000.0000 (unspecified)
sisf-01 (Device-tracking)
ARP 192.0.9.25              001b.4411.3ab7(S)    Tel1/0/4   trunk      200 ( 200) 0003
6mn      REACHABLE  313 s      no        yes           0000.0000.0000 (unspecified)
sisf-01 (Device-tracking)
L  192.168.0.1               00a5.bf9d.0462(D)    V1200     svi       200 ( 200) 0100
6mn      DOWN                 no        yes           0000.0000.0000 (unspecified)
sisf-01 (sisf_local)

```

**Table 57: show device-tracking database details Field Descriptions**

Field	Description
Binding table configuration: <ul style="list-style-type: none"><li>• max/box</li><li>• max/vlan</li><li>• max/port</li><li>• max/mac</li></ul>	<p>Displays binding table settings. The values correspond with what is configured using the <b>device-tracking binding</b> command in global configuration mode.</p> <ul style="list-style-type: none"> <li>• max/box: The value displayed here corresponds with the configured value for the <b>max-entries no_of_entries</b> keyword.</li> <li>• max/vlan: The value displayed here corresponds with the configured value for the <b>vlan-limit no_of_entries</b> keyword.</li> <li>• max/port: The value displayed here corresponds with the configured value for the <b>port-limit no_of_entries</b> keyword.</li> <li>• max/mac: The value displayed here corresponds with the configured value for the <b>mac-limit no_of_entries</b> keyword.</li> </ul>
Binding table current counters: <ul style="list-style-type: none"><li>• dynamic</li><li>• local</li><li>• total</li></ul>	<p>Displays the number of entries in the table.</p> <ul style="list-style-type: none"> <li>• dynamic: Dynamic entries are created by learning events that dynamically populate the binding table.</li> <li>• local: Local entries are automatically created when you configure an SVI on the device.</li> <li>One of ways in which SISF uses a local entry, is in the context of polling. If polling is enabled, the SVI address is used as the source address of an ARP probe.</li> <li>• total: The total is a sum of the dynamic, local, and static binding entries.</li> </ul>
Binding table counters by state:	Displays the number of entries in each state. The state can be REACHABLE, STALE, DOWN.
Codes	<p>Clarifies abbreviations that are used to signify learning events.</p> <p>The first column of a binding entry uses an abbreviated code, which tells you about the learning event that resulted in creation of that binding entry.</p>

show device-tracking database

Field	Description
Preflevel flags (prlvl)	<p>A list of preference level number codes and clarification for what the number codes in the <code>prlvl</code> column of the binding table mean.</p> <p>The codes signify a broad classification and multiple codes can apply to an entry. What is displayed in the <code>prlvl</code> column is a sum of these number codes and signifies a corresponding preference level.</p> <p>For example if an ARP entry (preference code: 0001) is learned from an access interface (preference code: 0004), the value displayed in the <code>prlvl</code> column is "0005".</p> <p>1 is the lowest preference level, and 100 is the highest.</p> <p>A binding entry with a higher preference is given preference in case of a collision. For example, if the same entry is seen on two different interfaces, the value in the <code>prlvl</code> column, determines which entry is retained.</p>
Network Layer Address	The IP address of the host from which a packet is received.
Link Layer Address	The MAC address of the host.
Mode	Displays one of the following values: "invalid", "unsupp", "access", "trunk", "vpc", "svi", "virtual", "pseudowire", "unkn", "bdi", "pseudoport".
vlan(prim)	The host's VLAN ID
prlvl	<p>A value between 1 and 100 is displayed, with 1 having the lowest preference level, and 100 having the highest preference level.</p> <p>See <code>Preflevel flags</code> above to know what the value displayed here means.</p>
age	The total age of the entry in seconds (s) or minutes (mn) since the last time the entry was refreshed. When it is refreshed (sign-of-life from the host), this value is reset.
state	<p>The current state of an entry, which can be one of the stable or transitional states.</p> <p>Stable state values are: REACHABLE, DOWN, and STALE,</p> <p>Transitional states values are: VERIFY, INCOMPLETE, and TENTATIVE.</p>

Field	Description
Time left	Displays the amount of time left until the next action in the current state.
In Crimson	<p>A <i>yes</i> or <i>no</i> value which indicates if the entry has been added to another database. The information is then used by other applications, like Cisco DNA Center.</p> <p>Typically, all the entries that are in a binding table are also added to this database.</p> <p>This is used by the technical support team, for troubleshooting and to diagnose a problem.</p>
Client ID	<p>This field is applicable only to virtual machines (VMs) in Cisco Software-Defined Access (SDA) deployments.</p> <p>It refers to the actual MAC address of a VM in a bridged networking mode, where the hosting device is a wireless client with a non-promiscuous network interface (NIC).</p>
Session ID	<p>This field is applicable only to VMs in SDA deployments.</p> <p>It refers to an access session ID for a VM in a bridged networking mode. Each Session ID is associated with a Client ID. SISF maintains this association and transfers it along as the VM roams or moves across fabric edges in an SDA setup.</p>
Policy (feature)	<p>Displays the name of the policy applied to the interface or VLAN.</p> <p>The "(feature)" displayed is always "Device-tracking", because only SISF-based device-tracking supports the creation of binding entries.</p>

**show device-tracking events**

# show device-tracking events

To display SISF binding table-related events, enter the **show device-tracking events** command in privileged EXEC mode. The types of events that are displayed includes the creation of binding table entries and all updates to an entry. Updates may be state changes, or, changes in the MAC, VLAN, or interface information for an entry.

## show device-tracking events

<b>Syntax Description</b>	This command has no arguments or keywords.				
<b>Command Default</b>	SISF binding table events are displayed.				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.1.1	This command was introduced.
Release	Modification				
Cisco IOS XE Denali 16.1.1	This command was introduced.				
<b>Usage Guidelines</b>	The output of this command is used by the technical support team, for troubleshooting.				

## Examples

The following is sample output for the **show device-tracking events** command. It shows you the kind of binding table events that the system logs:

```
Device# show device-tracking events
[Wed Mar 23 19:08:33.000] SSID 0 FSM Feature Table running for event ACTIVE_REGISTER in
state CREATING
[Wed Mar 23 19:08:33.000] SSID 0 Transition from CREATING to READY upon event ACTIVE_REGISTER

[Wed Mar 23 19:08:33.000] SSID 1 FSM Feature Table running for event ACTIVE_REGISTER in
state CREATING
[Wed Mar 23 19:08:33.000] SSID 1 Transition from CREATING to READY upon event ACTIVE_REGISTER

[Wed Mar 23 19:09:25.000] SSID 0 FSM sisf_mac_fsm running for event MAC_TENTV in state
MAC-CREATING
[Wed Mar 23 19:09:25.000] SSID 0 Transition from MAC-CREATING to MAC-TENTATIVE upon event
MAC_TENTV
[Wed Mar 23 19:09:25.000] SSID 1 Created Entry origin IPv4 ARP MAC 00a5.bf9c.e051 IPV4
10.0.0.1
[Wed Mar 23 19:09:25.000] SSID 0 FSM sisf_mac_fsm running for event MAC_VERIFIED in state
MAC-TENTATIVE
[Wed Mar 23 19:09:25.000] SSID 0 Transition from MAC-TENTATIVE to MAC-REACHABLE upon event
MAC_VERIFIED
[Wed Mar 23 19:09:25.000] SSID 1 FSM Binding table running for event VALIDATE_LLA in state
CREATING
[Wed Mar 23 19:09:25.000] SSID 1 FSM Binding table running for event SET_TENTATIVE in state
CREATING
[Wed Mar 23 19:09:25.000] SSID 1 Transition from CREATING to TENTATIVE upon event
SET_TENTATIVE
[Wed Mar 23 19:09:25.000] SSID 1 Entry State changed origin IPv4 ARP MAC 00a5.bf9c.e051
IPV4 10.0.0.1
```

```
[Wed Mar 23 20:07:27.000] SSID 0 FSM sisf_mac_fsm running for event MAC_DELETE_NOS in state  
MAC-REACHABLE  
[Wed Mar 23 20:07:27.000] SSID 0 Transition from MAC-REACHABLE to MAC-NONE upon event  
MAC_DELETE_NOS  
[Wed Mar 23 20:07:27.000] SSID 1 Transition from REACHABLE to NONE upon event DELETE
```

**show device-tracking features**

# show device-tracking features

To display the device-tracking features that are enabled, enter the **show device-tracking features** command in privileged EXEC mode. The "features" include SISF-based device-tracking, and security features like IPv6 RA Guard, IPv6 DHCP Guard, Layer 2 DHCP Relay, and so on, that use SISF.

## show device-tracking features

<b>Syntax Description</b>	This command has no arguments or keywords.				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.1.1	This command was introduced.
Release	Modification				
Cisco IOS XE Denali 16.1.1	This command was introduced.				

## Examples

The following is sample output for the **show device-tracking features** command.

```
Device# show device-tracking features
Feature name      priority state
Device-tracking    128     READY
Source guard       32      READY
```

# show device-tracking policies

To display *all* the device-tracking policies on the device, enter the **show device-tracking policies** command in privileged EXEC mode.

**show device-tracking policies [ details | interface *interface\_type\_no* [ details ] | vlan *vlanid* ]**

<b>Syntax Description</b>	<b>details</b> Displays information about the policy targets and policy parameters of all device-tracking policies on the device				
	<b>interface <i>interface_type_no</i></b> Displays all policies applied to the the specified interface. Enter an interface type and number.  Use the question mark (?) online help function to display the types of interfaces on the device.				
	<b>vlan <i>vlanid</i></b> Displays all policies applied to the the specified VLAN. The valid value range is from 1 to 4095.				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.1.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Denali 16.1.1	This command was introduced.				

## Examples

The following is sample output for the **show device-tracking policies** command with the **details** keyword. It shows that there is only one policy on the device. It shows the target to which the policy is applied and the policy parameters.

```
Device# show device-tracking policies details

Target          Type   Policy           Feature      Target range
Tel1/0/1        PORT   sisf-01        Device-tracking  vlan all

Device-tracking policy sisf-01 configuration:
  security-level guard
  device-role node
  gleanning from Neighbor Discovery
  gleanning from DHCP6
  gleanning from ARP
  gleanning from DHCP4
  NOT gleanning from protocol unkn
  tracking enable

Policy sisf-01 is applied on the following targets:
Target          Type   Policy           Feature      Target range
Tel1/0/1        PORT   sisf-01        Device-tracking  vlan all
```

**show device-tracking policy**

# show device-tracking policy

To display information about a particular policy, enter the **show device-tracking policy** command in privileged EXEC mode. Displayed information includes the list of targets to which the policy is applied, and policy parameters.

**show device-tracking policy *policy\_name***

Syntax Description	<i>policy_name</i> Enter the name of the policy.
--------------------	--

Command Modes	Privileged EXEC (#)
---------------	---------------------

Command History	Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.	

## Examples

The following is sample output for the **show device-tracking policy** command. Details of policy *sisf-01* are displayed.

```
Device# show device-tracking policy sisf-01
Device-tracking policy sisf-01 configuration:
  security-level guard
  device-role node
  gleanning from Neighbor Discovery
  gleanning from DHCP6
  gleanning from ARP
  gleanning from DHCP4
  NOT gleanning from protocol unkn
  tracking enable
Policy sisf-01 is applied on the following targets:
Target          Type   Policy           Feature           Target range
Tel/0/1         PORT   sisf-01        Device-tracking  vlan all
```

# show dot1x

To display IEEE 802.1x statistics, administrative status, and operational status for the switch or for the specified port, use the **show dot1x** command in user EXEC mode.

```
show dot1x [all [count | details | statistics | summary]] [interface type number [details | statistics] ] [statistics]
```

Syntax Description		
<b>all</b>	(Optional) Displays the IEEE 802.1x information for all interfaces.	
<b>count</b>	(Optional) Displays total number of authorized and unauthorized clients.	
<b>details</b>	(Optional) Displays the IEEE 802.1x interface details.	
<b>statistics</b>	(Optional) Displays the IEEE 802.1x statistics for all interfaces.	
<b>summary</b>	(Optional) Displays the IEEE 802.1x summary for all interfaces.	
<b>interface type number</b>	(Optional) Displays the IEEE 802.1x status for the specified port.	
Command Modes	User EXEC	
Command History	Release	Modification
Cisco IOS XE 3.2SE		This command was introduced.

This is an example of output from the **show dot1x all** command:

```
Device# show dot1x all
Sysauthcontrol           Enabled
Dot1x Protocol Version   3
```

This is an example of output from the **show dot1x all count** command:

```
Device# show dot1x all count
Number of Dot1x sessions
-----
Authorized Clients      = 0
UnAuthorized Clients    = 0
Total No of Client      = 0
```

This is an example of output from the **show dot1x all statistics** command:

```
Device# show dot1x statistics
Dot1x Global Statistics for
-----
RxStart = 0      RxLogoff = 0      RxResp = 0      RxRespID = 0
RxReq = 0       RxInvalid = 0     RxLenErr = 0
RxTotal = 0
```

```
show dot1x
```

```
TxStart = 0      TxLogoff = 0      TxResp = 0
TxReq = 0       ReTxReq = 0      ReTxReqFail = 0
TxReqID = 0     ReTxReqID = 0    ReTxReqIDFail = 0
TxTotal = 0
```

# show eap pac peer

To display stored Protected Access Credentials (PAC) for Extensible Authentication Protocol (EAP) Flexible Authentication via Secure Tunneling (FAST) peers, use the **show eap pac peer** command in privileged EXEC mode.

## show eap pac peer

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

This is an example of output from the **show eap pac peers** privileged EXEC command:

```
Device> show eap pac peers
No PACs stored
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>clear eap sessions</b>	Clears EAP session information for the switch or for the specified port.

**show ip dhcp snooping statistics**

# show ip dhcp snooping statistics

To display DHCP snooping statistics in summary or detail form, use the **show ip dhcp snooping statistics** command in user EXEC mode.

**show ip dhcp snooping statistics [detail]**

<b>Syntax Description</b>	<b>detail</b> (Optional) Displays detailed statistics information.	
<b>Command Modes</b>	User EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** In a switch stack, all statistics are generated on the stack primary. If a new active switch is elected, the statistics counters reset.

This is an example of output from the **show ip dhcp snooping statistics** command:

```
Device> show ip dhcp snooping statistics
Packets Forwarded = 0
Packets Dropped = 0
Packets Dropped From untrusted ports = 0
```

This is an example of output from the **show ip dhcp snooping statistics detail** command:

```
Device> show ip dhcp snooping statistics detail
Packets Processed by DHCP Snooping = 0
Packets Dropped Because
  IDB not known = 0
  Queue full = 0
  Interface is in errdisabled = 0
  Rate limit exceeded = 0
  Received on untrusted ports = 0
  Nonzero giaddr = 0
  Source mac not equal to chaddr = 0
  Binding mismatch = 0
  Insertion of opt82 fail = 0
  Interface Down = 0
  Unknown output interface = 0
  Reply output port equal to input port = 0
  Packet denied by platform = 0
```

This table shows the DHCP snooping statistics and their descriptions:

**Table 58: DHCP Snooping Statistics**

DHCP Snooping Statistic	Description
Packets Processed by DHCP Snooping	Total number of packets handled by DHCP snooping, including forwarded and dropped packets.
Packets Dropped Because IDB not known	Number of errors when the input interface of the packet cannot be determined.
Queue full	Number of errors when an internal queue used to process the packets is full. This might happen if DHCP packets are received at an excessively high rate and rate limiting is not enabled on the ingress ports.
Interface is in errdisabled	Number of times a packet was received on a port that has been marked as error disabled. This might happen if packets are in the processing queue when a port is put into the error-disabled state and those packets are subsequently processed.
Rate limit exceeded	Number of times the rate limit configured on the port was exceeded and the interface was put into the error-disabled state.
Received on untrusted ports	Number of times a DHCP server packet (OFFER, ACK, NAK, or LEASEQUERY) was received on an untrusted port and was dropped.
Nonzero giaddr	Number of times the relay agent address field (giaddr) in the DHCP packet received on an untrusted port was not zero, or the <b>no ip dhcp snooping information option allow-untrusted</b> global configuration command is not configured and a packet received on an untrusted port contained option-82 data.
Source mac not equal to chaddr	Number of times the client MAC address field of the DHCP packet (chaddr) does not match the packet source MAC address and the <b>ip dhcp snooping verify mac-address</b> global configuration command is configured.
Binding mismatch	Number of times a RELEASE or DECLINE packet was received on a port that is different than the port in the binding for that MAC address-VLAN pair. This indicates someone might be trying to spoof the real client, or it could mean that the client has moved to another port on the switch and issued a RELEASE or DECLINE. The MAC address is taken from the chaddr field of the DHCP packet, not the source MAC address in the Ethernet header.
Insertion of opt82 fail	Number of times the option-82 insertion into a packet failed. The insertion might fail if the packet with the option-82 data exceeds the size of a single physical packet on the internet.

**show ip dhcp snooping statistics**

DHCP Snooping Statistic	Description
Interface Down	Number of times the packet is a reply to the DHCP relay agent, but the SVI interface for the relay agent is down. This is an unlikely error that occurs if the SVI goes down between sending the client request to the DHCP server and receiving the response.
Unknown output interface	Number of times the output interface for a DHCP reply packet cannot be determined by either option-82 data or a lookup in the MAC address table. The packet is dropped. This can happen if option 82 is not used and the client MAC address has aged out. If IPSG is enabled with the port-security option and option 82 is not enabled, the MAC address of the client is not learned, and the reply packets will be dropped.
Reply output port equal to input port	Number of times the output port for a DHCP reply packet is the same as the input port, causing a possible loop. Indicates a possible network misconfiguration or misuse of trust settings on ports.
Packet denied by platform	Number of times the packet has been denied by a platform-specific registry.

# show macsec

To display 802.1ae Media Access Control Security (MACsec) information, use the **show macsec** command in privileged EXEC mode.

**show macsec {interface*interface-id* | summary}**

<b>Syntax Description</b>	<b>interface <i>interface-id</i></b>	Displays MACsec interface details.
	<b>summary</b>	Displays MACsec summary information.
<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.1	This command was introduced.

## Examples

This is sample output of the **show macsec interface** command when there is no MACsec session established on the interface:

```
Switch# show macsec interface gigabitetherent 1/0/1
MACsec is enabled
Replay protect : enabled
Replay window : 0
Include SCI : yes
Cipher : GCM-AES-128
Confidentiality Offset : 0
Capabilities
Max. Rx SA : 16
Max. Tx SA : 16
Validate Frames : strict
PN threshold notification support : Yes
Ciphers supported : GCM-AES-128
No Transmit Secure Channels
No Receive Secure Channels
```

This is sample output of the **show macsec interface** command after the session is established:

```
Switch# show macsec interface gigabitetherent 1/0/1
MACsec is enabled
Replay protect : enabled
Replay window : 0
Include SCI : yes
Cipher : GCM-AES-128
Confidentiality Offset : 0
Capabilities
Max. Rx SA : 16
Max. Tx SA : 16
Validate Frames : strict
PN threshold notification support : Yes
```

show macsec

```
Ciphers supported : GCM-AES-128
Transmit Secure Channels
SCI : 0022BDCF9A010002
Elapsed time : 00:00:00
Current AN: 0 Previous AN: -1
SC Statistics
Auth-only (0 / 0)
Encrypt (1910 / 0)
Receive Secure Channels
SCI : 001B2140EC4C0000
Elapsed time : 00:00:00
Current AN: 0 Previous AN: -1
SC Statistics
Notvalid pkts 0 Invalid pkts 0
Valid pkts 1 Late pkts 0
Uncheck pkts 0 Delay pkts 0
Port Statistics
Ingress untag pkts 0 Ingress notag pkts 1583
Ingress badtag pkts 0 Ingress unknownSCI pkts 0
Ingress noSCI pkts 0 Unused pkts 0
Notusing pkts 0 Decrypt bytes 80914
Ingress miss pkts 1492
```

This is sample output of the **show macsec summary** command to see all established MACsec sessions:

```
Switch# show macsec summary
Interface          Transmit SC      Receive SC
GigabitEthernet1/0/18    0            0
GigabitEthernet1/0/20    1            1
GigabitEthernet1/0/21    0            0
GigabitEthernet1/0/22    1            1
GigabitEthernet4/0/19    0            0
GigabitEthernet4/0/20    1            1
GigabitEthernet4/0/22    0            0
```

#### Related Commands

Command	Description
<b>maesec</b>	Enables MACsec on an interface

# show mka policy

To display a summary of all defined MACsec Key Agreement (MKA) protocol policies, including the MKA default policy, or to display a summary of a specified policy, use the **show mka policy** command in privileged EXEC mode.

**show mka policy [policy-name [detail] [sessions]]**

<b>Syntax Description</b>	<p><i>policy-name</i> (Optional) Specifies the name for the policy.</p> <p><b>detail</b> (Optional) Displays detailed configuration information for the specified MKA policy, including the names of the physical interfaces to which the policy is applied. The output shows the default values for each configuration option.</p> <p>When entered after the <b>session</b> keyword, displays detailed status information about all active MKA sessions with the specified policy name.</p> <p><b>sessions</b> (Optional) Displays a summary of all active MKA sessions with the specified policy name.</p>					
<b>Command Modes</b>	Privileged EXEC					
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>		Release	Modification	Cisco IOS XE Denali 16.3.1	This command was introduced.
Release	Modification					
Cisco IOS XE Denali 16.3.1	This command was introduced.					

## Examples

This is sample output of the **show mka policy** command:

```
Switch# show mka policy
MKA Policy Summary...
Policy          KS      Delay   Replay Window    Conf     Interfaces
Name           Priority Protect Protect Size      Offset Applied
=====
*DEFAULT POLICY* 0        NO       YES      0          0        Gi1/0/1
MkaPolicy-1     0        NO       YES     1000       0        Gi1/0/2  Gi1/0/3
MkaPolicy-2     0        NO       YES      0          50      Gi1/0/4  Gi1/0/5
MkaPolicy-3     0        YES      YES      64         30      Gi1/0/6
my_policy       0        NO       YES     4294967295 0
test-policy     0        NO       YES     10000      0
```

**show mka policy**

**Table 59: Table 0-5 show mka policy Output Fields**

Field	Description
Policy Name	The string identifier of the policy.
KS Priority	The set value of the priority for becoming the key server (KS). The range is 0 to 255, with 0 as the highest priority and 255 as the lowest priority. A value of 0 means that the switch should always try to act as the key server, while a value of 255 means that it should never try to act as the server. This value is not configurable.
Delay Protect	The set value of delay protection being provided. This value is not configurable.
Replay Protect	The configured value of replay protection being provided. (This is configurable by entering the replay-protection window-size command.)
Window Size	The configured size of the replay protection window in number of frames per packet. If replay protection is off, the value is 0. If replay protection is on and the value is 0, a strict in-order verification of MACsec frames occurs. (This is configurable by entering the replay-protection window-size command.)
Conf Offset	The configured value of the confidentiality offset in the number of bytes to offset protection or encryption into each frame in MACsec. Configurable values are 0 (no offset), 30, or 50 bytes.
Interfaces Applied	The short name of each interface on which this policy is applied. The string is empty if it is not applied to any interfaces.

This is sample output of the **show mka policy detail** command:

```
Switch# show mka policy MkaPolicy detail
MKA Policy Configuration ("MkaPolicy-3")
=====
MKA Policy Name..... MkaPolicy-3
Key Server Priority.... 0
Delay Protection..... NO
Replay Protection..... YES
Replay Window Size.... 64
Confidentiality Offset. 30
Applied Interfaces...
    GigabitEthernet1/0/4      GigabitEthernet1/0/5
    GigabitEthernet1/0/6
```

This is sample output of the **show mka policy sessions** command:

```
Switch# show mka policy replay-policy sessions
Summary of All Active MKA Sessions with MKA Policy "replay-policy"...
Interface Peer-RxSCI          Policy-Name      Audit-Session-ID
Port-ID Local-TxSCI           Key-Svr Status   CKN
=====
Gi1/0/25 001b.2140.ec3c/0000 replay-policy  0A05783B0000001700448BA8
2        001e.bdfe.6d99/0002 YES       Secured  3808F996026DFB8A2FCEC9A88BBD0680
```

Related Commands	Command	Description
	mka policy (global configuration)	Creates an MKA policy and enters MKA policy configuration mode.
	mka policy (interface configuration)	Applies an MKA policy to the interface.

show mka session

# show mka session

To display a summary of active MACsec Key Agreement (MKA) Protocol sessions, use the **show mka session** command in privileged EXEC mode.

**show mka session [interface*interface-id*] [port-id*port-id*] [local-sci*sci*] [detail]**

<b>Syntax Description</b>	<b>interface <i>interface-id</i></b> <b>port-id <i>port-id</i></b> <b>local-sci <i>sci</i></b> <b>detail</b>	(Optional) Displays status information for active MKA sessions on an interface. (Optional) Displays a summary of active MKA sessions running on the interface with the specified port ID. To see the port ID, enter the <b>show mka session interface <i>interface-id</i></b> command. Port identifier values begin at 2 and monotonically increase for each new session that uses a virtual port on the same physical interface. (Optional) Displays status information for the MKA session identified by the Local TX-SCI. To determine the Local TX-SCI for a specific session, enter the <b>show mka session</b> command without any keywords. The SCI must be 8 octets (16 hexadecimal digits) long. (Optional) Displays detailed status information about all active MKA sessions, all sessions on the specified interface, or on the specified interface with the specified port ID.
<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Denali 16.3.1	<b>Modification</b> This command was introduced.

## Examples

This is sample output of the **show mka session** command:

```
Switch# show mka session
Total MKA Sessions..... 1
  Secured Sessions... 1
  Pending Sessions... 0
=====
Interface  Peer-RxSCI      Policy-Name      Audit-Session-ID
Port-ID    Local-TxSCI     Key-Svr Status   CKN
=====
Gi1/0/1    001b.213d.28ed/0000 *DEFAULT POLICY* 020202020000000000000000EAA6
2          001e.bdfe.8402/0002 YES      Secured  3A06ECB1183E42BB4D7817EB2B949D0E
Gi1/0/1    001a.323a.38ef/0000 *DEFAULT POLICY* 020203140000000000000000EAB9
3          001e.bdfe.8402/0003 YES      Pending   CFB1E3B513344AB3417E17FBCB449D3A
```

```

Gi1/0/2    001c.113f.2d3a/0000 MkaPolicy-1      02020533000000000000EC81
2          001e.bdfe.8402/0002 YES     Secured   F103EABB133F4AB3497312EF2A949A03

```

**Table 60: Table 0-6 show mka session Output Fields**

Field	Description
Interface	The short name of the physical interface on which the MKA session is active.
Peer-RxSCI	The MAC address of the interface of the peer concatenated with the peer 16-bit Port-ID.
Policy-name	The name of the policy used at session start to set initial configuration values.
Audit session ID	Session ID.
Port-ID	The Port-ID used in the Local-TX-SCI.
Local-TxSCI	The MAC address of the physical interface concatenated with the 16-bit Port-ID.
Key Server Status	The key server: has value 'Y' for YES if the MKA session is the key server, otherwise, 'N' for NO.
CKN	Connectivity association key (CAK) name

This is sample output of the **show mka session detail** command:

```

Switch# show mka session detail
MKA Detailed Status for MKA Session
=====
Status: SECURED - Secured MKA Session with MACsec
Local Tx-SCI..... 0022.bdcd.9a01/0002
Interface MAC Address.... 0022.bdcd.9a01
MKA Port Identifier..... 2
Interface Name..... GigabitEthernet1/0/1
Audit Session ID..... 0B0B0B3D0000034F050FA69B
CAK Name (CKN)..... 46EFE9FE85199FE404FB7AFA3FD0732E
Member Identifier (MI).... D7B00EDA353242704CC6B0DB
Message Number (MN)..... 7
Authenticator..... YES
Key Server..... YES
Latest SAK Status..... Rx & Tx
Latest SAK AN..... 0
Latest SAK KI (KN)..... D7B00EDA353242704CC6B0DB00000001 (1)
Old SAK Status..... FIRST-SAK
Old SAK AN..... 0
Old SAK KI (KN)..... FIRST-SAK (0)
SAK Transmit Wait Time... 0s (Not waiting for any peers to respond)
SAK Retire Time..... 0s (No Old SAK to retire)
MKA Policy Name..... *DEFAULT POLICY*
Key Server Priority..... 0
Delay Protection..... NO
Replay Protection..... YES
Replay Window Size..... 0
Confidentiality Offset... 0
Algorithm Agility..... 80C201
Cipher Suite..... 0080020001000001 (GCM-AES-128)
MACsec Capability..... 3 (MACsec Integrity, Confidentiality, & Offset)
MACsec Desired..... YES

```

**show mka session**

```

# of MACsec Capable Live Peers..... 1
# of MACsec Capable Live Peers Responded.. 1
Live Peers List:
  MI           MN       Rx-SCI (Peer)
  -----
  DA296D3E62E0961234BF39A6 7      001b.2140.ec4c/0000
Potential Peers List:
  MI           MN       Rx-SCI (Peer)
  -----

```

This is sample output of the **show mka session interface** command:

```

Switch# show mka session interface gigabitethernet1/0/25
Summary of All Currently Active MKA Sessions on Interface GigabitEthernet1/0/25.
Interface Peer-RxSCI      Policy-Name      Audit-Session-ID
Port-ID Local-TxSCI      Key-Svr Status   CKN
=====
Gi1/0/25 001b.2140.ec3c/0000 replay-policy 0A05783B0000001700448BA8
2        001e.bdfe.6d99/0002 YES      Secured 3808F996026DFB8A2FCEC9A88BBD0680

```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear mka sessions</b>	Clears all MKA sessions or clear MKA sessions on a port-ID, interface, or Local TX-SCI.
<b>macsec</b>	Enables MACsec on an interface.

# show mka statistics

To display global MACsec Key Agreement (MKA) Protocol statistics and error counters, use the **show mka statistics** command in privileged EXEC mode.

**show mka statistics [interface*interface-id*port-id*port-id*] | [local-sci*sci*] }**

<b>Syntax Description</b>	<b>interface <i>interface-id</i></b> (Optional) Displays statistics for an MKA session on an interface. Only physical interfaces are valid.				
	<b>port-id <i>port-id</i></b> Displays a summary of active MKA sessions running on the interface with the specified port ID. To see the port ID, enter the show mka session or <b>show mka session interface <i>interface-id</i></b> command. Port identifier values begin at 2 and monotonically increase for each new active session using a virtual port on the same physical interface.				
	<b>local-sci <i>sci</i></b> (Optional) Shows statistics for an MKA session identified by its Local TX-SCI. To determine the Local TX-SCI for a session, enter the show mka session detail command. The SCI must be 8 octets (16 hexadecimal digits) long.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.1</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Denali 16.3.1	This command was introduced.				

## Examples

This is an example of the **show mka statistics** command output:

```
Switch# show mka statistics
MKA Global Statistics
=====
MKA Session Totals
    Secured..... 32
    Reauthentication Attempts.. 31
    Deleted (Secured)..... 1
    Keepalive Timeouts..... 0
CA Statistics
    Pairwise CAKs Derived..... 32
    Pairwise CAK Rekeys..... 31
    Group CAKs Generated..... 0
    Group CAKs Received..... 0
SA Statistics
    SAKs Generated..... 32
    SAKs Rekeyed..... 31
    SAKs Received..... 0
    SAK Responses Received.... 32
MKPDU Statistics
    MKPDUs Validated & Rx..... 580
    "Distributed SAK"..... 0
```

show mka statistics

```

    "Distributed CAK"..... 0
    MKPDUS Transmitted..... 597
        "Distributed SAK".... 32
        "Distributed CAK".... 0
    MKA Error Counter Totals
    =====
    Bring-up Failures..... 0
    Reauthentication Failures..... 0
    SAK Failures
        SAK Generation..... 0
        Hash Key Generation..... 0
        SAK Encryption/Wrap..... 0
        SAK Decryption/Unwrap..... 0
    CA Failures
        Group CAK Generation..... 0
        Group CAK Encryption/Wrap..... 0
        Group CAK Decryption/Unwrap..... 0
        Pairwise CAK Derivation..... 0
        CKN Derivation..... 0
        ICK Derivation..... 0
        KEK Derivation..... 0
        Invalid Peer MACsec Capability.. 2
    MACsec Failures
        Rx SC Creation..... 0
        Tx SC Creation..... 0
        Rx SA Installation..... 0
        Tx SA Installation..... 0
    MKPDU Failures
        MKPDU Tx..... 0
        MKPDU Rx Validation..... 0
        MKPDU Rx Bad Peer MN..... 0
        MKPDU Rx Non-recent Peerlist MN.. 0

```

**Table 61: Table 0-7 show mka Global Statistics Output Fields (continued)**

Field	Description
Reauthentications	Reauthentications from 802.1x.
Pairwise CAKs Derived	Pairwise secure connectivity association keys (CAKs) derived through EAP authentication.
Pairwise CAK Rekeys	Pairwise CAK rekeys after reauthentication.
Group CAKs Generated	Generated group CAKs while acting as a key server in a group CA.
Group CAKs Received	Received group CAKs while acting as a nonkey server member in a group CA.
SAK Rekeys	Secure association key (SAK) rekeys that have been initiated as key servers or received as nonkey server members.
SAKs Generated	Generated SAKs while acting as a key server in any CA.
SAKs Received	Received SAKs while acting as a nonkey server member in any CA.
MPDUs Validated & Rx	MACsec Key Agreement Protocol Data Units (MPDUs) received and validated.
MPDUs Transmitted	Transmitted MPDUs.

Related Commands	Command	Description
	clear mka statistics	Clears all MKA statistics or those on a specified interface port-ID or Local TX-SCI.

**show mka summary**

# show mka summary

To display a summary of MACsec Key Agreement (MKA) sessions and global statistics, use the **show mka summary** command in privileged EXEC mode.

## show mka summary

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
Cisco IOS XE Denali 16.3.1		This command was introduced.

## Examples

This is an example of the **show mka summary** command output:

```
Switch# show mka summary
Summary of All Currently Active MKA Sessions...
=====
Total MKA Sessions..... 1
Initializing (Waiting for Peer)..... 0
Pending (Waiting for Peer MACsec Reply).... 0
Secured (Secured MKA Session with MACsec).. 1
Reauthenticating MKA Sessions..... 0
Interface Peer-RxSCI Policy-Name Audit-Session-ID
Port-ID Local-TxSCI Key-Svr Status CKN
=====
Gi1/0/25 001b.2140.ec3c/0000 replay-policy 0A05783B0000001700448BA8
2 001e.bdfe.6d99/0002 YES Secured 3808F996026DFB8A2FCEC9A88BBD0680
MKA Global Statistics
=====
MKA Session Totals
Secured..... 36
Reauthentications..... 23
Deleted (Secured)..... 0
Keepalive Timeouts..... 4
MACsec SAK-Use Timeouts.. 0
CA Statistics
Pairwise CAKs Derived.... 33
Pairwise CAK Rekeys..... 23
Group CAKs Generated..... 0
Group CAKs Received..... 0
SA Statistics
SAKs Generated..... 61
SAKs Rekeyed..... 54
SAKs Received..... 0
SAK Responses Received... 59
MKPDU Statistics
MKPDUs Validated & Rx.... 75774
"Distributed SAK"..... 0
"Distributed CAK"..... 0
MKPDUs Transmitted..... 75049
```

```

"Distributed SAK"..... 96
"Distributed CAK"..... 0
MKA Error Counter Totals
=====
Internal Failures..... 0
Session Failures
Failed while Initializing..... 6
Failed while Pending MACsec... 2
Reauthentication Failure..... 0
SAK Failures
SAK Generation..... 0
Hash Key Generation..... 0
SAK Encryption/Wrap..... 0
SAK Decryption/Unwrap..... 0
CA Failures
Group CAK Generation..... 0
Group CAK Encryption/Wrap.... 0
Group CAK Decryption/Unwrap... 0
Pairwise CAK Derivation..... 0
CKN Derivation..... 0
ICK Derivation..... 0
KEK Derivation..... 0
MACsec Failures
Rx SC Creation..... 2
Tx SC Creation..... 2
Rx SA Installation..... 2
Tx SA Installation..... 0
MKPDU Failures
MKPDU Tx..... 0
MKPDU Rx Validation..... 13
Bad Peer MN (anti-replay)... 0
Non-recent Peerlist MN..... 0
MKA Policy Summary...
Policy KS Delay Replay Window Conf Interfaces
Name Priority Protect Protect Size Offset Applied
=====
*DEFAULT POLICY* 0 NO YES 0 0 Gi1/0/26 Gi1/0/29
replay-policy 0 NO YES 300 0 Gi1/0/25
Incredible-59#sh mka policy replay-policy
MKA Policy Summary...
Policy KS Delay Replay Window Conf Interfaces
Name Priority Protect Protect Size Offset Applied
=====
replay-policy 0 NO YES 300 0 Gi1/0/25

```

**Table 62: Table 0-8 show mka summary Output Fields**

<b>Field</b>	<b>Description</b>
Reauthentications	Reauthentications from 802.1x.
Pairwise CAKs Derived	Pairwise secure connectivity association keys (CAKs) derived through EAP authentication.
Pairwise CAK Rekeys	Pairwise CAK rekeys after reauthentication.
Group CAKs Generated	Generated group CAKs while acting as a key server in a group CA.
Group CAKs Received	Received group CAKs while acting as a nonkey server member in a group CA.

**show mka summary**

Field	Description
SAK Rekeys	Secure association key (SAK) rekeys that have been initiated as key servers or received as a non-key server members.
SAKs Generated	Generated SAKs while acting as a key server in any CA.
SAKs Received	Received SAKs while acting as a nonkey server member in any CA.
MPDUs Validated & Rx	MACsec Key Agreement Protocol Data Units (MPDUs) received and validated.
MPDUs Transmitted	Transmitted MPDUs.

#### Related Commands

Command	Description
show mka policy	Displays information about defined MKA protocol policies.
show mka session	Displays a summary of active MKA sessions.
<b>show mka statistics</b>	Displays global MKA statistics.

# show radius server-group

To display properties for the RADIUS server group, use the **show radius server-group** command.

**show radius server-group {name | all}**

<b>Syntax Description</b>	<i>name</i> Name of the server group. The character string used to name the group of servers must be defined using the <b>aaa group server radius</b> command.
---------------------------	--

<i>all</i>	Displays properties for all of the server groups.
------------	---

<b>Command Modes</b>	User EXEC
----------------------	-----------

	Privileged EXEC
--	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
------------------------	----------------	---------------------

	Cisco IOS XE 3.2SE	This command was introduced.
--	--------------------	------------------------------

<b>Usage Guidelines</b>	Use the <b>show radius server-group</b> command to display the server groups that you defined by using the <b>aaa group server radius</b> command.
-------------------------	--

This is an example of output from the **show radius server-group all** command:

```
Device# show radius server-group all
Server group radius
    Sharecount = 1    sg_unconfigured = FALSE
    Type = standard  Memlocks = 1
```

This table describes the significant fields shown in the display.

**Table 63: show radius server-group command Field Descriptions**

Field	Description
Server group	Name of the server group.
Sharecount	Number of method lists that are sharing this server group. For example, if one method list uses a particular server group, the sharecount would be 1. If two method lists use the same server group, the sharecount would be 2.
sg_unconfigured	Server group has been unconfigured.
Type	The type can be either standard or nonstandard. The type indicates whether the servers in the group accept nonstandard attributes. If all servers within the group are configured with the nonstandard option, the type will be shown as "nonstandard".

**show radius server-group**

Field	Description
Memlocks	An internal reference count for the server-group structure that is in memory. The number represents how many internal data structure packets or transactions are holding references to this server group. Memlocks is used internally for memory management purposes.

# show storm-control

To display broadcast, multicast, or unicast storm control settings on the switch or on the specified interface or to display storm-control history, use the **show storm-control** command in user EXEC mode.

**show storm-control [{interface-id}] [{broadcast | multicast | unicast}]**

<b>Syntax Description</b>	<i>interface-id</i> (Optional) Interface ID for the physical port (including type, stack member for stacking-capable switches, module, and port number).				
<b>broadcast</b>	(Optional) Displays broadcast storm threshold setting.				
<b>multicast</b>	(Optional) Displays multicast storm threshold setting.				
<b>unicast</b>	(Optional) Displays unicast storm threshold setting.				
<b>Command Modes</b>	User EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines**  
When you enter an interface ID, the storm control thresholds appear for the specified interface.  
If you do not enter an interface ID, settings appear for one traffic type for all ports on the switch.  
If you do not enter a traffic type, settings appear for broadcast storm control.

This is an example of a partial output from the **show storm-control** command when no keywords are entered. Because no traffic-type keyword was entered, the broadcast storm control settings appear.

```
Device> show storm-control
Interface Filter State    Upper      Lower      Current
----- ----- -----
Gi1/0/1  Forwarding    20 pps     10 pps     5 pps
Gi1/0/2  Forwarding   50.00%    40.00%    0.00%
<output truncated>
```

This is an example of output from the **show storm-control** command for a specified interface. Because no traffic-type keyword was entered, the broadcast storm control settings appear.

```
Device> show storm-control gigabitethernet 1/0/1
Interface Filter State    Upper      Lower      Current
----- ----- -----
Gi1/0/1  Forwarding    20 pps     10 pps     5 pps
```

The following table describes the fields in the show storm-control display:

**Table 64: show storm-control Field Descriptions**

Field	Description
Interface	Displays the ID of the interface.

**show storm-control**

<b>Field</b>	<b>Description</b>
Filter State	<p>Displays the status of the filter:</p> <ul style="list-style-type: none"> <li>• Blocking—Storm control is enabled, and a storm has occurred.</li> <li>• Forwarding—Storm control is enabled, and no storms have occurred.</li> <li>• Inactive—Storm control is disabled.</li> </ul>
Upper	Displays the rising suppression level as a percentage of total available bandwidth in packets per second or in bits per second.
Lower	Displays the falling suppression level as a percentage of total available bandwidth in packets per second or in bits per second.
Current	Displays the bandwidth usage of broadcast traffic or the specified traffic type (broadcast, multicast, or unicast) as a percentage of total available bandwidth. This field is only valid when storm control is enabled.

# show tech-support acl

To display access control list (ACL)-related information for technical support, use the **show tech-support acl** command in privileged EXEC mode.

## show tech-support acl

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

<b>Usage Guidelines</b>	The output of the <b>show tech-support acl</b> command is very long. To better manage this output, you can redirect the output to an external file (for example, <b>show tech-support acl   redirect flash:show_tech_acl.txt</b> ) in the local writable storage file system or remote file system.
-------------------------	---

The output of this command displays the following commands:



**Note** On stackable platforms, these commands are executed on every switch in the stack. On modular platforms, like Catalyst 9400 Series Switches, these commands are run only on the active switch.



**Note** The following list of commands is a sample of the commands available in the output; these may differ based on the platform.

- **show clock**
- **show version**
- **show running-config**
- **show module**
- **show interface**
- **show access-lists**
- **show logging**
- **show platform software fed switch *switch-number* acl counters hardware**
- **show platform software fed switch *switch-number* ifm mapping**
- **show platform hardware fed switch *switch-number* fwd-asic drops exceptions**
- **show platform software fed switch *switch-number* acl info**
- **show platform software fed switch *switch-number* acl**

**show tech-support acl**

- **show platform software fed switch *switch-number* acl usage**
- **show platform software fed switch *switch-number* acl policy intftype all cam**
- **show platform software fed switch *switch-number* acl cam brief**
- **show platform software fed switch *switch-number* acl policy intftype all vcu**
- **show platform hardware fed switch *switch-number* acl resource usage**
- **show platform hardware fed switch *switch-number* fwd-asic resource tcam table acl**
- **show platform hardware fed switch *switch-number* fwd-asic resource team utilization**
- **show platform software fed switch *switch-number* acl counters hardware**
- **show platform software classification switch *switch-number* all F0 class-group-manager class-group**
- **show platform software process database forwarding-manager switch *switch-number* R0 summary**
- **show platform software process database forwarding-manager switch *switch-number* F0 summary**
- **show platform software object-manager switch *switch-number* F0 pending-ack-update**
- **show platform software object-manager switch *switch-number* F0 pending-issue-update**
- **show platform software object-manager switch *switch-number* F0 error-object**
- **show platform software peer forwarding-manager switch *switch-number* F0**
- **show platform software access-list switch *switch-number* f0 statistics**
- **show platform software access-list switch *switch-number* r0 statistics**
- **show platform software trace message fed switch *switch-number***
- **show platform software trace message forwarding-manager switch *switch-number* F0**
- **show platform software trace message forwarding-manager switch R0 switch-number R0**

## Examples

The following is sample output from the **show tech-support acl** command:

```
Device# show tech-support acl

.
.
.

----- show platform software fed switch 1 acl cam brief -----

Printing entries for region ACL_CONTROL (143) type 6 asic 0
=====
TAQ-4 Index-0 (A:0,C:0) Valid StartF-1 StartA-1 SkipF-0 SkipA-0
Output IPv4 VACL

VCU Result: Not In-Use

L3 Length: 0000, L3 Protocol: 17 (UDP), L3 Tos: 00

Source Address/Mask
0.0.0.0/0.0.0.0
Destination Address/Mask
0.0.0.0/0.0.0.0
```

```
Router MAC: Disabled, Not First Fragment: Disabled, Small Offset: Disabled
L4 Source Port/Mask    L4 Destination Port/Mask
0x0044 (68)/0xffff    0x0043 (67)/0xffff
TCP Flags: 0x00 ( NOT SET )
ACTIONS: Forward L3, Forward L2, Logging Disabled
ACL Priority: 2 (15 is Highest Priority)

-----
TAQ-4 Index-1 (A:0,C:0) Valid StartF-0 StartA-0 SkipF-0 SkipA-0
Output IPv4 VACL

VCU Result: Not In-Use

L3 Length: 0000, L3 Protocol: 17 (UDP), L3 Tos: 00
Source Address/Mask
0.0.0.0/0.0.0.0
Destination Address/Mask
0.0.0.0/0.0.0.0

Router MAC: Disabled, Not First Fragment: Disabled, Small Offset: Disabled
L4 Source Port/Mask    L4 Destination Port/Mask
0x0043 (67)/0xffff    0x0044 (68)/0xffff
TCP Flags: 0x00 ( NOT SET )
ACTIONS: Forward L3, Forward L2, Logging Disabled
ACL Priority: 2 (15 is Highest Priority)

-----
TAQ-4 Index-2 (A:0,C:0) Valid StartF-0 StartA-0 SkipF-0 SkipA-0
Output IPv4 VACL

VCU Result: Not In-Use

L3 Length: 0000, L3 Protocol: 17 (UDP), L3 Tos: 00
Source Address/Mask
0.0.0.0/0.0.0.0
Destination Address/Mask
0.0.0.0/0.0.0.0

Router MAC: Disabled, Not First Fragment: Disabled, Small Offset: Disabled
L4 Source Port/Mask    L4 Destination Port/Mask
0x0043 (67)/0xffff    0x0043 (67)/0xffff
TCP Flags: 0x00 ( NOT SET )
ACTIONS: Forward L3, Forward L2, Logging Disabled
ACL Priority: 2 (15 is Highest Priority)

-----
TAQ-4 Index-3 (A:0,C:0) Valid StartF-0 StartA-0 SkipF-0 SkipA-0
Input IPv4 PACL

VCU Result: Not In-Use

L3 Length: 0000, L3 Protocol: 00 (HOPOPT), L3 Tos: 00
```

**show tech-support acl**

```

Source Address/Mask
0.0.0.0/0.0.0.0
Destination Address/Mask
0.0.0.0/0.0.0.0

Router MAC: Disabled, Not First Fragment: Disabled, Small Offset: Disabled

L4 Source Port/Mask    L4 Destination Port/Mask
0x0000 (0)/0x0000      0x0000 (0)/0x0000

TCP Flags: 0x00 ( NOT SET )

ACTIONS: Drop L3, Drop L2, Logging Disabled
ACL Priority: 2 (15 is Highest Priority)

-----
TAQ-4 Index-4 (A:0,C:0) Valid StartF-0 StartA-0 SkipF-0 SkipA-0
Output IPv4 PACL

VCU Result: Not In-Use

L3 Length: 0000, L3 Protocol: 00 (HOPOPT), L3 Tos: 00

Source Address/Mask
0.0.0.0/0.0.0.0
Destination Address/Mask
0.0.0.0/0.0.0.0

Router MAC: Disabled, Not First Fragment: Disabled, Small Offset: Disabled

L4 Source Port/Mask    L4 Destination Port/Mask
0x0000 (0)/0x0000      0x0000 (0)/0x0000

TCP Flags: 0x00 ( NOT SET )

ACTIONS: Drop L3, Drop L2, Logging Disabled
ACL Priority: 2 (15 is Highest Priority)

-----
TAQ-4 Index-5 (A:0,C:0) Valid StartF-0 StartA-0 SkipF-0 SkipA-0
Output MAC PACL

VLAN ID/MASK : 0x000 (000)/0x000

Source MAC/Mask : 0000.0000.0000/0000.0000.0000

Destination MAC/Mask : 0000.0000.0000/0000.0000.0000

isSnap: Disabled, isLLC: Disabled

ACTIONS: Drop L3, Drop L2, Logging Disabled
ACL Priority: 2 (15 is Highest Priority)

.
.
.

Output fields are self-explanatory.

```

# show tech-support identity

To display identity/802.1x-related information for technical support, use the **show tech-support identity** command in privileged EXEC mode.

**show tech-support identity mac *mac-address* interface *interface-name***

<b>Syntax Description</b>	<b>mac <i>mac-address</i></b>	Displays information about the client MAC address.
	<b>interface <i>interface-name</i></b>	Displays information about the client interface.
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>

Cisco IOS XE Gibraltar 16.11.1 This command was introduced.

**Usage Guidelines** The output of the **show tech-support platform** command is very long. To better manage this output, you can redirect the output to an external file (for example, **show tech-support identity mac *mac-address* interface *interface-name* | redirect flash:*filename***) in the local writable storage file system or remote file system.

The output of this command displays the following commands:

- **show clock**
- **show module**
- **show version**
- **show switch**
- **show redundancy**
- **show dot1x statistics**
- **show ip access-lists**
- **show interface**
- **show ip interface brief**
- **show vlan brief**
- **show running-config**
- **show logging**
- **show interface controller**
- **show platform authentication sbinfo interface**
- **show platform host-access-table**

```
show tech-support identity
```

- **show platform pm port-data**
- **show spanning-tree interface**
- **show access-session mac detail**
- **show platform authentication session mac**
- **show device-tracking database mac details**
- **show mac address-table address**
- **show access-session event-logging mac**
- **show authentication sessions mac details R0**
- **show ip admission cache R0**
- **show platform software wired-client R0**
- **show platform software wired-client F0**
- **show platform software process database forwarding-manager R0 summary**
- **show platform software process database forwarding-manager F0 summary**
- **show platform software object-manager F0 pending-ack-update**
- **show platform software object-manager F0 pending-issue-update**
- **show platform software object-manager F0 error-object**
- **show platform software peer forwarding-manager R0**
- **show platform software peer forwarding-manager F0**
- **show platform software VP R0 summary**
- **show platform software VP F0 summary**
- **show platform software fed punt cpuq**
- **show platform software fed punt cause summary**
- **show platform software fed inject cause summary**
- **show platform hardware fed fwd-asic drops exceptions**
- **show platform hardware fed fwd-asic resource tcam table acl**
- **show platform software fed acl counter hardware**
- **show platform software fed matm macTable**
- **show platform software fed ifm mappings**
- **show platform software trace message fed reverse**
- **show platform software trace message forwarding-manager R0 reverse**
- **show platform software trace message forwarding-manager F0 reverse**
- **show platform software trace message smd R0 reverse**

- **show authentication sessions mac details**
- **show platform software wired-client**
- **show platform software process database forwarding-manager summary**
- **show platform software object-manager pending-ack-update**
- **show platform software object-manager pending-issue-update**
- **show platform software object-manager error-object**
- **show platform software peer forwarding-manager**
- **show platform software VP summary**
- **show platform software trace message forwarding-manager reverse**
- **show ip admission cache**
- **show platform software trace message smd reverse**
- **show platform software fed punt cpuq**
- **show platform software fed punt cause summary**
- **show platform software fed inject cause summary**
- **show platform hardware fed fwd-asic drops exceptions**
- **show platform hardware fed fwd-asic resource tcam table acl**
- **show platform software fed acl counter hardware**
- **show platform software fed matm macTable**
- **show platform software fed ifm mappings**
- **show platform software trace message fed reverse**

---

## Examples

The following is sample output from the **show tech-support identity** command:

```
Device# show tech-support identity mac 0000.0001.0003 interface gigabitethernet1/0/1
.
.
.
----- show platform software peer forwarding-manager R0 -----
IOSD Connection Information:
MQIPC (reader) Connection State: Connected, Read-selected
  Connections: 1, Failures: 22
  3897 packet received (0 dropped), 466929 bytes
  Read attempts: 2352, Yields: 0
BIPC Connection state: Connected, Ready
  Accepted: 1, Rejected: 0, Closed: 0, Backpressures: 0
  36 packets sent, 2808 bytes
SMD Connection Information:
MQIPC (reader) Connection State: Connected, Read-selected
```

show tech-support identity

```

Connections: 1, Failures: 30
  0 packet received (0 dropped), 0 bytes
  Read attempts: 1, Yields: 0
MQIPC (writer) Connection State: Connected, Ready
  Connections: 1, Failures: 0, Backpressures: 0
  0 packet sent, 0 bytes

FP Peers Information:

Slot: 0
  Peer state: connected
  OM ID: 0, Download attempts: 638
    Complete: 638, Yields: 0, Spurious: 0
    IPC Back-Pressure: 0, IPC-Log Back-Pressure: 0
  Back-Pressure asserted for IPC: 0, IPC-Log: 1
  Number of FP FMAN peer connection expected: 7
  Number of FP FMAN online msg received: 1
  IPC state: unknown

Config IPC Context:
  State: Connected, Read-selected
  BIPC Handle: 0xdf3d48e8, BIPC FD: 36, Peer Context: 0xdf3e7158
  Tx Packets: 688, Messages: 2392, ACKs: 36
  Rx Packets: 37, Bytes: 2068

  IPC Log:
    Peer name: fman-log-bay0-peer0
    Flags: Recovery-Complete
    Send Seq: 36, Recv Seq: 36, Msgs Sent: 0, Msgs Recovered: 0

Upstream FMRP IPC Context:
  State: Connected, Read-selected
  BIPC Handle: 0xdf3e7308, BIPC FD: 37, Peer Context: 0xdf3e7158
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0

Upstream FMRP-IOSd IPC Context:
  State: Connected, Read-selected
  BIPC Handle: 0xdf3f9c38, BIPC FD: 38, Peer Context: 0xdf3e7158
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 37, Bytes: 2864
  Rx ACK Requests: 1, Tx ACK Responses: 1

Upstream FMRP-SMD IPC Context:
  State: Connected, Read-selected
  BIPC Handle: 0xdf40c568, BIPC FD: 39, Peer Context: 0xdf3e7158
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

Upstream FMRP-WNCD_0 IPC Context:
  State: Connected
  BIPC Handle: 0xdf4317c8, BIPC FD: 41, Peer Context: 0xdf3e7158
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

Upstream FMRP-WNCMGRD IPC Context:
  State: Connected
  BIPC Handle: 0xdf41ee98, BIPC FD: 40, Peer Context: 0xdf3e7158
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

```

```
Upstream FMRP-MOBILITYD IPC Context:  
  State: Connected  
  BIPC Handle: 0xdf4440f8, BIPC FD: 42, Peer Context: 0xdf3e7158  
  TX Packets: 0, Bytes: 0, Drops: 0  
  Rx Packets: 0, Bytes: 0  
  Rx ACK Requests: 0, Tx ACK Responses: 0  
  
Slot: 1  
Peer state: connected  
  OM ID: 1, Download attempts: 1  
    Complete: 1, Yields: 0, Spurious: 0  
    IPC Back-Pressure: 0, IPC-Log Back-Pressure: 0  
  Back-Pressure asserted for IPC: 0, IPC-Log: 0  
  Number of FP FMAN peer connection expected: 7  
  Number of FP FMAN online msg received: 1  
  IPC state: unknown  
  
Config IPC Context:  
  State: Connected, Read-selected  
  BIPC Handle: 0xdf45e4d8, BIPC FD: 48, Peer Context: 0xdf470e18  
  Tx Packets: 20, Messages: 704, ACKs: 1  
  Rx Packets: 2, Bytes: 108  
  
IPC Log:  
  Peer name: fman-log-bay0-peer1  
  Flags: Recovery-Complete  
  Send Seq: 1, Recv Seq: 1, Msgs Sent: 0, Msgs Recovered: 0  
  
Upstream FMRP IPC Context:  
  State: Connected, Read-selected  
  BIPC Handle: 0xdf470fc8, BIPC FD: 49, Peer Context: 0xdf470e18  
  TX Packets: 0, Bytes: 0, Drops: 0  
  Rx Packets: 0, Bytes: 0  
  
Upstream FMRP-IOSd IPC Context:  
  State: Connected, Read-selected  
  BIPC Handle: 0xdf4838f8, BIPC FD: 50, Peer Context: 0xdf470e18  
  TX Packets: 0, Bytes: 0, Drops: 0  
  Rx Packets: 0, Bytes: 0  
  Rx ACK Requests: 0, Tx ACK Responses: 0  
  
Upstream FMRP-SMD IPC Context:  
  State: Connected, Read-selected  
  BIPC Handle: 0xdf496228, BIPC FD: 51, Peer Context: 0xdf470e18  
  TX Packets: 0, Bytes: 0, Drops: 0  
  Rx Packets: 0, Bytes: 0  
  Rx ACK Requests: 0, Tx ACK Responses: 0  
  
Upstream FMRP-WNCD_0 IPC Context:  
  State: Connected  
  BIPC Handle: 0xdf4bb488, BIPC FD: 53, Peer Context: 0xdf470e18  
  TX Packets: 0, Bytes: 0, Drops: 0  
  Rx Packets: 0, Bytes: 0  
  Rx ACK Requests: 0, Tx ACK Responses: 0  
  
Upstream FMRP-WNCMGRD IPC Context:  
  State: Connected  
  BIPC Handle: 0xdf4a8b58, BIPC FD: 52, Peer Context: 0xdf470e18  
  TX Packets: 0, Bytes: 0, Drops: 0  
  Rx Packets: 0, Bytes: 0  
  Rx ACK Requests: 0, Tx ACK Responses: 0  
  
Upstream FMRP-MOBILITYD IPC Context:  
  State: Connected
```

show tech-support identity

```
BIPC Handle: 0xdf4cddb8, BIPC FD: 54, Peer Context: 0xdf470e18
TX Packets: 0, Bytes: 0, Drops: 0
Rx Packets: 0, Bytes: 0
Rx ACK Requests: 0, Tx ACK Responses: 0
```

```
----- show platform software peer forwarding-manager R0 -----
```

#### IOSD Connection Information:

```
MQIPC (reader) Connection State: Connected, Read-selected
Connections: 1, Failures: 22
3897 packet received (0 dropped), 466929 bytes
Read attempts: 2352, Yields: 0
BIPC Connection state: Connected, Ready
Accepted: 1, Rejected: 0, Closed: 0, Backpressures: 0
36 packets sent, 2808 bytes
```

#### SMD Connection Information:

```
MQIPC (reader) Connection State: Connected, Read-selected
Connections: 1, Failures: 30
0 packet received (0 dropped), 0 bytes
Read attempts: 1, Yields: 0
MQIPC (writer) Connection State: Connected, Ready
Connections: 1, Failures: 0, Backpressures: 0
0 packet sent, 0 bytes
```

#### FP Peers Information:

```
Slot: 0
Peer state: connected
OM ID: 0, Download attempts: 638
Complete: 638, Yields: 0, Spurious: 0
IPC Back-Pressure: 0, IPC-Log Back-Pressure: 0
Back-Pressure asserted for IPC: 0, IPC-Log: 1
Number of FP FMAN peer connection expected: 7
Number of FP FMAN online msg received: 1
IPC state: unknown
```

#### Config IPC Context:

```
State: Connected, Read-selected
BIPC Handle: 0xdf3d48e8, BIPC FD: 36, Peer Context: 0xdf3e7158
Tx Packets: 688, Messages: 2392, ACKs: 36
Rx Packets: 37, Bytes: 2068
```

#### IPC Log:

```
Peer name: fman-log-bay0-peer0
Flags: Recovery-Complete
Send Seq: 36, Recv Seq: 36, Msgs Sent: 0, Msgs Recovered: 0
```

#### Upstream FMRP IPC Context:

```
State: Connected, Read-selected
BIPC Handle: 0xdf3e7308, BIPC FD: 37, Peer Context: 0xdf3e7158
Tx Packets: 0, Bytes: 0, Drops: 0
Rx Packets: 0, Bytes: 0
```

#### Upstream FMRP-IOSd IPC Context:

```
State: Connected, Read-selected
BIPC Handle: 0xdf3f9c38, BIPC FD: 38, Peer Context: 0xdf3e7158
Tx Packets: 0, Bytes: 0, Drops: 0
Rx Packets: 37, Bytes: 2864
```

```
Rx ACK Requests: 1, Tx ACK Responses: 1

Upstream FMRP-SMD IPC Context:
  State: Connected, Read-selected
  BIPC Handle: 0xdf40c568, BIPC FD: 39, Peer Context: 0xdf3e7158
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

Upstream FMRP-WNCD_0 IPC Context:
  State: Connected
  BIPC Handle: 0xdf4317c8, BIPC FD: 41, Peer Context: 0xdf3e7158
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

Upstream FMRP-WNCMGRD IPC Context:
  State: Connected
  BIPC Handle: 0xdf41ee98, BIPC FD: 40, Peer Context: 0xdf3e7158
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

Upstream FMRP-MOBILITYD IPC Context:
  State: Connected
  BIPC Handle: 0xdf4440f8, BIPC FD: 42, Peer Context: 0xdf3e7158
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

Slot: 1
Peer state: connected
OM ID: 1, Download attempts: 1
  Complete: 1, Yields: 0, Spurious: 0
  IPC Back-Pressure: 0, IPC-Log Back-Pressure: 0
  Back-Pressure asserted for IPC: 0, IPC-Log: 0
  Number of FP FMAN peer connection expected: 7
  Number of FP FMAN online msg received: 1
  IPC state: unknown

Config IPC Context:
  State: Connected, Read-selected
  BIPC Handle: 0xdf45e4d8, BIPC FD: 48, Peer Context: 0xdf470e18
  Tx Packets: 20, Messages: 704, ACKs: 1
  Rx Packets: 2, Bytes: 108

  IPC Log:
    Peer name: fman-log-bay0-peer1
    Flags: Recovery-Complete
    Send Seq: 1, Recv Seq: 1, Msgs Sent: 0, Msgs Recovered: 0

Upstream FMRP IPC Context:
  State: Connected, Read-selected
  BIPC Handle: 0xdf470fc8, BIPC FD: 49, Peer Context: 0xdf470e18
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0

Upstream FMRP-IOSd IPC Context:
  State: Connected, Read-selected
  BIPC Handle: 0xdf4838f8, BIPC FD: 50, Peer Context: 0xdf470e18
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0
```

show tech-support identity

```

Upstream FMRP-SMD IPC Context:
  State: Connected, Read-selected
  BIPC Handle: 0xdf496228, BIPC FD: 51, Peer Context: 0xdf470e18
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

Upstream FMRP-WNCD_0 IPC Context:
  State: Connected
  BIPC Handle: 0xdf4bb488, BIPC FD: 53, Peer Context: 0xdf470e18
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

Upstream FMRP-WNCMGRD IPC Context:
  State: Connected
  BIPC Handle: 0xdf4a8b58, BIPC FD: 52, Peer Context: 0xdf470e18
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

Upstream FMRP-MOBILITYD IPC Context:
  State: Connected
  BIPC Handle: 0xdf4cddb8, BIPC FD: 54, Peer Context: 0xdf470e18
  TX Packets: 0, Bytes: 0, Drops: 0
  Rx Packets: 0, Bytes: 0
  Rx ACK Requests: 0, Tx ACK Responses: 0

```

----- show platform software VP R0 summary -----

Forwarding Manager Vlan Port Information

Vlan	Intf-ID	Stp-state
1	7	Forwarding
1	9	Forwarding
1	17	Forwarding
1	27	Forwarding
1	28	Forwarding
1	29	Forwarding
1	30	Forwarding
1	31	Forwarding
1	40	Forwarding
1	41	Forwarding

Forwarding Manager Vlan Port Information

Vlan	Intf-ID	Stp-state
1	49	Forwarding
1	51	Forwarding
1	63	Forwarding
1	72	Forwarding
1	73	Forwarding
1	74	Forwarding

----- show platform software VP R0 summary -----

## Forwarding Manager Vlan Port Information

Vlan	Intf-ID	Stp-state
1	7	Forwarding
1	9	Forwarding
1	17	Forwarding
1	27	Forwarding
1	28	Forwarding
1	29	Forwarding
1	30	Forwarding
1	31	Forwarding
1	40	Forwarding
1	41	Forwarding

## Forwarding Manager Vlan Port Information

Vlan	Intf-ID	Stp-state
1	49	Forwarding
1	51	Forwarding
1	63	Forwarding
1	72	Forwarding
1	73	Forwarding
1	74	Forwarding

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**show vlan access-map**

## show vlan access-map

To display information about a particular VLAN access map or for all VLAN access maps, use the **show vlan access-map** command in privileged EXEC mode.

**show vlan access-map [map-name]**

<b>Syntax Description</b>	<i>map-name</i> (Optional) Name of a specific VLAN access map.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="0"> <tr> <td style="vertical-align: top;"><b>Release</b></td> <td style="vertical-align: top;"><b>Modification</b></td> </tr> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

This is an example of output from the **show vlan access-map** command:

```
Device# show vlan access-map
Vlan access-map "vmap4" 10
  Match clauses:
    ip address: a12
  Action:
    forward
Vlan access-map "vmap4" 20
  Match clauses:
    ip address: a12
  Action:
    forward
```

# show vlan filter

To display information about all VLAN filters or about a particular VLAN or VLAN access map, use the **show vlan filter** command in privileged EXEC mode.

```
show vlan filter {access-map name | vlan vlan-id}
```

<b>Syntax Description</b>	<b>access-map</b> <i>name</i> (Optional) Displays filtering information for the specified VLAN access map.				
	<b>vlan</b> <i>vlan-id</i> (Optional) Displays filtering information for the specified VLAN. The range is 1 to 4094.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

This is an example of output from the **show vlan filter** command:

```
Device# show vlan filter
VLAN Map map_1 is filtering VLANs:
 20-22
```

**show vlan group**

# show vlan group

To display the VLANs that are mapped to VLAN groups, use the **show vlan group** command in privileged EXEC mode.

**show vlan group [{group-name *vlan-group-name* [user\_count]}]**

<b>Syntax Description</b>	<b>group-name <i>vlan-group-name</i></b> (Optional) Displays the VLANs mapped to the specified VLAN group.				
	<b>user_count</b> (Optional) Displays the number of users in each VLAN mapped to a specified VLAN group.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** The **show vlan group** command displays the existing VLAN groups and lists the VLANs and VLAN ranges that are members of each VLAN group. If you enter the **group-name** keyword, only the members of the specified VLAN group are displayed.

This example shows how to display the members of a specified VLAN group:

```
Device# show vlan group group-name group2
vlan group group1 :40-45
```

This example shows how to display number of users in each of the VLANs in a group:

```
Device# show vlan group group-name group2 user_count
  VLAN      : Count
-----
  40        : 5
  41        : 8
  42        : 12
  43        : 2
  44        : 9
  45        : 0
```

# storm-control

To enable broadcast, multicast, or unicast storm control and to set threshold levels on an interface, use the **storm-control** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

```
storm-control {action {shutdown | trap} | {broadcast | multicast | unicast} level {level [level-low]} | bps bps [bps-low] | pps pps [pps-low]}}
no storm-control {action {shutdown | trap} | {broadcast | multicast | unicast} level}
```

Syntax Description	<b>action</b> Specifies the action taken when a storm occurs on a port. The default action is to filter traffic and to not send an Simple Network Management Protocol (SNMP) trap. <b>shutdown</b> Disables the port during a storm. <b>trap</b> Sends an SNMP trap when a storm occurs. <b>broadcast</b> Enables broadcast storm control on the interface. <b>multicast</b> Enables multicast storm control on the interface. <b>unicast</b> Enables unicast storm control on the interface. <b>level</b> Specifies the rising and falling suppression levels as a percentage of total bandwidth of the port. <b>level-low</b> (Optional) Falling suppression level, up to two decimal places. The range is 0.00 to 100.00. Block the flooding of storm packets when the value specified for level is reached. <b>level bps</b> Specifies the rising and falling suppression levels as a rate in bits per second at which traffic is received on the port. <b>bps</b> Rising suppression level, up to 1 decimal place. The range is 0.0 to 10000000000.0. Block the flooding of storm packets when the value specified for bps is reached. You can use metric suffixes such as k, m, and g for large number thresholds. <b>bps-low</b> (Optional) Falling suppression level, up to 1 decimal place. The range is 0.0 to 10000000000.0. This value must be equal to or less than the rising suppression value. You can use metric suffixes such as k, m, and g for large number thresholds. <b>level pps</b> Specifies the rising and falling suppression levels as a rate in packets per second at which traffic is received on the port. <b>pps</b> Rising suppression level, up to 1 decimal place. The range is 0.0 to 10000000000.0. Block the flooding of storm packets when the value specified for pps is reached. You can use metric suffixes such as k, m, and g for large number thresholds.
--------------------	--

*pps-low* (Optional) Falling suppression level, up to 1 decimal place. The range is 0.0 to 10000000000.0. This value must be equal to or less than the rising suppression value.

You can use metric suffixes such as k, m, and g for large number thresholds.

**Command Default**

Broadcast, multicast, and unicast storm control are disabled.

The default action is to filter traffic and to not send an SNMP trap.

**Command Modes**

Interface configuration

**Command History****Release****Modification**

Cisco IOS XE 3.2SE

This command was introduced.

**Usage Guidelines**

The storm-control suppression level can be entered as a percentage of total bandwidth of the port, as a rate in packets per second at which traffic is received, or as a rate in bits per second at which traffic is received.

When specified as a percentage of total bandwidth, a suppression value of 100 percent means that no limit is placed on the specified traffic type. A value of **level 0 0** means that all broadcast, multicast, or unicast traffic on that port is blocked. Storm control is enabled only when the rising suppression level is less than 100 percent. If no other storm-control configuration is specified, the default action is to filter the traffic causing the storm and to send no SNMP traps.



**Note** When the storm control threshold for multicast traffic is reached, all multicast traffic except control traffic, such as bridge protocol data unit (BDPU) and Cisco Discovery Protocol (CDP) frames, are blocked. However, the switch does not differentiate between routing updates, such as Open Shortest Path First (OSPF) and regular multicast data traffic, so both types of traffic are blocked.

The **trap** and **shutdown** options are independent of each other.

If you configure the action to be taken as shutdown (the port is error-disabled during a storm) when a packet storm is detected, you must use the **no shutdown** interface configuration command to bring the interface out of this state. If you do not specify the **shutdown** action, specify the action as **trap** (the switch generates a trap when a storm is detected).

When a storm occurs and the action is to filter traffic, if the falling suppression level is not specified, the switch blocks all traffic until the traffic rate drops below the rising suppression level. If the falling suppression level is specified, the switch blocks traffic until the traffic rate drops below this level.



**Note** Storm control is supported on physical interfaces. You can also configure storm control on an EtherChannel. When storm control is configured on an EtherChannel, the storm control settings propagate to the EtherChannel physical interfaces.

When a broadcast storm occurs and the action is to filter traffic, the switch blocks only broadcast traffic.

For more information, see the software configuration guide for this release.

This example shows how to enable broadcast storm control with a 75.5-percent rising suppression level:

```
Device(config-if)# storm-control broadcast level 75.5
```

This example shows how to enable unicast storm control on a port with a 87-percent rising suppression level and a 65-percent falling suppression level:

```
Device(config-if)# storm-control unicast level 87 65
```

This example shows how to enable multicast storm control on a port with a 2000-packets-per-second rising suppression level and a 1000-packets-per-second falling suppression level:

```
Device(config-if)# storm-control multicast level pps 2k 1k
```

This example shows how to enable the **shutdown** action on a port:

```
Device(config-if)# storm-control action shutdown
```

You can verify your settings by entering the **show storm-control** privileged EXEC command.

# switchport port-security aging

To set the aging time and type for secure address entries or to change the aging behavior for secure addresses on a particular port, use the **switchport port-security aging** command in interface configuration mode. To disable port security aging or to set the parameters to their default states, use the **no** form of this command.

```
switchport port-security aging {static | time time | type {absolute | inactivity}}
no switchport port-security aging {static | time | type}
```

<b>Syntax Description</b>	<p><b>static</b> Enables aging for statically configured secure addresses on this port.</p> <p><b>time</b> Specifies the aging time for this port. The range is 0 to 1440 minutes. If the time is 0, aging is disabled for this port.</p> <p><b>type</b> Sets the aging type.</p> <p><b>absolute</b> Sets absolute aging type. All the secure addresses on this port age out exactly after the time (minutes) specified and are removed from the secure address list.</p> <p><b>inactivity</b> Sets the inactivity aging type. The secure addresses on this port age out only if there is no data traffic from the secure source address for the specified time period.</p>
---------------------------	---

<b>Command Default</b>	The port security aging feature is disabled. The default time is 0 minutes.
	The default aging type is absolute.
	The default static aging behavior is disabled.

<b>Command Modes</b>	Interface configuration
----------------------	-------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	<p>To enable secure address aging for a particular port, set the aging time to a value other than 0 for that port.</p> <p>To allow limited time access to particular secure addresses, set the aging type as <b>absolute</b>. When the aging time lapses, the secure addresses are deleted.</p> <p>To allow continuous access to a limited number of secure addresses, set the aging type as <b>inactivity</b>. This removes the secure address when it becomes inactive, and other addresses can become secure.</p> <p>To allow unlimited access to a secure address, configure it as a secure address, and disable aging for the statically configured secure address by using the <b>no switchport port-security aging static</b> interface configuration command.</p>
-------------------------	---

This example sets the aging time as 2 hours for absolute aging for all the secure addresses on the port:

```
Device(config)# interface gigabitethernet1/0/1
Device(config-if)# switchport port-security aging time 120
```

This example sets the aging time as 2 minutes for inactivity aging type with aging enabled for configured secure addresses on the port:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# switchport port-security aging time 2
Device(config-if)# switchport port-security aging type inactivity
Device(config-if)# switchport port-security aging static
```

This example shows how to disable aging for configured secure addresses:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# no switchport port-security aging static
```

**switchport port-security mac-address**

# switchport port-security mac-address

To configure secure MAC addresses or sticky MAC address learning, use the **switchport port-security mac-address** interface configuration command. To return to the default setting, use the **no** form of this command.

```
switchport port-security mac-address {mac-address [{vlan {vlan-id {access | voice}}}] | sticky [{mac-address | vlan {vlan-id {access | voice}}}]}
no switchport port-security mac-address {mac-address [{vlan {vlan-id {access | voice}}}] | sticky [{mac-address | vlan {vlan-id {access | voice}}}]}
```

**Syntax Description**

**mac-address** A secure MAC address for the interface by entering a 48-bit MAC address. You can add additional secure MAC addresses up to the maximum value configured.

**vlan vlan-id** (Optional) On a trunk port only, specifies the VLAN ID and the MAC address. If no VLAN ID is specified, the native VLAN is used.

**vlan access** (Optional) On an access port only, specifies the VLAN as an access VLAN.

**vlan voice** (Optional) On an access port only, specifies the VLAN as a voice VLAN.

**Note** The **voice** keyword is available only if voice VLAN is configured on a port and if that port is not the access VLAN.

**sticky** Enables the interface for sticky learning. When sticky learning is enabled, the interface adds all secure MAC addresses that are dynamically learned to the running configuration and converts these addresses to sticky secure MAC addresses.

**mac-address** (Optional) A MAC address to specify a sticky secure MAC address.

**Command Default**

No secure MAC addresses are configured.

Sticky learning is disabled.

**Command Modes**

Interface configuration

**Command History****Release****Modification**

Cisco IOS XE 3.2SE

This command was introduced.

**Usage Guidelines**

A secure port has the following limitations:

- A secure port can be an access port or a trunk port; it cannot be a dynamic access port.
- A secure port cannot be a routed port.
- A secure port cannot be a protected port.
- A secure port cannot be a destination port for Switched Port Analyzer (SPAN).
- A secure port cannot belong to a Gigabit or 10-Gigabit EtherChannel port group.

- You cannot configure static secure or sticky secure MAC addresses in the voice VLAN.
- When you enable port security on an interface that is also configured with a voice VLAN, set the maximum allowed secure addresses on the port to two. When the port is connected to a Cisco IP phone, the IP phone requires one MAC address. The Cisco IP phone address is learned on the voice VLAN, but is not learned on the access VLAN. If you connect a single PC to the Cisco IP phone, no additional MAC addresses are required. If you connect more than one PC to the Cisco IP phone, you must configure enough secure addresses to allow one for each PC and one for the Cisco IP phone.
- Voice VLAN is supported only on access ports and not on trunk ports.

Sticky secure MAC addresses have these characteristics:

- When you enable sticky learning on an interface by using the **switchport port-security mac-address sticky** interface configuration command, the interface converts all the dynamic secure MAC addresses, including those that were dynamically learned before sticky learning was enabled, to sticky secure MAC addresses and adds all sticky secure MAC addresses to the running configuration.
- If you disable sticky learning by using the **no switchport port-security mac-address sticky** interface configuration command or the running configuration is removed, the sticky secure MAC addresses remain part of the running configuration but are removed from the address table. The addresses that were removed can be dynamically reconfigured and added to the address table as dynamic addresses.
- When you configure sticky secure MAC addresses by using the **switchport port-security mac-address sticky mac-address** interface configuration command, these addresses are added to the address table and the running configuration. If port security is disabled, the sticky secure MAC addresses remain in the running configuration.
- If you save the sticky secure MAC addresses in the configuration file, when the switch restarts or the interface shuts down, the interface does not need to relearn these addresses. If you do not save the sticky secure addresses, they are lost. If sticky learning is disabled, the sticky secure MAC addresses are converted to dynamic secure addresses and are removed from the running configuration.
- If you disable sticky learning and enter the **switchport port-security mac-address sticky mac-address** interface configuration command, an error message appears, and the sticky secure MAC address is not added to the running configuration.

You can verify your settings by using the **show port-security** privileged EXEC command.

This example shows how to configure a secure MAC address and a VLAN ID on a port:

```
Device(config)# interface gigabitethernet 2/0/2
Device(config-if)# switchport mode trunk
Device(config-if)# switchport port-security
Device(config-if)# switchport port-security mac-address 1000.2000.3000 vlan 3
```

This example shows how to enable sticky learning and to enter two sticky secure MAC addresses on a port:

```
Device(config)# interface gigabitethernet 2/0/2
Device(config-if)# switchport port-security mac-address sticky
Device(config-if)# switchport port-security mac-address sticky 0000.0000.4141
Device(config-if)# switchport port-security mac-address sticky 0000.0000.000f
```

**switchport port-security maximum**

# switchport port-security maximum

To configure the maximum number of secure MAC addresses, use the **switchport port-security maximum** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

```
switchport port-security maximum value [vlan [{vlan-list | [{access | voice}]}]]
no switchport port-security maximum value [vlan [{vlan-list | [{access | voice}]}]]
```

## Syntax Description

**value** Sets the maximum number of secure MAC addresses for the interface.

The default setting is 1.

**vlan** (Optional) For trunk ports, sets the maximum number of secure MAC addresses on a VLAN or range of VLANs. If the **vlan** keyword is not entered, the default value is used.

**vlan-list** (Optional) Range of VLANs separated by a hyphen or a series of VLANs separated by commas. For nonspecified VLANs, the per-VLAN maximum value is used.

**access** (Optional) On an access port only, specifies the VLAN as an access VLAN.

**voice** (Optional) On an access port only, specifies the VLAN as a voice VLAN.

**Note** The **voice** keyword is available only if voice VLAN is configured on a port and if that port is not the access VLAN.

## Command Default

When port security is enabled and no keywords are entered, the default maximum number of secure MAC addresses is 1.

## Command Modes

Interface configuration

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

The maximum number of secure MAC addresses that you can configure on a switch or switch stack is set by the maximum number of available MAC addresses allowed in the system. This number is determined by the active Switch Database Management (SDM) template. See the **sdm prefer** command. This number represents the total of available MAC addresses, including those used for other Layer 2 functions and any other secure MAC addresses configured on interfaces.

A secure port has the following limitations:

- A secure port can be an access port or a trunk port.
- A secure port cannot be a routed port.
- A secure port cannot be a protected port.
- A secure port cannot be a destination port for Switched Port Analyzer (SPAN).
- A secure port cannot belong to a Gigabit or 10-Gigabit EtherChannel port group.

- When you enable port security on an interface that is also configured with a voice VLAN, set the maximum allowed secure addresses on the port to two. When the port is connected to a Cisco IP phone, the IP phone requires one MAC address. The Cisco IP phone address is learned on the voice VLAN, but is not learned on the access VLAN. If you connect a single PC to the Cisco IP phone, no additional MAC addresses are required. If you connect more than one PC to the Cisco IP phone, you must configure enough secure addresses to allow one for each PC and one for the Cisco IP phone.

Voice VLAN is supported only on access ports and not on trunk ports.

- When you enter a maximum secure address value for an interface, if the new value is greater than the previous value, the new value overrides the previously configured value. If the new value is less than the previous value and the number of configured secure addresses on the interface exceeds the new value, the command is rejected.

Setting a maximum number of addresses to one and configuring the MAC address of an attached device ensures that the device has the full bandwidth of the port.

When you enter a maximum secure address value for an interface, this occurs:

- If the new value is greater than the previous value, the new value overrides the previously configured value.
- If the new value is less than the previous value and the number of configured secure addresses on the interface exceeds the new value, the command is rejected.

You can verify your settings by using the **show port-security** privileged EXEC command.

This example shows how to enable port security on a port and to set the maximum number of secure addresses to 5. The violation mode is the default, and no secure MAC addresses are configured.

```
Device(config)# interface gigabitethernet 2/0/2
Device(config-if)# switchport mode access
Device(config-if)# switchport port-security
Device(config-if)# switchport port-security maximum 5
```

**switchport port-security violation**

# switchport port-security violation

To configure secure MAC address violation mode or the action to be taken if port security is violated, use the **switchport port-security violation** command in interface configuration mode. To return to the default settings, use the **no** form of this command.

```
switchport port-security violation {protect | restrict | shutdown | shutdown vlan}
no switchport port-security violation {protect | restrict | shutdown | shutdown vlan}
```

**Syntax Description**

<b>protect</b>	Sets the security violation protect mode.
<b>restrict</b>	Sets the security violation restrict mode.
<b>shutdown</b>	Sets the security violation shutdown mode.
<b>shutdown</b> <b>vlan</b>	Sets the security violation mode to per-VLAN shutdown.

**Command Default**

The default violation mode is **shutdown**.

**Command Modes**

Interface configuration

**Command History**

<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines**

In the security violation protect mode, when the number of port secure MAC addresses reaches the maximum limit allowed on the port, packets with unknown source addresses are dropped until you remove a sufficient number of secure MAC addresses to drop below the maximum value or increase the number of maximum allowable addresses. You are not notified that a security violation has occurred.



**Note** We do not recommend configuring the protect mode on a trunk port. The protect mode disables learning when any VLAN reaches its maximum limit, even if the port has not reached its maximum limit.

In the security violation restrict mode, when the number of secure MAC addresses reaches the limit allowed on the port, packets with unknown source addresses are dropped until you remove a sufficient number of secure MAC addresses or increase the number of maximum allowable addresses. An SNMP trap is sent, a syslog message is logged, and the violation counter increments.

In the security violation shutdown mode, the interface is error-disabled when a violation occurs and the port LED turns off. An SNMP trap is sent, a syslog message is logged, and the violation counter increments. When a secure port is in the error-disabled state, you can bring it out of this state by entering the **errdisable recovery cause psecure-violation** global configuration command, or you can manually re-enable it by entering the **shutdown** and **no shutdown** interface configuration commands.

When the security violation mode is set to per-VLAN shutdown, only the VLAN on which the violation occurred is error-disabled.

A secure port has the following limitations:

- A secure port can be an access port or a trunk port.
- A secure port cannot be a routed port.
- A secure port cannot be a protected port.
- A secure port cannot be a destination port for Switched Port Analyzer (SPAN).
- A secure port cannot belong to a Gigabit or 10-Gigabit EtherChannel port group.

A security violation occurs when the maximum number of secure MAC addresses are in the address table and a station whose MAC address is not in the address table attempts to access the interface or when a station whose MAC address is configured as a secure MAC address on another secure port attempts to access the interface.

When a secure port is in the error-disabled state, you can bring it out of this state by entering the **errdisable recovery cause psecure-violation** global configuration command. You can manually re-enable the port by entering the **shutdown** and **no shutdown** interface configuration commands or by using the **clear errdisable interface** privileged EXEC command.

You can verify your settings by using the **show port-security** privileged EXEC command.

This example show how to configure a port to shut down only the VLAN if a MAC security violation occurs:

```
Device(config)# interface gigabitethernet2/0/2
Device(config)# switchport port-security violation shutdown vlan
```

# tacacs server

To configure the TACACS+ server for IPv6 or IPv4 and enter TACACS+ server configuration mode, use the **tacacs server** command in global configuration mode. To remove the configuration, use the **no** form of this command.

```
tacacs server name
no tacacs server
```

<b>Syntax Description</b>	<b>name</b> Name of the private TACACS+ server host.
---------------------------	--

<b>Command Default</b>	No TACACS+ server is configured.
------------------------	----------------------------------

<b>Command Modes</b>	Global configuration (config)
----------------------	-------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	The <b>tacacs server</b> command configures the TACACS server using the <i>name</i> argument and enters TACACS+ server configuration mode. The configuration is applied once you have finished configuration and exited TACACS+ server configuration mode.
-------------------------	--

<b>Examples</b>	The following example shows how to configure the TACACS server using the name server1 and enter TACACS+ server configuration mode to perform further configuration:
-----------------	---

```
Device(config)# tacacs server server1
Device(config-server-tacacs) #
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>address ipv6 (TACACS+)</b>	Configures the IPv6 address of the TACACS+ server.
	<b>key (TACACS+)</b>	Configures the per-server encryption key on the TACACS+ server.
	<b>port (TACACS+)</b>	Specifies the TCP port to be used for TACACS+ connections.
	<b>send-nat-address (TACACS+)</b>	Sends a client's post-NAT address to the TACACS+ server.
	<b>single-connection (TACACS+)</b>	Enables all TACACS packets to be sent to the same server using a single TCP connection.
	<b>timeout (TACACS+)</b>	Configures the time to wait for a reply from the specified TACACS server.

# tracking (IPv6 snooping)

To override the default tracking policy on a port, use the **tracking** command in IPv6 snooping policy configuration mode.

```
tracking {enable [reachable-lifetime {value | infinite}] | disable [stale-lifetime {value | infinite}]}
```

<b>Syntax Description</b>	<b>enable</b> Enables tracking. <b>reachable-lifetime</b> (Optional) Specifies the maximum amount of time a reachable entry is considered to be directly or indirectly reachable without proof of reachability. <ul style="list-style-type: none"> <li>The <b>reachable-lifetime</b> keyword can be used only with the <b>enable</b> keyword.</li> <li>Use of the <b>reachable-lifetime</b> keyword overrides the global reachable lifetime configured by the <b>ipv6 neighbor binding reachable-lifetime</b> command.</li> </ul>				
<b>value</b>	Lifetime value, in seconds. The range is from 1 to 86400, and the default is 300.				
<b>infinite</b>	Keeps an entry in a reachable or stale state for an infinite amount of time.				
<b>disable</b>	Disables tracking.				
<b>stale-lifetime</b>	(Optional) Keeps the time entry in a stale state, which overwrites the global stale-lifetime configuration. <ul style="list-style-type: none"> <li>The stale lifetime is 86,400 seconds.</li> <li>The <b>stale-lifetime</b> keyword can be used only with the <b>disable</b> keyword.</li> <li>Use of the <b>stale-lifetime</b> keyword overrides the global stale lifetime configured by the <b>ipv6 neighbor binding stale-lifetime</b> command.</li> </ul>				
<b>Command Default</b>	The time entry is kept in a reachable state.				
<b>Command Modes</b>	IPv6 snooping configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	The <b>tracking</b> command overrides the default tracking policy set by the <b>ipv6 neighbor tracking</b> command on the port on which this policy applies. This function is useful on trusted ports where, for example, you may not want to track entries but want an entry to stay in the binding table to prevent it from being stolen.				

## tracking (IPv6 snooping)

The **reachable-lifetime** keyword is the maximum time an entry will be considered reachable without proof of reachability, either directly through tracking or indirectly through IPv6 snooping. After the **reachable-lifetime** value is reached, the entry is moved to stale. Use of the **reachable-lifetime** keyword with the tracking command overrides the global reachable lifetime configured by the **ipv6 neighbor binding reachable-lifetime** command.

The **stale-lifetime** keyword is the maximum time an entry is kept in the table before it is deleted or the entry is proven to be reachable, either directly or indirectly. Use of the **reachable-lifetime** keyword with the **tracking** command overrides the global stale lifetime configured by the **ipv6 neighbor binding stale-lifetime** command.

This example shows how to define an IPv6 snooping policy name as policy1, place the switch in IPv6 snooping policy configuration mode, and configure an entry to stay in the binding table for an infinite length of time on a trusted port:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# tracking disable stale-lifetime infinite
```

# trusted-port

To configure a port to become a trusted port, use the **trusted-port** command in IPv6 snooping policy mode or ND inspection policy configuration mode. To disable this function, use the **no** form of this command.

**trusted-port**  
**no trusted-port**

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Default</b>	No ports are trusted.
------------------------	-----------------------

<b>Command Modes</b>	ND inspection policy configuration IPv6 snooping configuration
----------------------	---

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	When the <b>trusted-port</b> command is enabled, limited or no verification is performed when messages are received on ports that have this policy. However, to protect against address spoofing, messages are analyzed so that the binding information that they carry can be used to maintain the binding table. Bindings discovered from these ports will be considered more trustworthy than bindings received from ports that are not configured to be trusted.
-------------------------	--

This example shows how to define an NDP policy name as policy1, place the switch in NDP inspection policy configuration mode, and configure the port to be trusted:

```
Device(config)# ipv6 nd inspection policy1
Device(config-nd-inspection)# trusted-port
```

This example shows how to define an IPv6 snooping policy name as policy1, place the switch in IPv6 snooping policy configuration mode, and configure the port to be trusted:

```
Device(config)# ipv6 snooping policy policy1
Device(config-ipv6-snooping)# trusted-port
```

# username

To establish a username-based authentication system, use the **username** command in global configuration mode. To remove an established username-based authentication, use the **no** form of this command.

```
username name [aaa attribute list aaa-list-name]
username name [access-class access-list-number]
username name [algorithm-type {md5 | scrypt | sha256 }]
username name [autocommand command]
username name [callback-dialstring telephone-number]
username name [callback-line [tty] line-number [ending-line-number]]
username name [callback-rotary rotary-group-number]
username name [common-criteria-policy policy-name]
username name [dnis]
username name [mac]
username name [nocallback-verify]
username name [noescape]
username name [nohangup]
username name [{nopassword | password password | password encryption-type
encrypted-password}]
username name [one-time {password {0 | 6 | 7 | password} | secret {0 | 5 | 8 | 9 | password}}]
username name [password secret]
username name [privilege level]
username name [secret {0 | 5 | password}]
username name [serial-number]
username name [user-maxlinks number]
username name [view view-name]
no username name
```

## Syntax Description

<b>name</b>	Hostname, server name, user ID, or command name. The <i>name</i> argument can be only one word. Blank spaces and quotation marks are not allowed.
<b>aaa attribute list</b> <i>aaa-list-name</i>	(Optional) Uses the specified authentication, authorization, and accounting (AAA) method list.
<b>access-class</b> <i>access-list-number</i>	(Optional) Specifies an outgoing access list that overrides the access list specified in the <b>access-class</b> command available in line configuration mode. It is used for the duration of the user's session.
<b>algorithm-type</b>	(Optional) Specifies the algorithm to use for hashing the plaintext secret for the user. <ul style="list-style-type: none"> <li>• <b>md5</b>—Encodes the password using the MD5 algorithm.</li> <li>• <b>scrypt</b>—Encodes the password using the SCRYPT hashing algorithm.</li> <li>• <b>sha256</b>—Encodes the password using the PBKDF2 hashing algorithm.</li> </ul>

<b>autocommand</b> <i>command</i>	(Optional) Causes the specified command to be issued automatically after the user logs in. When the command is complete, the session is terminated. Because the command can be any length and can contain embedded spaces, commands using the <b>autocommand</b> keyword must be the last option on the line.
<b>callback-dialstring</b> <i>telephone-number</i>	(Optional) For asynchronous callback only: permits you to specify a telephone number to pass to the DCE device.
<b>callback-line</b> <i>line-number</i>	(Optional) For asynchronous callback only: relative number of the terminal line (or the first line in a contiguous group) on which you enable a specific username for callback. Numbering begins with zero.
<i>ending-line-number</i>	(Optional) Relative number of the last line in a contiguous group on which you want to enable a specific username for callback. If you omit the keyword (such as <b>tty</b> ), then line-number and ending-line-number are absolute rather than relative line numbers.
<b>tty</b>	(Optional) For asynchronous callback only: standard asynchronous line.
<b>callback-rotary</b> <i>rotary-group-number</i>	(Optional) For asynchronous callback only: permits you to specify a rotary group number on which you want to enable a specific username for callback. The next available line in the rotary group is selected. Range: 1 to 100.
<b>common-criteria-policy</b>	(Optional) Specifies the name of the common-criteria policy.
<b>dnis</b>	(Optional) Does not require a password when obtained via Dialed Number Identification Service (DNIS).
<b>mac</b>	(Optional) Allows a MAC address to be used as the username for MAC filtering done locally.
<b>nocallback-verify</b>	(Optional) Specifies that the authentication is not required for EXEC callback on the specified line.
<b>noescape</b>	(Optional) Prevents a user from using an escape character on the host to which that user is connected.
<b>nohangup</b>	(Optional) Prevents Cisco IOS software from disconnecting the user after an automatic command (set up with the <b>autocommand</b> keyword) has completed. Instead, the user gets another EXEC prompt.
<b>nopassword</b>	(Optional) No password is required for this user to log in. This is usually the most useful keyword to use in combination with the <b>autocommand</b> keyword.
<b>password</b>	(Optional) Specifies the password to access the <i>name</i> argument. A password must be from 1 to 25 characters, can contain embedded spaces, and must be the last option specified in the <b>username</b> command.
<i>password</i>	Password that a user enters.

**username**

<i>encryption-type</i>	Single-digit number that defines whether the text immediately following is encrypted and if so, what type of encryption is used. Defined encryption types are 0, which means that the text immediately following is not encrypted, 6 and 7, which means that the text is encrypted using a Cisco-defined encryption algorithm.
<i>encrypted-password</i>	Encrypted password that a user enters.
<b>one-time</b>	(Optional) Specifies that the username and password is valid for only one time. This configuration is used to prevent default credentials from remaining in user configurations. <ul style="list-style-type: none"> <li>• <b>0</b>—Specifies that an unencrypted password or secret (depending on the configuration) follows.</li> <li>• <b>6</b>—Specifies an encrypt password follows.</li> <li>• <b>7</b>—Specifies that a hidden password follows.</li> <li>• <b>5</b>—Specifies that a MD5 HASHED secret follows.</li> <li>• <b>8</b>—Specifies a PBKDF2 HASHED secret follows.</li> <li>• <b>9</b>—Specifies a SCRYPT HASHED secret follows.</li> </ul>
<b>secret</b>	(Optional) Specifies a secret for the user.
<i>secret</i>	For Challenge Handshake Authentication Protocol (CHAP) authentication: specifies the secret for the local device or the remote device. The secret is encrypted when it is stored on the local device. The secret can consist of any string of up to 11 ASCII characters. There is no limit to the number of username and password combinations that can be specified, allowing any number of remote devices to be authenticated.
<b>privilege</b> <i>privilege-level</i>	(Optional) Sets the privilege level for the user. Range: 1 to 15.
<b>serial-number</b>	(Optional) Specifies the serial number.
<b>user-maxlinks</b> <i>number</i>	(Optional) Maximum number of inbound links allowed for a user.
<b>view</b> <i>view-name</i>	(Optional) For CLI view only: associates a CLI view name, which is specified with the <b>parser view</b> command, with the local AAA database.

**Command Default** No username-based authentication system is established.

**Command Modes** Global configuration (config)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

**Usage Guidelines** The **username** command provides username or password authentication, or both, for login purposes only.

Multiple **username** commands can be used to specify options for a single user.

Add a username entry for each remote system with which the local device communicates and from which it requires authentication. The remote device must have a username entry for the local device. This entry must have the same password as the local device's entry for that remote device.

This command can be useful for defining usernames that get special treatment. For example, you can use this command to define an "info" username that does not require a password but connects the user to a general purpose information service.

The **username** command is required as part of the configuration for CHAP. Add a username entry for each remote system from which the local device requires authentication.



**Note** To enable the local device to respond to remote CHAP challenges, one **username name** entry must be the same as the **hostname** entry that has already been assigned to the other device.

- To avoid the situation of a privilege level 1 user entering into a higher privilege level, configure a per-user privilege level other than 1 (for example, 0 or 2 through 15).
- Per-user privilege levels override virtual terminal privilege levels.

### CLI and Lawful Intercept Views

Both CLI views and lawful intercept views restrict access to specified commands and configuration information. A lawful intercept view allows a user to secure access to lawful intercept commands that are held within the TAP-MIB, which is a special set of Simple Network Management Protocol (SNMP) commands that stores information about calls and users.

Users who are specified via the **lawful-intercept** keyword are placed in the lawful-intercept view, by default, if no other privilege level or view name has been explicitly specified.

If no value is specified for the *secret* argument and the **debug serial-interface** command is enabled, an error is displayed when a link is established and the CHAP challenge is not implemented. The CHAP debugging information is available using the **debug ppp negotiation**, **debug serial-interface**, and **debug serial-packet** commands.

### Examples

The following example shows how to implement a service similar to the UNIX **who** command, which can be entered at the login prompt and lists the current users of the device:

```
Device(config)# username who nopassword nohangup autocommand show users
```

The following example shows how to implement an information service that does not require a password to be used. The command takes the following form:

```
Device(config)# username info nopassword noescape autocommand telnet nic.ddn.mil
```

The following example shows how to implement an ID that works even if all the TACACS+ servers break. The command takes the following form:

```
Device(config)# username superuser password superpassword
```

The following example shows how to enable CHAP on interface serial 0 of "server\_1." It also defines a password for a remote server named "server\_r."

**username**

```
hostname server_1
username server_r password theirsystem
interface serial 0
  encapsulation ppp
  ppp authentication chap
```

The following is output from the **show running-config** command displaying the passwords that are encrypted:

```
hostname server_1
username server_r password 7 121F0A18
interface serial 0
  encapsulation ppp
  ppp authentication chap
```

In the following example, a privilege level 1 user is denied access to privilege levels higher than 1:

```
Device(config)# username user privilege 0 password 0 cisco
Device(config)# username user2 privilege 2 password 0 cisco
```

The following example shows how to remove the username-based authentication for user2:

```
Device(config)# no username user2
```

Related Commands	Command	Description
	<b>debug ppp negotiation</b>	Displays PPP packets sent during PPP startup, where PPP options are negotiated.
	<b>debug serial-interface</b>	Displays information about a serial connection failure.
	<b>debug serial-packet</b>	Displays more detailed serial interface debugging information than you can obtain using <b>debug serial interface</b> command.

# vlan access-map

To create or modify a VLAN map entry for VLAN packet filtering, and change the mode to the VLAN access-map configuration, use the **vlan access-map** command in global configuration mode on the switch stack or on a standalone switch. To delete a VLAN map entry, use the **no** form of this command.

```
vlan access-map name [number]
no vlan access-map name [number]
```



**Note** This command is not supported on switches running the LAN Base feature set.

## Syntax Description

**name** Name of the VLAN map.

**number** (Optional) The sequence number of the map entry that you want to create or modify (0 to 65535). If you are creating a VLAN map and the sequence number is not specified, it is automatically assigned in increments of 10, starting from 10. This number is the sequence to insert to, or delete from, a VLAN access-map entry.

## Command Default

There are no VLAN map entries and no VLAN maps applied to a VLAN.

## Command Modes

Global configuration

## Command History

### Release

Cisco IOS XE 3.2SE

### Modification

This command was introduced.

## Usage Guidelines

In global configuration mode, use this command to create or modify a VLAN map. This entry changes the mode to VLAN access-map configuration, where you can use the **match** access-map configuration command to specify the access lists for IP or non-IP traffic to match and use the **action** command to set whether a match causes the packet to be forwarded or dropped.

In VLAN access-map configuration mode, these commands are available:

- **action**—Sets the action to be taken (forward or drop).
- **default**—Sets a command to its defaults.
- **exit**—Exits from VLAN access-map configuration mode.
- **match**—Sets the values to match (IP address or MAC address).
- **no**—Negates a command or set its defaults.

When you do not specify an entry number (sequence number), it is added to the end of the map.

There can be only one VLAN map per VLAN and it is applied as packets are received by a VLAN.

You can use the **no vlan access-map name [number]** command with a sequence number to delete a single entry.

**vlan access-map**

Use the **vlan filter** interface configuration command to apply a VLAN map to one or more VLANs.

For more information about VLAN map entries, see the software configuration guide for this release.

This example shows how to create a VLAN map named vac1 and apply matching conditions and actions to it. If no other entries already exist in the map, this will be entry 10.

```
Device(config)# vlan access-map vac1
Device(config-access-map)# match ip address acl1
Device(config-access-map)# action forward
```

This example shows how to delete VLAN map vac1:

```
Device(config)# no vlan access-map vac1
```

# vlan filter

To apply a VLAN map to one or more VLANs, use the **vlan filter** command in global configuration mode on the switch stack or on a standalone switch. To remove the map, use the **no** form of this command.

```
vlan filter mapname vlan-list {list | all}
no vlan filter mapname vlan-list {list | all}
```



**Note** This command is not supported on switches running the LAN Base feature set.

## Syntax Description

**mapname** Name of the VLAN map entry.

**vlan-list** Specifies which VLANs to apply the map to.

**list** The list of one or more VLANs in the form tt, uu-vv, xx, yy-zz, where spaces around commas and dashes are optional. The range is 1 to 4094.

**all** Adds the map to all VLANs.

## Command Default

There are no VLAN filters.

## Command Modes

Global configuration

## Command History

### Release

### Modification

Cisco IOS XE 3.2SE

This command was introduced.

## Usage Guidelines

To avoid accidentally dropping too many packets and disabling connectivity in the middle of the configuration process, we recommend that you completely define the VLAN access map before applying it to a VLAN.

For more information about VLAN map entries, see the software configuration guide for this release.

This example applies VLAN map entry map1 to VLANs 20 and 30:

```
Device(config)# vlan filter map1 vlan-list 20, 30
```

This example shows how to delete VLAN map entry mac1 from VLAN 20:

```
Device(config)# no vlan filter map1 vlan-list 20
```

You can verify your settings by entering the **show vlan filter** privileged EXEC command.

# vlan group

To create or modify a VLAN group, use the **vlan group** command in global configuration mode. To remove a VLAN list from the VLAN group, use the **no** form of this command.

```
vlan group group-name vlan-list vlan-list
no vlan group group-name vlan-list vlan-list
```

<b>Syntax Description</b>	<p><i>group-name</i> Name of the VLAN group. The group name may contain up to 32 characters and must begin with a letter.</p> <p><b>vlan-list</b> <i>vlan-list</i> Specifies one or more VLANs to be added to the VLAN group. The <i>vlan-list</i> argument can be a single VLAN ID, a list of VLAN IDs, or VLAN ID range. Multiple entries are separated by a hyphen (-) or a comma (,).</p>				
<b>Command Default</b>	None				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

<b>Usage Guidelines</b>	<p>If the named VLAN group does not exist, the <b>vlan group</b> command creates the group and maps the specified VLAN list to the group. If the named VLAN group exists, the specified VLAN list is mapped to the group.</p> <p>The <b>no</b> form of the <b>vlan group</b> command removes the specified VLAN list from the VLAN group. When you remove the last VLAN from the VLAN group, the VLAN group is deleted.</p> <p>A maximum of 100 VLAN groups can be configured, and a maximum of 4094 VLANs can be mapped to a VLAN group.</p>
-------------------------	---

This example shows how to map VLANs 7 through 9 and 11 to a VLAN group:

```
Device(config)# vlan group group1 vlan-list 7-9,11
```

This example shows how to remove VLAN 7 from the VLAN group:

```
Device(config)# no vlan group group1 vlan-list 7
```



PART **XIII**

## **Stack Manager and High Availability**

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# Stack Manager and High Availability Commands

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# debug platform stack-manager

To enable debugging of the stack manager software, use the **debug platform stack-manager** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

```
debug platform stack-manager {level1 | level2 | level3 | sdp | serviceability | sim | ssm | trace} [{switch switch-number}]
no debug platform stack-manager {level1 | level2 | level3 | sdp | serviceability | sim | ssm | trace}
[{switch switch-number}]
```

Syntax Description	<b>level1</b> Enables level 1 debug logs. <b>level2</b> Enables level 2 debug logs. <b>level3</b> Enables level 3 debug logs. <b>sdp</b> Displays the Stack Discovery Protocol (SDP) debug messages. <b>serviceability</b> Displays stack manager serviceability debug messages. <b>sim</b> Displays the stack information module debug messages. <b>ssm</b> Displays the stack state-machine debug messages. <b>trace</b> Traces the stack manager entry and exit debug messages. <b>switch switch-number</b> (Optional) Specifies the stack member number to enable debugging on. The range is 1 to 9.				
Command Default	Debugging is disabled.				
Command Modes	Privileged EXEC				
Command History	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				
Usage Guidelines	<p>This command is supported only on stacking-capable switches.</p> <p>The <b>undebbug platform stack-manager</b> command is the same as the <b>no debug platform stack-manager</b> command.</p>				

# domain id

To configure Cisco StackWise Virtual domain ID on a switch, use the **domain *id*** command in the StackWise Virtual configuration mode. To disable, use the **no** form of this command.

**domain *id***  
**no domain *id***

<b>Syntax Description</b>	<b>domain</b>	Associates StackWise Virtual configuration with a specific domain.				
	<i>id</i>	Value of the domain ID. The range is from 1 to 255. The default is one.				
<b>Command Default</b>	No domain ID is configured.					
<b>Command Modes</b>	StackWise Virtual configuration (config-stackwise-virtual)					
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.3</td><td>This command was introduced.</td></tr> </tbody> </table>		<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.3	This command was introduced.
<b>Release</b>	<b>Modification</b>					
Cisco IOS XE Denali 16.3.3	This command was introduced.					
<b>Usage Guidelines</b>	This command is optional. You must enable Stackwise Virtual, using the <b>stackwise-virtual</b> command, before configuring the domain ID.					

## Example

The following example shows how to enable Cisco StackWise Virtual and configure a domain ID:

```
Device(config)# stackwise-virtual
Device(config-stackwise-virtual)#domain 2
```

# dual-active recovery-reload-disable

To disable automatic recovery reload of a switch, use the **dual-active recovery-reload-disable** command in the StackWise Virtual configuration mode. To enable automatic recovery reload, use the **no** form of the command.

**dual-active recovery-reload-disable**  
**no dual-active recovery-reload-disable**

<b>Syntax Description</b>	<b>dual-active recovery-reload-disable</b>	Disables automatic recovery reload.
<b>Command Default</b>	Enabled.	
<b>Command Modes</b>	StackWise Virtual configuration (config-stackwise-virtual)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

## Example:

The following example shows how to disable automatic recovery reload of a switch:

```
Device(config)# stackwise-virtual
Device(config-stackwise-virtual)#dual-active recovery-reload-disable
```

# dual-active detection pagp

To enable PAgP dual-active detection, use the **dual-active detection pagp** command in the StackWise Virtual configuration mode. To disable PAgP dual-active detection, use the **no** form of the command.

**dual-active detection pagp**  
**no dual-active detection pagp**

<b>Syntax Description</b>	<b>dual-active detection pagp</b>	Enables pagp dual-active detection.				
<b>Command Default</b>	Enabled.					
<b>Command Modes</b>	StackWise Virtual configuration (config-stackwise-virtual)					
<b>Command History</b>	<table> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.6.1</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.6.1	This command was introduced.	
<b>Release</b>	<b>Modification</b>					
Cisco IOS XE Everest 16.6.1	This command was introduced.					

## Example:

The following example shows how to enable PAgP dual-active detection trust mode on channel-group:

```
Device(config)# stackwise-virtual
Device(config-stackwise-virtual)#dual-active detection pagp
Device(config-stackwise-virtual)#dual-active detection pagp trust channel-group 1
```

# mode sso

To set the redundancy mode to stateful switchover (SSO), use the **mode sso** command in redundancy configuration mode.

## mode sso

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Default</b>	None
------------------------	------

<b>Command Modes</b>	Redundancy configuration
----------------------	--------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	The <b>mode sso</b> command can be entered only from within redundancy configuration mode.
-------------------------	--

Follow these guidelines when configuring your system to SSO mode:

- You must use identical Cisco IOS images on the switches in the stack to support SSO mode. Redundancy may not work due to differences between the Cisco IOS releases.
- If you perform an online insertion and removal (OIR) of the module, the switch resets during the stateful switchover and the port states are restarted only if the module is in a transient state (any state other than Ready).
- The forwarding information base (FIB) tables are cleared on a switchover. Routed traffic is interrupted until route tables reconverge.

This example shows how to set the redundancy mode to SSO:

```
Device(config)# redundancy
Device(config-red)# mode sso
Device(config-red)#

```

main-cpu

# main-cpu

To enter the redundancy main configuration submode and enable the standby switch, use the **main-cpu** command in redundancy configuration mode.

## main-cpu

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Redundancy configuration (config-red)

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** From the redundancy main configuration submode, use the **standby console enable** command to enable the standby switch.

This example shows how to enter the redundancy main configuration submode and enable the standby switch:

```
Device(config)# redundancy
Device(config-red)# main-cpu
Device(config-r-mc)# standby console enable
Device#
```

# policy config-sync prc reload

To reload the standby switch if a parser return code (PRC) failure occurs during configuration synchronization, use the **policy config-sync reload** command in redundancy configuration mode. To specify that the standby switch is not reloaded if a parser return code (PRC) failure occurs, use the **no** form of this command.

```
policy config-sync {bulk | lbl} prc reload  
no policy config-sync {bulk | lbl} prc reload
```

Syntax Description	<b>bulk</b> Specifies bulk configuration mode. <b>lbl</b> Specifies line-by-line (lbl) configuration mode.				
Command Default	The command is enabled by default.				
Command Modes	Redundancy configuration (config-red)				
Command History	<table><thead><tr><th>Release</th><th>Modification</th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

This example shows how to specify that the standby switch is not reloaded if a parser return code (PRC) failure occurs during configuration synchronization:

```
Device(config-red)# no policy config-sync bulk prc reload
```

# mode sso

To set the redundancy mode to stateful switchover (SSO), use the **mode sso** command in redundancy configuration mode.

## mode sso

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Redundancy configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The **mode sso** command can be entered only from within redundancy configuration mode.

Follow these guidelines when configuring your system to SSO mode:

- You must use identical Cisco IOS images on the switches in the stack to support SSO mode. Redundancy may not work due to differences between the Cisco IOS releases.
- If you perform an online insertion and removal (OIR) of the module, the switch resets during the stateful switchover and the port states are restarted only if the module is in a transient state (any state other than Ready).
- The forwarding information base (FIB) tables are cleared on a switchover. Routed traffic is interrupted until route tables reconverge.

This example shows how to set the redundancy mode to SSO:

```
Device(config)# redundancy
Device(config-red)# mode sso
Device(config-red) #
```

# policy config-sync prc reload

To reload the standby switch if a parser return code (PRC) failure occurs during configuration synchronization, use the **policy config-sync reload** command in redundancy configuration mode. To specify that the standby switch is not reloaded if a parser return code (PRC) failure occurs, use the **no** form of this command.

```
policy config-sync {bulk | lbl} prc reload  
no policy config-sync {bulk | lbl} prc reload
```

Syntax Description	<b>bulk</b> Specifies bulk configuration mode. <b>lbl</b> Specifies line-by-line (lbl) configuration mode.				
Command Default	The command is enabled by default.				
Command Modes	Redundancy configuration (config-red)				
Command History	<table><thead><tr><th>Release</th><th>Modification</th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

This example shows how to specify that the standby switch is not reloaded if a parser return code (PRC) failure occurs during configuration synchronization:

```
Device(config-red)# no policy config-sync bulk prc reload
```

**redundancy config-sync mismatched-commands**

# redundancy config-sync mismatched-commands

To allow the standby switch to join the stack if a configuration mismatch occurs between the active and standby switches, use the **redundancy config-sync mismatched-commands** command in privileged EXEC mode.

**redundancy config-sync {ignore | validate} mismatched-commands**

<b>Syntax Description</b>	<b>ignore</b> Ignores the mismatched command list. <b>validate</b> Revalidates the mismatched command list with the modified running-configuration.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** If the command syntax check in the running configuration of the active switch fails while the standby switch is booting, use the **redundancy config-sync mismatched-commands** command to display the Mismatched Command List (MCL) on the active switch and to reboot the standby switch.

The following is a log entry example for mismatched commands:

```
00:06:31: Config Sync: Bulk-sync failure due to Servicing Incompatibility. Please check
full list of mismatched commands via:
show redundancy config-sync failures mcl
00:06:31: Config Sync: Starting lines from MCL file:
interface GigabitEthernet7/7
! <submode> "interface"
- ip address 192.0.2.0 255.255.255.0
! </submode> "interface"
```

To display all mismatched commands, use the **show redundancy config-sync failures mcl** command.

To clean the MCL, follow these steps:

1. Remove all mismatched commands from the running configuration of the active switch.
2. Revalidate the MCL with a modified running configuration by using the **redundancy config-sync validate mismatched-commands** command.
3. Reload the standby switch.

You can ignore the MCL by doing the following:

1. Enter the **redundancy config-sync ignore mismatched-commands** command.
2. Reload the standby switch; the system changes to SSO mode.



**Note** If you ignore the mismatched commands, the out-of-sync configuration at the active switch and the standby switch still exists.

3. Verify the ignored MCL with the **show redundancy config-sync ignored mcl** command.

If SSO mode cannot be established between the active and standby switches because of an incompatibility in the configuration file, a mismatched command list (MCL) is generated at the active switch and a reload into route processor redundancy (RPR) mode is forced for the standby switch.



**Note** RPR mode is supported on Catalyst 3850 switches as a fallback in case of errors. It is not configurable.

If you attempt to establish an SSO after removing the offending configuration and rebooting the standby switch with the same image, the C3K\_REDUNDANCY-2-IOS\_VERSION\_CHECK\_FAIL and ISSU-3-PEER\_IMAGE\_INCOMPATIBLE messages appear because the peer image is listed as incompatible. You can clear the peer image from the incompatible list with the **redundancy config-sync ignore mismatched-commands** EXEC command while the peer is in a standby cold (RPR) state. This action allows the standby switch to boot in a standby hot (SSO) state when it reloads.

This example shows how to revalidate the mismatched command list with the modified configuration:

```
Device# redundancy config-sync validate mismatched-commands  
Device#
```

# redundancy

To enter redundancy configuration mode, use the **redundancy** command in global configuration mode.

## redundancy

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Global configuration (config)

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The redundancy configuration mode is used to enter the main CPU submode, which is used to enable the standby switch.

To enter the main CPU submode, use the **main-cpu** command while in redundancy configuration mode.

From the main CPU submode, use the **standby console enable** command to enable the standby switch.

Use the **exit** command to exit redundancy configuration mode.

This example shows how to enter redundancy configuration mode:

```
Device(config)# redundancy
Device(config-red) #
```

This example shows how to enter the main CPU submode:

```
Device(config)# redundancy
Device(config-red)# main-cpu
Device(config-r-mc) #
```

# redundancy force-switchover

To force a switchover from the active switch to the standby switch, use the **redundancy force-switchover** command in privileged EXEC mode on a switch stack.

## **redundancy force-switchover**

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Privileged EXEC

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Use the **redundancy force-switchover** command to manually switch over to the redundant switch. The redundant switch becomes the new active switch that runs the Cisco IOS image, and the modules are reset to their default settings.

The old active switch reboots with the new image and joins the stack.

If you use the **redundancy force-switchover** command on the active switch, the switchports on the active switch go down.

If you use this command on a switch that is in a partial ring stack, the following warning message appears:

```
Device# redundancy force-switchover
Stack is in Half ring setup; Reloading a switch might cause stack split
This will reload the active unit and force switchover to standby[confirm]
```

This example shows how to manually switch over from the active to the standby supervisor engine:

```
Device# redundancy force-switchover
Device#
```

# redundancy reload

To force a reload of one or all of the switches in the stack, use the **redundancy reload** command in privileged EXEC mode.

**redundancy reload {peer | shelf}**

## Syntax Description

**peer** Reloads the peer unit.

**shelf** Reboots all switches in the stack.

## Command Default

None

## Command Modes

Privileged EXEC

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE	This command was introduced.
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## Usage Guidelines

Before using this command, see the “Performing a Software Upgrade” section of the *Stacking Configuration Guide (Catalyst 3850 Switches)* for additional information.

Use the **redundancy reload shelf** command to reboot all the switches in the stack.

This example shows how to manually reload all switches in the stack:

```
Device# redundancy reload shelf
Device#
```

# reload

To reload the stack member and to apply a configuration change, use the **reload** command in privileged EXEC mode.

**reload** [{/noverify | /verify}] [{LINE | at | cancel | in | slot *stack-member-number* | standby-cpu}]

<b>Syntax Description</b>	/noverify /verify <i>LINE</i> <b>at</b> <b>cancel</b> <b>in</b> <b>slot</b> <i>stack-member-number</i> <b>standby-cpu</b>	(Optional) Specifies to not verify the file signature before the reload. (Optional) Verifies the file signature before the reload. (Optional) Reason for the reload. (Optional) Specifies the time in hh:mm for the reload to occur. (Optional) Cancels the pending reload. (Optional) Specifies a time interval for reloads to occur. (Optional) Saves the changes on the specified stack member and then restarts it. (Optional) Stack member number on which to save the changes. The range is 1 to 9. (Optional) Reloads the standby route processor (RP).
---------------------------	---	--

**Command Default** Immediately reloads the stack member and puts a configuration change into effect.

**Command Modes** Privileged EXEC

Command History	Release	Modification
Cisco IOS XE 3.2SE		This command was introduced.

**Usage Guidelines** If there is more than one switch in the switch stack, and you enter the **reload slot *stack-member-number*** command, you are not prompted to save the configuration.

**Examples** This example shows how to reload the switch stack:

```
Device# reload
System configuration has been modified. Save? [yes/no]: yes
Reload command is being issued on Active unit, this will reload the whole stack
Proceed with reload? [confirm] yes
```

This example shows how to reload a specific stack member:

```
Device# reload slot 6
Proceed with reload? [confirm] y
```

This example shows how to reload a single-switch switch stack (there is only one member switch):

```
Device# reload slot 3
System configuration has been modified. Save? [yes/no]: y
Proceed to reload the whole Stack? [confirm] y
```

# reload

To reload the stack member and to apply a configuration change, use the **reload** command in privileged EXEC mode.

**reload** [{/noverify | /verify}] [{LINE | at | cancel | in | slot *stack-member-number* | standby-cpu}]

<b>Syntax Description</b>	/noverify /verify <i>LINE</i> <b>at</b> <b>cancel</b> <b>in</b> <b>slot</b> <i>stack-member-number</i> <b>standby-cpu</b>	(Optional) Specifies to not verify the file signature before the reload. (Optional) Verifies the file signature before the reload. (Optional) Reason for the reload. (Optional) Specifies the time in hh:mm for the reload to occur. (Optional) Cancels the pending reload. (Optional) Specifies a time interval for reloads to occur. (Optional) Saves the changes on the specified stack member and then restarts it. (Optional) Stack member number on which to save the changes. The range is 1 to 9. (Optional) Reloads the standby route processor (RP).
---------------------------	---	--

**Command Default** Immediately reloads the stack member and puts a configuration change into effect.

**Command Modes** Privileged EXEC

Command History	Release	Modification
Cisco IOS XE 3.2SE		This command was introduced.

**Usage Guidelines** If there is more than one switch in the switch stack, and you enter the **reload slot *stack-member-number*** command, you are not prompted to save the configuration.

**Examples** This example shows how to reload the switch stack:

```
Device# reload
System configuration has been modified. Save? [yes/no]: yes
Reload command is being issued on Active unit, this will reload the whole stack
Proceed with reload? [confirm] yes
```

This example shows how to reload a specific stack member:

```
Device# reload slot 6
Proceed with reload? [confirm] y
```

This example shows how to reload a single-switch switch stack (there is only one member switch):

```
Device# reload slot 3
System configuration has been modified. Save? [yes/no]: y
Proceed to reload the whole Stack? [confirm] y
```

# session

To access the diagnostic shell of a specific stack member or to access the Cisco IOS prompt of the standby device use the **session** command in privileged EXEC mode on the active device.

```
session {standby ios | switch [{stack-member-number}]}
```

<b>Syntax Description</b>	<b>standby ios</b> Accesses the Cisco IOS prompt of the standby Device. <b>Note</b> You cannot configure the standby Device using this command.				
	<b>switch</b> Accesses the diagnostic shell of a stack member.				
	<i>stack-member-number</i> (Optional) Stack member number to access from the active switch. The range is 1 to 9.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>When you access the Cisco IOS prompt on the standby Device, <code>-stby</code> is appended to the system prompt. You cannot configure the standby Device at the <code>Device-stby&gt;</code> prompt.</p> <p>When you access the diagnostic shell of a stack member, <code>(diag)</code> is appended to the system prompt.</p>				
<b>Examples</b>	<p>This example shows how to access stack member 3:</p> <pre>Device# session switch 3 Device(diag)&gt;</pre> <p>This example shows how to access the standby device:</p> <pre>Device# session standby ios Device-stby&gt;</pre>				

# session

To access the diagnostic shell of a specific stack member or to access the Cisco IOS prompt of the standby device use the **session** command in privileged EXEC mode on the active device.

```
session {standby ios | switch [{stack-member-number}]}
```

<b>Syntax Description</b>	<b>standby ios</b> Accesses the Cisco IOS prompt of the standby Device. <b>Note</b> You cannot configure the standby Device using this command.				
	<b>switch</b> Accesses the diagnostic shell of a stack member.				
	<b>stack-member-number</b> (Optional) Stack member number to access from the active switch. The range is 1 to 9.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>When you access the Cisco IOS prompt on the standby Device, <code>-stby</code> is appended to the system prompt. You cannot configure the standby Device at the <code>Device-stby&gt;</code> prompt.</p> <p>When you access the diagnostic shell of a stack member, <code>(diag)</code> is appended to the system prompt.</p>				
<b>Examples</b>	<p>This example shows how to access stack member 3:</p> <pre>Device# session switch 3 Device(diag)&gt;</pre> <p>This example shows how to access the standby device:</p> <pre>Device# session standby ios Device-stby&gt;</pre>				

# set platform software fed switch

To set the packet cache count per SVL port, use the **set platform software fed switch** command in privileged EXEC or user EXEC mode.

**set platform software fed switch** {switch-number | active | standby} {F0 | F1 active} fss pak-cache count

<b>Syntax Description</b>	<b>switch</b> {switch-number   active   standby} Specifies information about the switch. You have the following options: <ul style="list-style-type: none"> <li>• <i>switch-number</i></li> <li>• <b>active</b>—Displays information relating to the active switch.</li> <li>• <b>standby</b>—Displays information relating to the standby switch, if available.</li> </ul>				
<b>F0</b>	Specifies information about the Embedded Service Processor slot 0.				
<b>FP active</b>	Specifies information about the active Embedded Service Processor.				
<b>pak-cache count</b>	Specifies the packet cache count. The range is 10 to 600. The default is 10.				
<b>Command Default</b>	The default per port packet cache count is 10.				
<b>Command Modes</b>	User EXEC(> Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
Release	Modification				
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.				
<b>Usage Guidelines</b>	None				

## Example

This example shows how to set the packet cache count per SVL port.

```
Device# set platform software fed switch active F1 active fss pak-cache 40
```

**set platform software nif-mgr switch**

# set platform software nif-mgr switch

To set the packet cache count per SVL port, use the **set platform software nif-mgr switch** command in privileged EXEC or user EXEC mode.

```
set platform software nif-mgr switch {switch-number | active | standby }R0 pak-cache count
```

**Syntax Description**

**switch {switch-number | active** Specifies information about the switch. You have the following options:  
**| standby}**

- *switch-number*.
- **active**—Displays information relating to the active switch.
- **standby**—Displays information relating to the standby switch, if available.

R0	Specifies information about the Route Processor (RP) slot 0.
----	--

<b>pak-cache</b> <i>count</i>	Specifies the packet cache count. The range is 10 to 600. The default is 10.
-------------------------------	--

**Command Default**

The default per port packet cache count is 10.

**Command Modes**

User EXEC(>)

Privileged EXEC (#)

**Command History**
**Release** **Modification**

Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
--------------------------------	------------------------------

**Usage Guidelines**

None

**Example**

This example shows how to set the packet cache count per SVL port.

```
Device# set platform software nif_mgr switch active R0 pak-cache 40
```

# show platform software fed

To display the per port SDP/LMP control packet exchange history between FED and Network Interface Manager (NIF Mgr) software processes, use the **show platform software fed** command in privileged EXEC mode.

```
show platform software fed [switch {switch-number | active | standby} | fss {counters | interface-counters interface {interface-type interface-number}} | lmp-packets interface {interface-type interface-number} | sdp-packets]
```

<b>Syntax Description</b>	<b>switch {switch-number   active   standby}</b> Displays information about the switch. You have the following options: <ul style="list-style-type: none"> <li>• <i>switch-number</i>.</li> <li>• <b>active</b>—Displays information relating to the active switch.</li> <li>• <b>standby</b>—Displays information relating to the standby switch, if available.</li> </ul> <p><b>Note</b> This keyword is not supported.</p>				
<b>fss</b>	Specifies information about Front Side Stacking (FSS).				
<b>counters</b>	Displays the number of TX and RX packets of SDP, LMP, OOB1/2, EMP and LOOPBACK types.				
<b>interface-counters</b>	Displays the number of TX and RX packets for all the interfaces. You can filter the output to display for a particular SVL interface using the <b>interface-counters interface {interface-type interface-number}</b> command.				
<b>lmp-packets</b>	Displays details of LMP packet transactions between FED and NIF Manager for all the SVL interfaces. You can filter the output to display for a particular SVL interface using the <b>lmp-packets interface {interface-type interface-number}</b> command.				
<b>sdp-packets</b>	Displays details of SDP packets transmitted between FED and NIF Manager for all the SVL interfaces.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding-bottom: 2px;"><b>Release</b></th> <th style="text-align: left; padding-bottom: 2px;"><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td style="padding-top: 2px;">Cisco IOS XE Gibraltar 16.11.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.				
<b>Usage Guidelines</b>	By default, the output of <b>show platform software fed switch active fss sdp-packets</b> command displays a packet cache count of 10. You can set the packet cache count per port to a maximum of 600 using the <b>set platform software fed switch</b> command.				

show platform software fed

### Example

The following is an output example from the **show platform software fed switch active fss lmp-packets interface interface-type interface-number** command.

```
Device# show platform software fed switch active fss lmp-packets interface fortygigabitethernet1/0/1

Interface: fortygigabitethernet1/0/1 IFID:0x1d
FED FSS LMP packets max 10:

FED --> Nif Mgr
Timestamp          Local      Peer      Seq
              LPN       LPN      Num
-----
Tue Sep 18 12:45:13 2018    11        11     4329
Tue Sep 18 12:45:14 2018    11        11     4330
```

The following is an output example from the **show platform software fed switch active fss sdp-packets** command.

```
Device# show platform software fed switch active fss sdp-packets
FED FSS SDP packets max 10:
-----

FED-> Nif Mgr
Timestamp          Src Mac           Dst Mac.          Seq Num
-----  

Thu Oct  4 05:54:04 2018   e4aa:5d54:8aa8   ffff:ffff:ffff  262
Thu Oct  4 05:54:08 2018   e4aa:5d54:8aa8   ffff:ffff:ffff  263
Thu Oct  4 05:54:12 2018   e4aa:5d54:8aa8   ffff:ffff:ffff  264
```

The following is an output example from the **show platform software fed switch active fss counters** command.

```
Device# show platform software fed switch active fss counters
FSS Packet Counters
  SDP                                LMP
  TX | RX                           TX | RX
  -----|-----                         -----
  1493    1494                         4988    4988

  OOB1                                OOB2
  TX | RX                           TX | RX
  -----|-----                         -----
  22       8                           134858  133833

  EMP                                LOOPBACK
  TX | RX                           TX | RX
  -----|-----                         -----
  0        0                           71      71
```

The following is an output example from the **show platform software fed switch active fss interface-counters interface interface-type interface-number** command.

```
Device# show platform software fed switch active fss interface-counters fortygigabitethernet1/0/1
```

```
Interface fortygigabitethernet1/0/1 IFID: 0x1d Counters
      LMP
      TX    |    RX
-----
6391        6389
```

**Related Commands**

Command	Description
<b>set platform software fed switch</b>	Configures the per port packet cache count for an SVL interface.

**show platform software nif-mgr switch**

## show platform software nif-mgr switch

To display the control packet exchange history between the Network Interface Manager software process (NIF Mgr) and the StackWise Virtual Link (SVL) interfaces, use the **show platform software nif-mgr switch** command in privileged EXEC mode.

```
show platform software nif-mgr switch {switch-number | active | standby} R0{counters [lpn lpn-index] | packets [lpn lpn-index ] | switch-info}
```

```
show platform software nif-mgr switch {switch-number | active | standby}
R0counters{slotslot-number }{port port-number }packets{slotslot-number }{port port-number }
{switch-info}
```

<b>Syntax Description</b>	<b>switch {switch-number   active   standby}</b> Displays information about the switch. You have the following options: <ul style="list-style-type: none"> <li>• <i>switch-number</i>.</li> <li>• <b>active</b>—Displays information relating to the active switch.</li> <li>• <b>standby</b>—Displays information relating to the standby switch, if available.</li> </ul> <p><b>Note</b> This keyword is not supported.</p>				
<b>R0</b>	Displays information about the Route Processor (RP) slot 0.				
<b>counters</b>	Displays the number of TX and RX packets of LMP and SDP type.				
<b>lpn lpn-index</b>	Specifies the local port number (LPN). The range is 1 to 96. Use the <b>show platform software nif-mgr switch active R0 switch-info</b> command for information about <i>lpn-index</i> .				
<b>packets</b>	Displays the details of TX and RX packets of LMP and SDP type.				
<b>switch-info</b>	Displays information about NIF Manager operational database.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding-bottom: 2px;">Release</th><th style="text-align: left; padding-bottom: 2px;">Modification</th></tr> </thead> <tbody> <tr> <td style="padding-top: 2px;">Cisco IOS XE Gibraltar 16.10.1</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Gibraltar 16.10.1	This command was introduced.
Release	Modification				
Cisco IOS XE Gibraltar 16.10.1	This command was introduced.				
<b>Usage Guidelines</b>	<p>The output of the <b>show platform software nif-mgr switch active R0 counters</b> command displays counters for LMP and SDP packets that are transmitted.</p> <p>The output of the <b>show platform software nif-mgr switch active R0 switch-info</b> command displays the SVL links details and the protocol flap count on each of the links.</p> <ul style="list-style-type: none"> <li>• LMP to FED</li> </ul>				

- SDP to FED
- FED to LMP
- FED to SDP
- Stack Manager to SDP
- SDP to Stack Manager

The output of the **show platform software nif-mgr switch active R0 packets** command displays the timestamp details of the LMP and SDP packets transmitted.

- Timestamp of last 10 LMP frames from FED
- Timestamp of last 10 LMP frames to FED
- Timestamp of last 10 SDP frames from Stack manager
- Timestamp of last 10 SDP frames to Stack manager

By default, the packet cache count per SVL port during bootup is 10. To set the packet cache count per port, use the **set platform software nif-mgr switch** command.

### Example

The following is an output example from the **show platform software nif-mgr switch active R0 counters** command.

```
Device# show platform software nif-mgr switch active R0 counters
NIF Manager Counters
Counters:
#####
Stack Link : 1
=====
FED to NIF Mgr
-----
Number of LMP RX Packets : 749
NIF Mgr to FED
-----
Number of LMP TX Packets : 758
Stack Link : 2
=====
FED to NIF Mgr
-----
Number of LMP RX Packets : 0
NIF Mgr to FED
-----
Number of LMP TX Packets : 0

NIF Mgr to Stack Mgr
-----
Number of SDP Success Packets - 1854
Number of SDP Fail Packets - 0
Stack Mgr to NIF Mgr
-----
Number of SDP Success Packets - 1850
Number of SDP Fail Packets - 0
```

## show platform software nif-mgr switch

The following is an output example from the **show platform software nif-mgr switch active R0 counters lpn lpn-index** command.

```
Device# Switch#sh platform software nif_mgr switch active r0 counters lpn 1
Counters:
#####
LPN : 1 Stack Link : 1 port 1
=====
FED to NIF Mgr
-----
Number of LMP RX Packets : 760
NIF Mgr to FED
-----
Number of LMP TX Packets : 768
```

The following is an output example from the **show platform software nif-mgr switch active R0 packets** command.

```
Device# show platform software nif-mgr switch active R0 packets
NIF manager packets max 10:

Stack Link : 1
LMP
-----
FED->
Nif Mgr
Timestamp          Local    Peer   Seq
LPN      LPN     Num
-----
Wed Jun 20 02:20:49 2018 3       3     1050
Wed Jun 20 02:20:50 2018 3       3     1051
Wed Jun 20 02:20:41 2018 3       3     1042
Wed Jun 20 02:20:42 2018 3       3     1043
Wed Jun 20 02:20:43 2018 3       3     1044
Wed Jun 20 02:20:44 2018 3       3     1045
Wed Jun 20 02:20:45 2018 3       3     1046
Wed Jun 20 02:20:46 2018 3       3     1047
Wed Jun 20 02:20:47 2018 3       3     1048
Wed Jun 20 02:20:48 2018 3       3     1049

Nif Mgr->
FED
Timestamp          Local    Peer   Seq
LPN      LPN     Num
-----
Wed Jun 20 02:20:49 2018 3       3     1050
Wed Jun 20 02:20:50 2018 3       3     1051
Wed Jun 20 02:20:41 2018 3       3     1042
Wed Jun 20 02:20:42 2018 3       3     1043
Wed Jun 20 02:20:43 2018 3       3     1044
Wed Jun 20 02:20:44 2018 3       3     1045
Wed Jun 20 02:20:45 2018 3       3     1046
Wed Jun 20 02:20:46 2018 3       3     1047
Wed Jun 20 02:20:47 2018 3       3     1048
Wed Jun 20 02:20:48 2018 3       3     1049

SDP
-----
Nif Mgr->
Stack Mgr
Timestamp          Src Mac        Dst Mac        Seq Num
-----
Wed Jun 20 02:20:40 2018 40ce:2499:aa90 fffff:ffff:ffff 320
```

```

Wed Jun 20 02:20:44 2018      40ce:2499:aa90 ffff:ffff:ffff 321
Wed Jun 20 02:20:48 2018      40ce:2499:aa90 ffff:ffff:ffff 322
Wed Jun 20 02:20:12 2018      40ce:2499:aa90 ffff:ffff:ffff 313
Wed Jun 20 02:20:16 2018      40ce:2499:aa90 ffff:ffff:ffff 314
Wed Jun 20 02:20:20 2018      40ce:2499:aa90 ffff:ffff:ffff 315
Wed Jun 20 02:20:24 2018      40ce:2499:aa90 ffff:ffff:ffff 316
Wed Jun 20 02:20:28 2018      40ce:2499:aa90 ffff:ffff:ffff 317
Wed Jun 20 02:20:32 2018      40ce:2499:aa90 ffff:ffff:ffff 318
Wed Jun 20 02:20:36 2018      40ce:2499:aa90 ffff:ffff:ffff 319

```

Stack Mgr->

Nif Mgr

Timestamp	Src Mac	Dst Mac	Seq Num
Wed Jun 20 02:20:17 2018	40ce:2499:a9d0	ffff:ffff:ffff	310
Wed Jun 20 02:20:21 2018	40ce:2499:a9d0	ffff:ffff:ffff	311
Wed Jun 20 02:20:25 2018	40ce:2499:a9d0	ffff:ffff:ffff	312
Wed Jun 20 02:20:29 2018	40ce:2499:a9d0	ffff:ffff:ffff	313
Wed Jun 20 02:20:33 2018	40ce:2499:a9d0	ffff:ffff:ffff	314
Wed Jun 20 02:20:37 2018	40ce:2499:a9d0	ffff:ffff:ffff	315
Wed Jun 20 02:20:41 2018	40ce:2499:a9d0	ffff:ffff:ffff	316
Wed Jun 20 02:20:45 2018	40ce:2499:a9d0	ffff:ffff:ffff	317
Wed Jun 20 02:20:49 2018	40ce:2499:a9d0	ffff:ffff:ffff	318
Wed Jun 20 02:20:13 2018	40ce:2499:a9d0	ffff:ffff:ffff	309

#### Related Commands

Command	Description
<b>set platform software nif-mgr switch</b>	Configures the per port packet cache count for an SVL interface.

**show platform stack-manager**

# show platform stack-manager

To display platform-dependent switch-stack information, use the **show platform stack-manager** command in privileged EXEC mode.

**show platform stack-manager {oir-states | sdp-counters | sif-counters} switch *stack-member-number***

<b>Syntax Description</b>	<b>oir-states</b> Displays Online Insertion and Removal (OIR) state information <b>sdp-counters</b> Displays Stack Discovery Protocol (SDP) counter information. <b>sif-counters</b> Displays Stack Interface (SIF) counter information. <b>switch <i>stack-member-number</i></b> Specifies the stack member for which to display stack-manager information.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>Use the <b>show platform stack-manager</b> command to collect data and statistics for the switch stack. Use this command only when you are working directly with your technical support representative while troubleshooting a problem. Do not use this command unless your technical support representative asks you to do so.</p>				

# show platform stack-manager

To display platform-dependent switch-stack information, use the **show platform stack-manager** command in privileged EXEC mode.

**show platform stack-manager {oir-states | sdp-counters | sif-counters} switch *stack-member-number***

<b>Syntax Description</b>	<b>oir-states</b> Displays Online Insertion and Removal (OIR) state information <b>sdp-counters</b> Displays Stack Discovery Protocol (SDP) counter information. <b>sif-counters</b> Displays Stack Interface (SIF) counter information. <b>switch <i>stack-member-number</i></b> Specifies the stack member for which to display stack-manager information.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>Use the <b>show platform stack-manager</b> command to collect data and statistics for the switch stack. Use this command only when you are working directly with your technical support representative while troubleshooting a problem. Do not use this command unless your technical support representative asks you to do so.</p>				

**show redundancy config-sync**

# show redundancy config-sync

To display a configuration synchronization failure or the ignored mismatched command list (MCL), if any, use the **show redundancy config-sync** command in EXEC mode.

**show redundancy config-sync {failures {bem | mcl | prc} | ignored failures mcl}**

<b>Syntax Description</b>	<b>failures</b> Displays MCL entries or best effort method (BEM)/Parser Return Code (PRC) failures. <b>bem</b> Displays a BEM failed command list, and forces the standby switch to reboot. <b>mcl</b> Displays commands that exist in the switch's running configuration but are not supported by the image on the standby switch, and forces the standby switch to reboot. <b>prc</b> Displays a PRC failed command list and forces the standby switch to reboot. <b>ignored failures mcl</b> Displays the ignored MCL failures.				
<b>Command Default</b>	None				
<b>Command Modes</b>	User EXEC Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>When two versions of Cisco IOS images are involved, the command sets supported by two images might differ. If any of those mismatched commands are executed on the active switch, the standby switch might not recognize those commands, which causes a configuration mismatch condition. If the syntax check for the command fails on the standby switch during a bulk synchronization, the command is moved into the MCL and the standby switch is reset. To display all the mismatched commands, use the <b>show redundancy config-sync failures mcl</b> command.</p> <p>To clean the MCL, follow these steps:</p> <ol style="list-style-type: none"> <li>1. Remove all mismatched commands from the active switch's running configuration.</li> <li>2. Revalidate the MCL with a modified running configuration by using the <b>redundancy config-sync validate mismatched-commands</b> command.</li> <li>3. Reload the standby switch.</li> </ol> <p>Alternatively, you could ignore the MCL by following these steps:</p> <ol style="list-style-type: none"> <li>1. Enter the <b>redundancy config-sync ignore mismatched-commands</b> command.</li> <li>2. Reload the standby switch; the system transitions to SSO mode.</li> </ol>				



**Note** If you ignore the mismatched commands, the out-of-synchronization configuration on the active switch and the standby switch still exists.

3. You can verify the ignored MCL with the **show redundancy config-sync ignored mcl** command.

Each command sets a return code in the action function that implements the command. This return code indicates whether or not the command successfully executes. The active switch maintains the PRC after executing a command. The standby switch executes the command and sends the PRC back to the active switch. A PRC failure occurs if these two PRCs do not match. If a PRC error occurs at the standby switch either during bulk synchronization or line-by-line (LBL) synchronization, the standby switch is reset. To display all PRC failures, use the **show redundancy config-sync failures prc** command.

To display best effort method (BEM) errors, use the **show redundancy config-sync failures bem** command.

This example shows how to display the BEM failures:

```
Device> show redundancy config-sync failures bem
BEM Failed Command List
-----
The list is Empty
```

This example shows how to display the MCL failures:

```
Device> show redundancy config-sync failures mcl
Mismatched Command List
-----
The list is Empty
```

This example shows how to display the PRC failures:

```
Device# show redundancy config-sync failures prc
PRC Failed Command List
-----
The list is Empty
```

**show redundancy**

# show redundancy

To display redundancy facility information, use the **show redundancy** command in privileged EXEC mode

```
show redundancy [{clients | config-sync | counters | history [{reload | reverse}] | slaves[slave-name] {clients | counters} | states | switchover history [domain default]}]
```

Syntax Description	<b>clients</b> (Optional) Displays information about the redundancy facility client.				
<b>config-sync</b>	(Optional) Displays a configuration synchronization failure or the ignored mismatched command list. For more information, see <a href="#">show redundancy config-sync, on page 1120</a> .				
<b>counters</b>	(Optional) Displays information about the redundancy facility counter.				
<b>history</b>	(Optional) Displays a log of past status and related information for the redundancy facility.				
<b>history reload</b>	(Optional) Displays a log of past reload information for the redundancy facility.				
<b>history reverse</b>	(Optional) Displays a reverse log of past status and related information for the redundancy facility.				
<b>slaves</b>	(Optional) Displays all subordinates in the redundancy facility.				
<b>slave-name</b>	(Optional) The name of the redundancy facility subordinate to display specific information for. Enter additional keywords to display all clients or counters in the specified subordinate.				
<b>clients</b>	Displays all redundancy facility clients in the specified subordinates.				
<b>counters</b>	Displays all counters in the specified subordinate.				
<b>states</b>	(Optional) Displays information about the redundancy facility state, such as disabled, initialization, standby or active.				
<b>switchover history</b>	(Optional) Displays information about the redundancy facility switchover history.				
<b>domain default</b>	(Optional) Displays the default domain as the domain to display switchover history for.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

This example shows how to display information about the redundancy facility:

```
Device# show redundancy
Redundant System Information :
```

```
-----
Available system uptime = 6 days, 9 hours, 23 minutes
Switchovers system experienced = 0
Standby failures = 0
Last switchover reason = not known

Hardware Mode = Simplex
Configured Redundancy Mode = SSO
Operating Redundancy Mode = SSO
Maintenance Mode = Disabled
Communications = Down      Reason: Simplex mode

Current Processor Information :
-----
Active Location = slot 1
Current Software state = ACTIVE
Uptime in current state = 6 days, 9 hours, 23 minutes
Image Version = Cisco IOS Software, IOS-XE Software, Catalyst 3
850 L3 Switch Software (CAT3850-UNIVERSALK9-M), Version 03.08.59.EMD EARLY DEPLO
YMENT ENGINEERING NOVA_WEEKLY BUILD, synced to DSGS_PI2_POSTPC_FLO_DSBU7_NG3K_11
05
Copyright (c) 1986-2012 by Cisco Systems, Inc.
Compiled Sun 16-S
Configuration register = 0x102

Peer (slot: 0) information is not available because it is in 'DISABLED' state
Device#
```

This example shows how to display redundancy facility client information:

```
Device# show redundancy clients
Group ID = 1
  clientID = 20002  clientSeq = 4  EICORE HA Client
  clientID = 24100  clientSeq = 5  WCM_CAPWAP
  clientID = 24101  clientSeq = 6  WCM RRM HA
  clientID = 24103  clientSeq = 8  WCM QOS HA
  clientID = 24105  clientSeq = 10  WCM_MOBILITY
  clientID = 24106  clientSeq = 11  WCM_DOT1X
  clientID = 24107  clientSeq = 12  WCM_APFROGUE
  clientID = 24110  clientSeq = 15  WCM_CIDS
  clientID = 24111  clientSeq = 16  WCM_NETFLOW
  clientID = 24112  clientSeq = 17  WCM_MCAST
  clientID = 24120  clientSeq = 18  wcm_comet
  clientID = 24001  clientSeq = 21  Table Manager Client
  clientID = 20010  clientSeq = 24  SNMP SA HA Client
  clientID = 20007  clientSeq = 27  Installer HA Client
  clientID = 29    clientSeq = 60  Redundancy Mode RF
  clientID = 139   clientSeq = 61  IfIndex
  clientID = 3300  clientSeq = 62  Persistent Variable
  clientID = 25    clientSeq = 68  CHKPT RF
  clientID = 20005 clientSeq = 74  IIF-shim
  clientID = 10001 clientSeq = 82  QEMU Platform RF

<output truncated>
```

The output displays the following information:

- clientID displays the client's ID number.
- clientSeq displays the client's notification sequence number.
- Current redundancy facility state.

**show redundancy**

This example shows how to display the redundancy facility counter information:

```
Device# show redundancy counters
Redundancy Facility OMs

    comm link up = 0
    comm link down = 0
    invalid client tx = 0
    null tx by client = 0
        tx failures = 0
    tx msg length invalid = 0

    client not rxing msgs = 0
    rx peer msg routing errors = 0
        null peer msg rx = 0
        errored peer msg rx = 0

        buffers tx = 0
    tx buffers unavailable = 0
        buffers rx = 0
    buffer release errors = 0

    duplicate client registers = 0
    failed to register client = 0
        Invalid client syncs = 0
```

Device#

This example shows how to display redundancy facility history information:

```
Device# show redundancy history
00:00:00 *my state = INITIALIZATION(2) peer state = DISABLED(1)
00:00:00 RF_EVENT_INITIALIZATION(524) op=0 rc=0
00:00:00 *my state = NEGOTIATION(3) peer state = DISABLED(1)
00:00:01 client added: Table Manager Client(24001) seq=21
00:00:01 client added: SNMP SA HA Client(20010) seq=24
00:00:06 client added: WCM_CAPWAP(24100) seq=5
00:00:06 client added: WCM_QOS_HA(24103) seq=8
00:00:07 client added: WCM_DOT1X(24106) seq=11
00:00:07 client added: EICORE HA Client(20002) seq=4
00:00:09 client added: WCM_MOBILITY(24105) seq=10
00:00:09 client added: WCM_NETFLOW(24111) seq=16
00:00:09 client added: WCM_APFROGUE(24107) seq=12
00:00:09 client added: WCM_RRM_HA(24101) seq=6
00:00:09 client added: WCM_MCAST(24112) seq=17
00:00:09 client added: WCM_CIDS(24110) seq=15
00:00:09 client added: wcm_comet(24120) seq=18
00:00:22 RF_STATUS_REDUNDANCY_MODE_CHANGE(405) First Slave(0) op=0 rc=0
00:00:22 RF_STATUS_REDUNDANCY_MODE_CHANGE(405) Slave(6107) op=0 rc=0
00:00:22 RF_STATUS_REDUNDANCY_MODE_CHANGE(405) Slave(6109) op=0 rc=0
00:00:22 RF_STATUS_REDUNDANCY_MODE_CHANGE(405) Slave(6128) op=0 rc=0
00:00:22 RF_STATUS_REDUNDANCY_MODE_CHANGE(405) Slave(8897) op=0 rc=0
00:00:22 RF_STATUS_REDUNDANCY_MODE_CHANGE(405) Slave(8898) op=0 rc=0
00:00:22 RF_STATUS_REDUNDANCY_MODE_CHANGE(405) Slave(8901) op=0 rc=0
00:00:22 RF_EVENT_SLAVE_STATUS_DONE(523) First Slave(0) op=405 rc=0
00:00:22 RF_STATUS_REDUNDANCY_MODE_CHANGE(405) Redundancy Mode RF(29) op=0 rc=0
00:00:22 RF_STATUS_REDUNDANCY_MODE_CHANGE(405) IfIndex(139) op=0 rc=0

<output truncated>
```

This example shows how to display information about the redundancy facility subordinates:

```
Device# show redundancy slaves
Group ID = 1
Slave/Process ID = 6107 Slave Name = [installer]
Slave/Process ID = 6109 Slave Name = [eicored]
Slave/Process ID = 6128 Slave Name = [snmp_subagent]
Slave/Process ID = 8897 Slave Name = [wcm]
Slave/Process ID = 8898 Slave Name = [table_mgr]
Slave/Process ID = 8901 Slave Name = [iosd]
```

```
Device#
```

This example shows how to display information about the redundancy facility state:

```
Device# show redundancy states
    my state = 13 -ACTIVE
    peer state = 1 -DISABLED
        Mode = Simplex
        Unit ID = 1

    Redundancy Mode (Operational) = SSO
    Redundancy Mode (Configured) = SSO
        Redundancy State = Non Redundant
            Manual Swact = disabled (system is simplex (no peer unit))

    Communications = Down      Reason: Simplex mode

        client count = 75
        client_notification_TMR = 360000 milliseconds
            keep_alive TMR = 9000 milliseconds
            keep_alive count = 0
            keep_alive threshold = 18
            RF debug mask = 0

Device#
```

**show stackwise-virtual**

# show stackwise-virtual

To display your Cisco StackWise Virtual configuration information, use the **show stackwise-virtual** command.

```
show stackwise-virtual { [switch [switch number <1-2>] {link | bandwidth | neighbors | dual-active-detection} }
```

<b>Syntax Description</b>	<b>switch number</b> <b>link</b> <b>bandwidth</b> <b>neighbors</b> <b>dual-active-detection</b>	(Optional) Displays information of a particular switch in the stack. Displays Stackwise Virtual link information. Displays bandwidth availability for StackWise Virtual. Displays Stackwise Virtual neighbors. Displays Stackwise-Virtual dual-active-detection information.
<b>Command Default</b>	None	
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.3	This command was introduced.

## Example:

The following is a sample output from the **show stackwise-virtual** command:

```
Device# show stackwise-virtual

Stackwise Virtual: <Enabled/Disabled>
Domain Number: <Domain Number>
Switch   Stackwise Virtual Link      Ports
-----  -----
1       1                           Tengigabitethernet1/0/4
                                2                           Tengigabitethernet1/0/5
2       1                           Tengigabitethernet2/0/4
                                2                           Tengigabitethernet2/0/5
```

The following is a sample output from the **show stackwise-virtual link** command:

```
Device# show stackwise-virtual link

Stackwise Virtual Link (SVL) Information:
-----
Flags:
```

```
-----
Link Status
-----
U-Up D-Down
Protocol Status
-----
S-Suspended P-Pending E-Error T-Timeout R-Ready
-----
Switch SVL Ports Link-Status Protocol-Status
----- --- -----
1 1 FortyGigabitEthernet1/1/1 U R
2 1 FortyGigabitEthernet2/1/1 U R
```

The following is a sample output from the **show stackwise-virtual bandwidth** command:

```
Device# show stackwise-virtual bandwidth

Switch Bandwidth
1 160
2 160
```

The following is a sample output from the **show stackwise-virtual neighbors** command:

```
Device#show stackwise-virtual neighbors

Switch Number Local Interface Remote Interface
1 Tengigabitethernet1/0/1 Tengigabitethernet2/0/1
Tengigabitethernet1/0/2 Tengigabitethernet2/0/2
2 Tengigabitethernet2/0/1 Tengigabitethernet1/0/1
Tengigabitethernet2/0/2 Tengigabitethernet2/0/2
```

The following is a sample output from the **show stackwise-virtual dual-active-detection** command:

```
Device#show stackwise-virtual dual-active-detection

Stackwise Virtual Dual-Active-Detection (DAD) Configuration:
Switch Number Dual-Active-Detection Interface
1 Tengigabitethernet1/0/10
Tengigabitethernet1/0/11
2 Tengigabitethernet2/0/12
Tengigabitethernet2/0/13

Stackwise Virtual Dual-Active-Detection (DAD) Configuration After Reboot:
Switch Number Dual-Active-Detection Interface
1 Tengigabitethernet1/0/10
Tengigabitethernet1/0/11
2 Tengigabitethernet2/0/12
Tengigabitethernet2/0/13
```

**show switch**

# show switch

To display information that is related to the stack member or the switch stack, use the **show switch** command in EXEC mode.

**show switch [{stack-member-number | detail | neighbors | stack-ports [{summary}]})]**

<b>Syntax Description</b>	<table border="0"> <tr> <td><b>stack-member-number</b></td><td>(Optional) Number of the stack member. The range is 1 to 9.</td></tr> <tr> <td><b>detail</b></td><td>(Optional) Displays detailed information about the stack ring.</td></tr> <tr> <td><b>neighbors</b></td><td>(Optional) Displays the neighbors of the entire switch stack.</td></tr> <tr> <td><b>stack-ports</b></td><td>(Optional) Displays port information for the entire switch stack.</td></tr> <tr> <td><b>summary</b></td><td>(Optional) Displays the stack cable length, the stack link status, and the loopback status.</td></tr> </table>	<b>stack-member-number</b>	(Optional) Number of the stack member. The range is 1 to 9.	<b>detail</b>	(Optional) Displays detailed information about the stack ring.	<b>neighbors</b>	(Optional) Displays the neighbors of the entire switch stack.	<b>stack-ports</b>	(Optional) Displays port information for the entire switch stack.	<b>summary</b>	(Optional) Displays the stack cable length, the stack link status, and the loopback status.
<b>stack-member-number</b>	(Optional) Number of the stack member. The range is 1 to 9.										
<b>detail</b>	(Optional) Displays detailed information about the stack ring.										
<b>neighbors</b>	(Optional) Displays the neighbors of the entire switch stack.										
<b>stack-ports</b>	(Optional) Displays port information for the entire switch stack.										
<b>summary</b>	(Optional) Displays the stack cable length, the stack link status, and the loopback status.										
<b>Command Default</b>	None										
<b>Command Modes</b>	User EXEC (> Privileged EXEC (#)										
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.						
<b>Release</b>	<b>Modification</b>										
Cisco IOS XE 3.2SE	This command was introduced.										
<b>Usage Guidelines</b>	<p>This command displays these states:</p> <ul style="list-style-type: none"> <li>• Initializing—A switch has been just added to the stack and it has not completed the basic initialization to go to the ready state.</li> <li>• HA Sync in Progress—After the standby is elected, the corresponding switch remains in this state until the synchronization is completed.</li> <li>• Syncing—A switch that is added to an already existing stack remains in this state until the switch add sequence is complete.</li> <li>• Ready—The member has completed loading the system- and interface-level configurations and can forward traffic.</li> <li>• V-Mismatch—A switch in version mismatch mode. Version-mismatch mode is when a switch that joins the stack has a software version that is incompatible with the active switch.</li> <li>• Provisioned—The state of a preconfigured switch before it becomes an active member of a switch stack. The MAC address and the priority number in the display are always 0 for the provisioned switch.</li> <li>• Unprovisioned—The state of a switch when the provisioned switch number was unprovisioned using the <b>no switch switch-number provision</b> command.</li> </ul>										

- Removed—A switch that was present in the stack was removed using the **reload slot** command.
- Sync not started—When multiple switches are added to an existing stack together, the active switch adds them one by one. The switch that is being added is in the Syncing state. The switches that have not been added yet are in the Sync not started state.
- Lic-Mismatch—A switch has a different license level than the active switch.

A typical state transition for a stack member (including an active switch) booting up is Waiting > Initializing > Ready.

A typical state transition for a stack member in version mismatch (VM) mode is Waiting > Ver Mismatch.

You can use the **show switch** command to identify whether the provisioned switch exists in the switch stack. The **show running-config** and the **show startup-config** privileged EXEC commands do not provide this information.

The display also includes stack MAC-persistency wait-time if persistent MAC address is enabled.

## Examples

This example shows how to display summary stack information:

```
Device# show switch
Switch/Stack Mac Address : 6400.f124.e900
          H/W   Current
Switch#  Role    Mac Address      Priority Version State
-----+
1       Member  0000.0000.0000    0        0     Provisioned
2       Member  0000.0000.0000    0        0     Removed
*3      Active   6400.f124.e900  2        0     Ready
8       Member  0000.0000.0000    0        0     Unprovisioned
```

This example shows how to display detailed stack information:

```
Device# show switch detail
Switch/Stack Mac Address : 2037.06ce.3f80 - Local Mac Address
Mac persistency wait time: Indefinite
          H/W   Current
Switch#  Role    Mac Address      Priority Version State
-----+
*1      Active  2037.06ce.3f80    1        0     Ready
2       Member  0000.0000.0000    0        0     Provisioned
6       Member  2037.06ce.1e00    1        0     Ready

          Stack Port Status           Neighbors
          Port 1   Port 2
Switch# 
-----+
1       Ok      Down            6      None
6       Down    Ok              None      1
```

This example shows how to display the member 6 summary information:

```
Device# show switch 6
Switch#  Role    Mac Address      Priority      State
-----+
6       Member  0003.e31a.1e00    1           Ready
```

This example shows how to display the neighbor information for a stack:

```
Device# show switch neighbors
      Switch #    Port A      Port B
```

**show switch**

```

----- ----- -----
 6     None      8
 8     6        None

```

This example shows how to display stack-port information:

```
Device# show switch stack-ports
Switch #   Port A       Port B
-----   -----
 6         Down        Ok
 8         Ok          Down
```

This example shows the output for the **show switch stack-ports summary** command. The table that follows describes the fields in the display.

```
Device# show switch stack-ports summary
Switch#/ Port# Stack Port Neighbor Port Status Cable Length Link OK Link Active Sync OK # Changes In Loopback
----- 1/1    2      Down  50 cm  No    NO   No  10  No
1/2    3      Ok   1 m   Yes  Yes  Yes  0   No
2/1    5      Ok   3 m   Yes  Yes  Yes  0   No
2/2    1      Down  50 cm  No    No   No  10  No
3/1    1      Ok   1 m   Yes  Yes  Yes  0   No
3/2    5      Ok   1 m   Yes  Yes  Yes  0   No
5/1    3      Ok   1 m   Yes  Yes  Yes  0   No
5/2    2      Ok   3 m   Yes  Yes  Yes  0   No
```

**Table 65: Show switch stack-ports summary Command Output**

Field	Description
Switch#/Port#	Member number and its stack port number.
Stack Port Status	Status of the stack port. <ul style="list-style-type: none"> <li>Down—A cable is detected, but either no connected neighbor is up, or the stack port is disabled.</li> <li>OK—A cable is detected, and the connected neighbor is up.</li> </ul>
Neighbor	Switch number of the active member at the other end of the stack cable.
Cable Length	Valid lengths are 50 cm, 1 m, or 3 m. If the switch cannot detect the cable length, the value is <i>no cable</i> . The cable might not be connected, or the link might be unreliable.
Link OK	Whether the stack cable is connected and functional. There may or may not be a neighbor connected on the other end. The <i>link partner</i> is a stack port on a neighbor switch. <ul style="list-style-type: none"> <li>No—There is no stack cable connected to this port or the stack cable is not functional.</li> <li>Yes—There is a functional stack cable connected to this port.</li> </ul>

Field	Description
Link Active	Whether a neighbor is connected on the other end of the stack cable. <ul style="list-style-type: none"> <li>• No—No neighbor is detected on the other end. The port cannot send traffic over this link.</li> <li>• Yes—A neighbor is detected on the other end. The port can send traffic over this link.</li> </ul>
Sync OK	Whether the link partner sends valid protocol messages to the stack port. <ul style="list-style-type: none"> <li>• No—The link partner does not send valid protocol messages to the stack port.</li> <li>• Yes—The link partner sends valid protocol messages to the port.</li> </ul>
# Changes to LinkOK	The relative stability of the link. If a large number of changes occur in a short period of time, link flapping can occur.
In Loopback	Whether a stack cable is attached to a stack port on the member. <ul style="list-style-type: none"> <li>• No—At least one stack port on the member has an attached stack cable.</li> <li>• Yes—None of the stack ports on the member has an attached stack cable.</li> </ul>

**show redundancy config-sync**

# show redundancy config-sync

To display a configuration synchronization failure or the ignored mismatched command list (MCL), if any, use the **show redundancy config-sync** command in EXEC mode.

**show redundancy config-sync {failures {bem | mcl | prc} | ignored failures mcl}**

<b>Syntax Description</b>	<b>failures</b> Displays MCL entries or best effort method (BEM)/Parser Return Code (PRC) failures. <b>bem</b> Displays a BEM failed command list, and forces the standby switch to reboot. <b>mcl</b> Displays commands that exist in the switch's running configuration but are not supported by the image on the standby switch, and forces the standby switch to reboot. <b>prc</b> Displays a PRC failed command list and forces the standby switch to reboot. <b>ignored failures mcl</b> Displays the ignored MCL failures.				
<b>Command Default</b>	None				
<b>Command Modes</b>	User EXEC Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>When two versions of Cisco IOS images are involved, the command sets supported by two images might differ. If any of those mismatched commands are executed on the active switch, the standby switch might not recognize those commands, which causes a configuration mismatch condition. If the syntax check for the command fails on the standby switch during a bulk synchronization, the command is moved into the MCL and the standby switch is reset. To display all the mismatched commands, use the <b>show redundancy config-sync failures mcl</b> command.</p> <p>To clean the MCL, follow these steps:</p> <ol style="list-style-type: none"> <li>1. Remove all mismatched commands from the active switch's running configuration.</li> <li>2. Revalidate the MCL with a modified running configuration by using the <b>redundancy config-sync validate mismatched-commands</b> command.</li> <li>3. Reload the standby switch.</li> </ol> <p>Alternatively, you could ignore the MCL by following these steps:</p> <ol style="list-style-type: none"> <li>1. Enter the <b>redundancy config-sync ignore mismatched-commands</b> command.</li> <li>2. Reload the standby switch; the system transitions to SSO mode.</li> </ol>				



**Note** If you ignore the mismatched commands, the out-of-synchronization configuration on the active switch and the standby switch still exists.

3. You can verify the ignored MCL with the **show redundancy config-sync ignored mcl** command.

Each command sets a return code in the action function that implements the command. This return code indicates whether or not the command successfully executes. The active switch maintains the PRC after executing a command. The standby switch executes the command and sends the PRC back to the active switch. A PRC failure occurs if these two PRCs do not match. If a PRC error occurs at the standby switch either during bulk synchronization or line-by-line (LBL) synchronization, the standby switch is reset. To display all PRC failures, use the **show redundancy config-sync failures prc** command.

To display best effort method (BEM) errors, use the **show redundancy config-sync failures bem** command.

This example shows how to display the BEM failures:

```
Device> show redundancy config-sync failures bem
BEM Failed Command List
-----
The list is Empty
```

This example shows how to display the MCL failures:

```
Device> show redundancy config-sync failures mcl
Mismatched Command List
-----
The list is Empty
```

This example shows how to display the PRC failures:

```
Device# show redundancy config-sync failures prc
PRC Failed Command List
-----
The list is Empty
```

**show tech-support stack**

# show tech-support stack

To display all switch stack-related information for use by technical support, use the **show tech-support stack** command in privileged EXEC mode.

## show tech-support stack

<b>Syntax Description</b>	This command has no arguments or keywords.	
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
	Cisco IOS XE Gibraltar 16.12.1	The output for this command was enhanced to include more stack-related information.

**Usage Guidelines** The **show tech-support stack** command captures the snapshot of stacking states and information for debug issues. Use this command, when a stacking issues (such as stack cable issue, silent reload, switch not becoming ready, stack crash, and so on) occur.

The output of the **show tech-support stack** command is very long. To better manage this output, you can redirect the output to a file (for example, **show tech-support stack | redirect flash:filename**) in the local writable storage file system or remote file system.

The output of the **show tech stack** command displays the following commands:

- **show clock**
- **show version**
- **show running-config**
- **show redundancy switchover history**
- **show switch stack-ports summary**
- **show switch stack-mode**
- **show switch stack-ring speed**
- **show switch stack-bandwidth**
- **show switch detail**
- **show switch neighbors**

The following commands are only available on stacked switches in ready state

- **show platform software stack-mgr switch**
- **show platform software sif switch**
- **show platform hardware fed switch**

- **dir crashinfo:**
- **dir flash:/core**

**Examples**

The following is sample output from the **show tech-support stack** command:

```
Device# show tech-support stack
```

```
.
```

```
.
```

```
----- show switch stack-ports summary -----
```

Sw#/Port#	Port Status	Neighbor	Cable Length	Link OK	Link Active	Sync OK	#Changes
to LinkOK	In Loopback						
1/1	OK No	3	50cm	Yes	Yes	Yes	1
1/2	OK No	2	50cm	Yes	Yes	Yes	1
2/1	OK No	1	50cm	Yes	Yes	Yes	1
2/2	OK No	3	50cm	Yes	Yes	Yes	1
3/1	OK No	2	50cm	Yes	Yes	Yes	1
3/2	OK No	1	50cm	Yes	Yes	Yes	1

```
----- show switch stack-mode -----
```

Switch#	Role	Mac Address	Version	Mode	Configured	State
*1	Active	046c.9d1e.f380		N+1	None	Ready
2	Member	0c75.bd11.5d80	V01	N+1	None	Ready
3	Standby	0c75.bd11.59ff	P1A	N+1	None	Ready

```
----- show switch stack-bandwidth -----
```

Switch#	Role	Stack Bandwidth	Current State
*1	Active	480G	Ready
2	Member	480G	Ready
3	Standby	480G	Ready

```
----- show switch stack-ring speed -----
```

```
Stack Ring Speed : 480G
```

show tech-support stack

```
Stack Ring Configuration: Full
Stack Ring Protocol      : StackWise
```

```
----- show switch detail -----
```

```
Switch/Stack Mac Address : 046c.9d1e.f380 - Local Mac Address
Mac persistency wait time: Indefinite
```

Switch#	Role	Mac Address	H/W Priority	Current Version	State
<hr/>					
*1	Active	046c.9d1e.f380	1		Ready
2	Member	0c75.bd11.5d80	1	V01	Ready
3	Standby	0c75.bd11.59ff	1	P1A	Ready

Switch#	Stack Port Status		Neighbors	
	Port 1	Port 2	Port 1	Port 2
1	OK	OK	3	2
2	OK	OK	1	3
3	OK	OK	2	1

```
----- show switch neighbors -----
```

Switch #	Port 1	Port 2
1	3	2
2	1	3
3	2	1

```
----- show platform software stack-mgr switch 1 R0 oir-states --
```

Switch#	OIR State	Type	Provisioned
<hr/>			
1	CHASSIS_COMPATIBLE	C9300-24U	YES
2	CHASSIS_COMPATIBLE	C9300-48U	YES
3	CHASSIS_COMPATIBLE	C9300-48U	YES

```
----- show platform software stack-mgr switch 1 R0 sdp-counters --
```

```
Stack Discovery Protocol (SDP) Counters
```

Message	Tx Success	Tx Fail	Rx Success	Rx Fail
<hr/>				
Discovery	16	0	27	0
Neighbor	5	1	5	2
Keepalive	473	0	945	0
SEPPUKU	0	0	0	0
Standby Elect Req	1	0	0	0
Standby Elect Ack	0	0	1	0
Standby IOS State	0	0	2	0

Reload Req	0	0	0	0
Reload Ack	0	0	0	0
SESA Mesg	0	0	0	0
RTU Msg	1	0	4	0
Disc Timer Stop	1	0	2	0

-----  
----- show platform software sif switch 1 R0 counters -----

#### Stack Interface (SIF) Counters

##### Stack Discovery Protocol (SDP) Messages

Message	Tx Success	Tx Fail	Rx Success	Rx Fail
Discovery	0	0	0	0
Neighbor	0	0	0	0
Forward	516	0	1040	0

##### SIF Management Messages

Message	Success	Fail
Link Status	4	0
Link Management	0	0
Chassis Num	1	0
Topo Change	2	0
Active Declare	1	0
Template set	0	0

-----  
----- show platform software sif switch 1 R0 counters oob -----

##### SIF OOB Statistics

Message	Count
TX LSMPI	524
TX Enq Failed	0
TX Copy Failed	0
TX Ring Full	0
TX Iter	516
TX Enq Success	526
RX Process	1042
RX Exception	0
RX Total	1042
Dequeue Attempts	986
Dequeue Success	1043

##### SIF Netdrv OOB Statistics Unicast Messages

show tech-support stack

```
-----
Switch      Count
-----
2          42228
3          79287
-----
Broadcast messages count: 4
-----
----- show platform software sif switch 1 R0 counters cable -----
SIF Cable Statistics
-----
Direction      Remove      Insert
-----
East          0           1
West          0           1
-----
SIF Link Statistics
-----
ASIC          Port        State       Changes
-----
0              1           1           2
1              2           1           2
-----
----- show platform software sif switch 1 R0 exceptions -----
----- show platform software sif switch 1 R0 topo -----
Stack Interface (SIF) Topology
-----
Stacked Switch List
-----
Chassis#      MAC Adress      Role
-----
3              0c75.bd11.59ff
2              0c75.bd11.5d80
1              046c.9d1e.f380      L,A
-----
L: Local Switch; A: Active Switch;
-----
.
.
.
The output fields are self-explanatory.
```

# stack-mac update force

To update the stack MAC address to the MAC address of the active switch, use the **stack-mac update force** command in EXEC mode on the active switch.

## stack-mac update force

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Default</b>	None
------------------------	------

<b>Command Modes</b>	User EXEC
	Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	By default, the stack MAC address is not changed to the MAC address of the new active switch during a high availability (HA) failover. Use the <b>stack-mac update force</b> command to force the stack MAC address to change to the MAC address of the new active switch.
-------------------------	--

If the switch with the same MAC address as the stack MAC address is currently a member of the stack, the **stack-mac update force** command has no effect. (It does not change the stack MAC address to the MAC address of the active switch.)



<b>Note</b>	If you do not change the stack MAC address, Layer 3 interface flapping does not occur. It also means that a foreign MAC address (a MAC address that does not belong to any of the switches in the stack) could be the stack MAC address. If the switch with this foreign MAC address joins another stack as the active switch, two stacks will have the same stack MAC address. You must use the <b>stack-mac update force</b> command to resolve the conflict.
-------------	---

This example shows how to update the stack MAC address to the MAC address of the active switch:

```
Device> stack-mac update force
Device>
```

You can verify your settings by entering the **show switch** privileged EXEC command. The stack MAC address includes whether the MAC address is local or foreign.

# stackwise-virtual

To enable Cisco StackWise Virtual on a switch, use the **stackwise-virtual** command in the global configuration mode. To disable Cisco StackWise Virtual, use the **no** form of this command.

**stackwise-virtual**  
**no stackwise-virtual**

<b>Syntax Description</b>	<b>stackwise-virtual</b>	Enables Cisco StackWise Virtual.
<b>Command Default</b>	Disabled.	
<b>Command Modes</b>	Global configuration (config)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.3	This command was introduced.
<b>Usage Guidelines</b>		After disabling Cisco StackWise Virtual, the switches must be reloaded to unstack them.

## Example

The following example shows how to enable Cisco StackWise Virtual :

```
Device(config)# stackwise-virtual
```

# stackwise-virtual link

To associate an interface with configured StackWise Virtual link, use the **stackwise-virtual link** command in the interface configuration mode. To disassociate the interface, use the **no** form of the command.

```
stackwise-virtual link link-value
no stackwise-virtual link link-value
```

<b>Syntax Description</b>	<b>stackwise-virtual link</b>	Associates a 10-G or 40-G interface to StackWise Virtual link.
	<i>link value</i>	Domain ID configured for Cisco StackWise Virtual.
<b>Command Default</b>		Disabled.
<b>Command Modes</b>		Interface configuration (config-if).
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.3.3	This command was introduced.

## Example:

This example shows how to associate a 40 Gigabit Ethernet interface with configured Stackwise Virtual Link (SVL):

```
Device(config)# interface FortyGigabitEthernet1/1/1
Device(config-if)#stackwise-virtual link 1
```

# stackwise-virtual dual-active-detection

To configure an interface as dual-active-detection link, use the **stackwise-virtual dual-active-detection** command in the interface configuration mode. To disassociate the interface, use the **no** form of the command.

**stackwise-virtual dual-active-detection**  
**no stackwise-virtual dual-active-detection**

<b>Syntax Description</b>	<b>stackwise-virtual dual-active-detection</b>	Enables Cisco StackWise Virtual dual-active-detection for the specified 10-G or 40-G interface.				
<b>Command Default</b>	Disabled.					
<b>Command Modes</b>	Interface configuration (config-if)					
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.3</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.3	This command was introduced.	
<b>Release</b>	<b>Modification</b>					
Cisco IOS XE Denali 16.3.3	This command was introduced.					

## Example:

The following example shows how to configure a 10 Gigabit Ethernet interface as Dual-Active-Detection link:

```
Device(config)# interface TenGigabitEthernet1/0/2
Device(config-if)#stackwise-virtual dual-active-detection
```

# standby console enable

To enable access to the standby console switch, use the **standby console enable** command in redundancy main configuration submode. To disable access to the standby console switch, use the **no** form of this command.

**standby console enable**  
**no standby console enable**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Access to the standby console switch is disabled.

**Command Modes** Redundancy main configuration submode

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** This command is used to collect and review specific data about the standby console. The command is useful primarily for Cisco technical support representatives troubleshooting the switch.

This example shows how to enter the redundancy main configuration submode and enable access to the standby console switch:

```
Device(config)# redundancy
Device(config-red)# main-cpu
Device(config-r-mc)# standby console enable
Device(config-r-mc)#

```

switch stack port

# switch stack port

To disable or enable the specified stack port on the member, use the **switch** command in privileged EXEC mode on a stack member.

```
switch stack-member-number stack port port-number {disable | enable}
```

## Syntax Description

**stack-member-number** Current stack member number. The range is 1 to 9.

**stack port port-number** Specifies the stack port on the member. The range is 1 to 2.

**disable** Disables the specified port.

**enable** Enables the specified port.

## Command Default

The stack port is enabled.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

A stack is in the full-ring state when all members are connected through the stack ports and are in the ready state.

The stack is in the partial-ring state when the following occurs:

- All members are connected through their stack ports but some are not in the ready state.
- Some members are not connected through the stack ports.



### Note

Be careful when using the **switch stack-member-number stack port port-number disable** command. When you disable the stack port, the stack operates at half bandwidth.

If you enter the **switch stack-member-number stack port port-number disable** privileged EXEC command and the stack is in the full-ring state, you can disable only one stack port. This message appears:

```
Enabling/disabling a stack port may cause undesired stack changes. Continue?[confirm]
```

If you enter the **switch stack-member-number stack port port-number disable** privileged EXEC command and the stack is in the partial-ring state, you cannot disable the port. This message appears:

```
Disabling stack port not allowed with current stack configuration.
```

## Examples

This example shows how to disable stack port 2 on member 4:

```
Device# switch 4 stack port 2 disable
```

# switch priority

To change the stack member priority value, use the **switch priority** command in EXEC mode on the active switch.

**switch stack-member-number priority new-priority-value**

## Syntax Description

*stack-member-number* Current stack member number. The range is 1 to 9.

*new-priority-value* New stack member priority value. The range is 1 to 15.

## Command Default

The default priority value is 1.

## Command Modes

User EXEC

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

The new priority value is a factor when a new active switch is elected. When you change the priority value, the active switch is not changed immediately.

## Examples

This example shows how to change the priority value of stack member 6 to 8:

```
Device# switch 6 priority 8
Changing the Switch Priority of Switch Number 6 to 8
Do you want to continue?[confirm]
```

# switch provision

To supply a configuration to a new switch before it joins the switch stack, use the **switch provision** command in global configuration mode on the active switch. To delete all configuration information that is associated with the removed switch (a stack member that has left the stack), use the **no** form of this command.

```
switch stack-member-number provision type
no switch stack-member-number provision
```

## Syntax Description

*stack-member-number* Stack member number. The range is 1 to 9.

*type* Switch type of the new switch before it joins the stack.

## Command Default

The switch is not provisioned.

## Command Modes

Global configuration (config)

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

For *type*, enter the model number of a supported switch that is listed in the command-line help strings.

To avoid receiving an error message, you must remove the specified switch from the switch stack before using the **no** form of this command to delete a provisioned configuration.

To change the switch type, you must also remove the specified switch from the switch stack. You can change the stack member number of a provisioned switch that is physically present in the switch stack if you do not also change the switch type.

If the switch type of the provisioned switch does not match the switch type in the provisioned configuration on the stack, the switch stack applies the default configuration to the provisioned switch and adds it to the stack. The switch stack displays a message when it applies the default configuration.

Provisioned information appears in the running configuration of the switch stack. When you enter the **copy running-config startup-config** privileged EXEC command, the provisioned configuration is saved in the startup configuration file of the switch stack.



### Caution

When you use the **switch provision** command, memory is allocated for the provisioned configuration. When a new switch type is configured, the previously allocated memory is not fully released. Therefore, do not use this command more than approximately 200 times, or the switch will run out of memory and unexpected behavior will result.

## Examples

This example shows how to provision a switch with a stack member number of 2 for the switch stack. The **show running-config** command output shows the interfaces associated with the provisioned switch.

```
Device(config)# switch 2 provision WS-xxxx
Device(config)# end
```

```
Device# show running-config | include switch 2
!
interface GigabitEthernet2/0/1
!
interface GigabitEthernet2/0/2
!
interface GigabitEthernet2/0/3
<output truncated>
```

You also can enter the **show switch** user EXEC command to display the provisioning status of the switch stack.

This example shows how to delete all configuration information about stack member 5 when the switch is removed from the stack:

```
Device(config)# no switch 5 provision
```

You can verify that the provisioned switch is added to or removed from the running configuration by entering the **show running-config** privileged EXEC command.

**switch renumber**

# switch renumber

To change the stack member number, use the **switch renumber** command in EXEC mode on the active switch.

**switch current-stack-member-number renumber new-stack-member-number**

## Syntax Description

*current-stack-member-number* Current stack member number. The range is 1 to 9.

*new-stack-member-number* New stack member number for the stack member. The range is 1 to 9.

## Command Default

The default stack member number is 1.

## Command Modes

User EXEC

Privileged EXEC

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE	This command was introduced.
-----------------------	------------------------------

## Usage Guidelines

If another stack member is already using the member number that you just specified, the active switch assigns the lowest available number when you reload the stack member.



**Note** If you change the number of a stack member, and no configuration is associated with the new stack member number, that stack member loses its current configuration and resets to its default configuration.

Do not use the **switch current-stack-member-number renumber new-stack-member-number** command on a provisioned switch. If you do, the command is rejected.

Use the **reload slot current stack member number** privileged EXEC command to reload the stack member and to apply this configuration change.

## Examples

This example shows how to change the member number of stack member 6 to 7:

```
Device# switch 6 renumber 7
```

```
WARNING:Changing the switch number may result in a configuration change for that switch.  
The interface configuration associated with the old switch number will remain as a provisioned  
configuration.  
Do you want to continue?[confirm]
```

# switch renumber

To change the stack member number, use the **switch renumber** command in EXEC mode on the active switch.

**switch *current-stack-member-number* renumber *new-stack-member-number***

## Syntax Description

*current-stack-member-number* Current stack member number. The range is 1 to 9.

*new-stack-member-number* New stack member number for the stack member. The range is 1 to 9.

## Command Default

The default stack member number is 1.

## Command Modes

User EXEC

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

If another stack member is already using the member number that you just specified, the active switch assigns the lowest available number when you reload the stack member.



**Note** If you change the number of a stack member, and no configuration is associated with the new stack member number, that stack member loses its current configuration and resets to its default configuration.

Do not use the **switch *current-stack-member-number* renumber *new-stack-member-number*** command on a provisioned switch. If you do, the command is rejected.

Use the **reload slot *current stack member number*** privileged EXEC command to reload the stack member and to apply this configuration change.

## Examples

This example shows how to change the member number of stack member 6 to 7:

```
Device# switch 6 renumber 7
```

WARNING:Changing the switch number may result in a configuration change for that switch.  
The interface configuration associated with the old switch number will remain as a provisioned configuration.

Do you want to continue?[confirm]

**switch renumber**

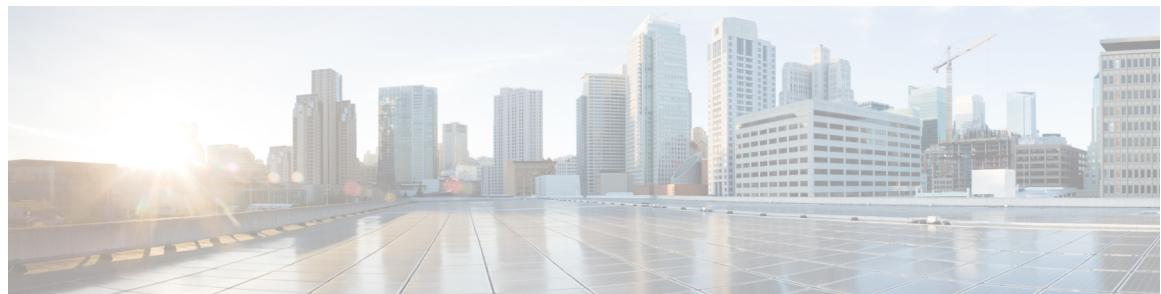


PART **XIV**

## **System Management**

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# System Management Commands

---

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# arp

To display the contents of the Address Resolution Protocol (ARP) table, use the **arp** command in boot loader mode.

**arp [ip\_address]**

<b>Syntax Description</b>	<i>ip_address</i> (Optional) Shows the ARP table or the mapping for a specific IP address.
---------------------------	--

<b>Command Default</b>	No default behavior or values.
------------------------	--------------------------------

<b>Command Modes</b>	Boot loader
----------------------	-------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	The ARP table contains the IP-address-to-MAC-address mappings.
-------------------------	--

<b>Examples</b>	This example shows how to display the ARP table:
-----------------	--

```
Device: arp 172.20.136.8
arp'ing 172.20.136.8...
172.20.136.8 is at 00:1b:78:d1:25:ae, via port 0
```

# boot

To load and boot an executable image and display the command-line interface (CLI), use the **boot** command in boot loader mode.

**boot [-post | -n | -p | flag] filesystem:/file-url...**

<b>Syntax Description</b>	<b>-post</b> (Optional) Run the loaded image with an extended or comprehensive power-on self-test (POST). Using this keyword causes POST to take longer to complete. <b>-n</b> (Optional) Pause for the Cisco IOS Debugger immediately after launching. <b>-p</b> (Optional) Pause for the JTAG Debugger right after loading the image. <b>filesystem:</b> Alias for a file system. Use <b>flash:</b> for the system board flash device; use <b>usbflash0:</b> for USB memory sticks. <b>/file-url</b> Path (directory) and name of a bootable image. Separate image names with a semicolon.
---------------------------	--

<b>Command Default</b>	No default behavior or values.
------------------------	--------------------------------

<b>Command Modes</b>	Boot loader
----------------------	-------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	<p>When you enter the <b>boot</b> command without any arguments, the device attempts to automatically boot the system by using the information in the BOOT environment variable, if any.</p> <p>If you supply an image name for the <i>file-url</i> variable, the <b>boot</b> command attempts to boot the specified image.</p> <p>When you specify boot loader <b>boot</b> command options, they are executed immediately and apply only to the current boot loader session.</p> <p>These settings are not saved for the next boot operation.</p> <p>Filenames and directory names are case sensitive.</p>
-------------------------	---

## Example

This example shows how to boot the device using the *new-image.bin* image:

```
Device: set BOOT flash:/new-images/new-image.bin
Device: boot
```

After entering this command, you are prompted to start the setup program.

# cat

To display the contents of one or more files, use the **cat** command in boot loader mode.

**cat** *filesystem:/file-url...*

## Syntax Description

*filesystem:* Specifies a file system.

*/file-url* Specifies the path (directory) and name of the files to display. Separate each filename with a space.

## Command Default

No default behavior or values.

## Command Modes

Boot loader

## Command History

### Release

### Modification

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

Filenames and directory names are case sensitive.

If you specify a list of files, the contents of each file appears sequentially.

## Examples

This example shows how to display the contents of an image file:

```
Device: cat flash:image_file_name
version_suffix: universal-122-xx.SEx
version_directory: image_file_name
image_system_type_id: 0x00000002
image_name: image_file_name.bin
ios_image_file_size: 8919552
total_image_file_size: 11592192
image_feature: IP|LAYER_3|PLUS|MIN_DRAM_MEG=128
image_family: family
stacking_number: 1.34
board_ids: 0x00000068 0x00000069 0x0000006a 0x0000006b
info_end:
```

# clear location

To clear a specific radio frequency identification (RFID) tag or all of the RFID tags information in the entire database, use the **clear location** command in EXEC mode.

```
clear location [mac-address mac-address | rfid]
```

<b>Syntax Description</b>	<b>mac-address</b> <i>mac-address</i> MAC address of a specific RFID tag. <b>rfid</b> Specifies all of the RFID tags in the database.				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	User EXEC Privileged EXEC				
<b>Command History</b>	<table border="1"><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

This example shows how to clear information about all of the RFID tags in the database:

```
Device> clear location rfid
```

# clear location statistics

To clear radio-frequency identification (RFID) statistics, use the **clear location statistics** command in EXEC mode.

**clear location statistics**

**Syntax Description** This command has no arguments or keywords.

**Command Default** No default behavior or values.

**Command Modes** User EXEC

Privileged EXEC

**Command History**

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

The following is sample output from the **clear location rfid** command and shows how to clear RFID statistics:

```
Device> clear location statistics
```

# copy

To copy a file from a source to a destination, use the **copy** command in boot loader mode.

**copy** *filesystem:/source-file-url filesystem:/destination-file-url*

## Syntax Description

*filesystem:* Alias for a file system. Use **usbflash0:** for USB memory sticks.

*/source-file-url* Path (directory) and filename (source) to be copied.

*/destination-file-url* Path (directory) and filename of the destination.

## Command Default

No default behavior or values.

## Command Modes

Boot loader

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

Filenames and directory names are case sensitive.

Directory names are limited to 127 characters between the slashes (/); the name cannot contain control characters, spaces, deletes, slashes, quotes, semicolons, or colons.

Filenames are limited to 127 characters; the name cannot contain control characters, spaces, deletes, slashes, quotes, semicolons, or colons.

If you are copying a file to a new directory, the directory must already exist.

## Examples

This example shows how to copy a file at the root:

```
Device: copy usbflash0:test1.text usbflash0:test4.text
File "usbflash0:test1.text" successfully copied to "usbflash0:test4.text"
```

You can verify that the file was copied by entering the **dir** *filesystem:* boot loader command.

**copy startup-config tftp:**

## copy startup-config tftp:

To copy the configuration settings from a switch to a TFTP server, use the **copy startup-config tftp:** command in Privileged EXEC mode.

**copy startup-config tftp:** *remote host {ip-address}/{name}*

<b>Syntax Description</b>	<i>remote host {ip-address}/{name}</i> Host name or IP-address of Remote host.
---------------------------	--

<b>Command Default</b>	No default behavior or values.
------------------------	--------------------------------

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Release 16.1	This command was introduced.

<b>Usage Guidelines</b>	To copy your current configurations from the switch, run the command <b>copy startup-config tftp:</b> and follow the instructions. The configurations are copied onto the TFTP server.  Then, login to another switch and run the command <b>copy tftp: startup-config</b> and follow the instructions. The configurations are now copied onto the other switch.
-------------------------	--

<b>Examples</b>	This example shows how to copy the configuration settings onto a TFTP server:
-----------------	---

```
Device: copy startup-config tftp:
Address or name of remote host []?
```

# copy tftp: startup-config

To copy the configuration settings from a TFTP server onto a new switch, use the **copy tftp: startup-config** command in Privileged EXEC mode on the new switch.

**copy tftp: startup-config** *remote host {ip-address}/{name}*

<b>Syntax Description</b>	<i>remote host {ip-address}/{name}</i> Host name or IP-address of Remote host.
---------------------------	--

<b>Command Default</b>	No default behavior or values.
------------------------	--------------------------------

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Release 16.1	This command was introduced.

<b>Usage Guidelines</b>	After the configurations are copied, to save your configurations, use <b>write memory</b> command and then either reload the switch or run the <b>copy startup-config running-config</b> command.
-------------------------	---

<b>Examples</b>	This example shows how to copy the configuration settings from the TFTP server onto a switch:
-----------------	---

```
Device: copy tftp: startup-config
Address or name of remote host []?
```

**debug platform condition feature multicast controlplane**

# debug platform condition feature multicast controlplane

To enable radioactive tracing for the Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) snooping features, use the **debug platform condition feature multicast controlplane** command in privileged EXEC mode. To disable radioactive tracing, use the **no** form of this command.

```
debug platform condition feature multicast controlplane {{igmp-debug | pim} group-ip {ipv4 address / ipv6 address} | {mld-snooping | igmp-snooping} mac mac-address ip {ipv4 address / ipv6 address} vlan vlan-id } level {debug | error | info | verbose | warning}
no debug platform condition feature multicast controlplane {{igmp-debug | pim} group-ip {ipv4 address / ipv6 address} | {mld-snooping | igmp-snooping} mac mac-address ip {ipv4 address / ipv6 address} vlan vlan-id } level {debug | error | info | verbose | warning}
```

<b>Syntax Description</b>	<b>igmp-debug</b>	Enables IGMP control radioactive tracing.
	<b>pim</b>	Enables Protocol Independent Multicast (PIM) control radioactive tracing.
	<b>mld-snooping</b>	Enables MLD snooping control radioactive tracing.
	<b>igmp-snooping</b>	Enables IGMP snooping control radioactive tracing.
	<b>mac mac-address</b>	MAC address of the receiver.
	<b>group-ip {ipv4 address / ipv6 address}</b>	IPv4 or IPv6 address of the igmp-debug or pim group.
	<b>ip {ipv4 address / ipv6 address}</b>	IPv4 or IPv6 address of the mld-snooping or igmp-snooping group.
	<b>vlan vlan-id</b>	VLAN ID. The range is from 1 to 4094.
	<b>level</b>	Enables debug severity levels.
	<b>debug</b>	Enables debugging level.
	<b>error</b>	Enables error debugging.
	<b>info</b>	Enables information debugging.
	<b>verbose</b>	Enables detailed debugging.
	<b>warning</b>	Enables warning debugging.

**Command Modes** Privileged EXEC (#)

**Command History****Release****Modification**

Cisco IOS XE Gibraltar 16.11.1 This command was introduced.

The following example shows how to enable radioactive tracing for IGMP snooping:

```
Device# debug platform condition feature multicast controlplane igmp-snooping mac
000a.f330.344a ip 10.1.1.10 vlan 550 level warning
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>clear debug platform condition all</b>	Removes the debug conditions applied to a platform.
<b>debug platform condition</b>	Filters debugging output for <b>debug</b> commands on the basis of specified conditions.
<b>debug platform condition start</b>	Starts conditional debugging on a system.
<b>debug platform condition stop</b>	Stops conditional debugging on a system.
<b>show platform condition</b>	Displays the currently active debug configuration.

**debug platform condition mac**

# debug platform condition mac

To enable radioactive tracing for MAC learning, use the **debug platform condition mac** command in privileged EXEC mode. To disable radioactive tracing for MAC learning, use the **no** form of this command.

```
debug platform condition mac {mac-address {control-plane | egress | ingress} | access-list access-list name {egress | ingress}}
no debug platform condition mac {mac-address {control-plane | egress | ingress} | access-list access-list name {egress | ingress}}
```

<b>Syntax Description</b>	<b>mac mac-address</b> <b>access-list access-list name</b> <b>control-plane</b> <b>egress</b> <b>ingress</b>	Filters output on the basis of the specified MAC address. Filters output on the basis of the specified access list. Displays messages about the control plane routines. Filters output on the basis of outgoing packets. Filters output on the basis of incoming packets.
---------------------------	--	---

<b>Command Modes</b>	Privileged EXEC (#)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

The following example shows how to filter debugging output on the basis of a MAC address:

```
Device# debug platform condition mac bc16.6509.3314 ingress
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>show platform condition</b>	Displays the currently active debug configuration.
	<b>debug platform condition</b>	Filters debugging output for <b>debug</b> commands on the basis of specified conditions.
	<b>debug platform condition start</b>	Starts conditional debugging on a system.
	<b>debug platform condition stop</b>	Stops conditional debugging on a system.
	<b>clear debug platform condition all</b>	Removes the debug conditions applied to a platform.

# debug platform rep

To enable debugging of Resilient Ethernet Protocol (REP) functions, use the **debug platform rep** command in privileged EXEC mode. To remove the specified condition, use the **no** form of this command.

```
debug platform rep {all | error | event | packet | verbose}
no debug platform rep {all | error | event | packet | verbose}
```

## Syntax Description

<b>all</b>	Enables all REP debugging functions.
<b>error</b>	Enables REP error debugging.
<b>event</b>	Enables REP event debugging.
<b>packet</b>	Enables REP packet debugging.
<b>verbose</b>	Enables REP verbose debugging.

## Command Modes

Privileged EXEC (#)

## Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

The following example shows how to enable debugging for all functions:

```
Device# debug platform rep all

debug platform rep verbose debugging is on
debug platform rep control pkt handle debugging is on
debug platform rep error debugging is on
debug platform rep event debugging is on
```

## Related Commands

Command	Description
<b>show platform condition</b>	Displays the currently active debug configuration.
<b>debug platform condition</b>	Filters debugging output for <b>debug</b> commands on the basis of specified conditions.
<b>debug platform condition start</b>	Starts conditional debugging on a system.
<b>debug platform condition stop</b>	Stops conditional debugging on a system.
<b>clear debug platform condition all</b>	Removes the debug conditions applied to a platform.

**debug voice diagnostics mac-address**

## debug voice diagnostics mac-address

To enable debugging of voice diagnostics for voice clients, use the **debug voice diagnostics mac-address** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

```
debug voice diagnostics mac-address mac-address1 verbose mac-address2 verbose
nodebug voice diagnostics mac-address mac-address1 verbose mac-address2 verbose
```

<b>Syntax Description</b>	<b>voice diagnostics</b> Configures voice debugging for voice clients. <b>mac-address</b> <i>mac-address1 mac-address2</i> Specifies MAC addresses of the voice clients. <b>verbose</b> Enables verbose mode for voice diagnostics.				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

The following is sample output from the **debug voice diagnostics mac-address** command and shows how to enable debugging of voice diagnostics for voice client with MAC address of 00:1f:ca:cf:b6:60:

```
Device# debug voice diagnostics mac-address 00:1f:ca:cf:b6:60
```

# delete

To delete one or more files from the specified file system, use the **delete** command in boot loader mode.

**delete** *filesystem:/file-url...*

## Syntax Description

*filesystem*: Alias for a file system. Use **usbflash0**: for USB memory sticks.

*/file-url...* Path (directory) and filename to delete. Separate each filename with a space.

## Command Default

No default behavior or values.

## Command Modes

Boot loader

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

Filenames and directory names are case sensitive.

The device prompts you for confirmation before deleting each file.

## Examples

This example shows how to delete two files:

```
Device: delete usbflash0:test2.text usbflash0:test5.text
Are you sure you want to delete "usbflash0:test2.text" (y/n)?y
File "usbflash0:test2.text" deleted
Are you sure you want to delete "usbflash0:test5.text" (y/n)?y
File "usbflash0:test2.text" deleted
```

You can verify that the files were deleted by entering the **dir usbflash0**: boot loader command.

# dir

To display the list of files and directories on the specified file system, use the **dir** command in boot loader mode.

**dir** *filesystem:/file-url*

## Syntax Description

*filesystem*: Alias for a file system. Use **flash:** for the system board flash device; use **usbflash0:** for USB memory sticks.

*/file-url* (Optional) Path (directory) and directory name that contain the contents you want to display. Separate each directory name with a space.

## Command Default

No default behavior or values.

## Command Modes

Boot Loader

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

Directory names are case sensitive.

## Examples

This example shows how to display the files in flash memory:

```
Device: dir flash:
Directory of flash:/
      2 -rwx        561  Mar  01 2013 00:48:15  express_setup.debug
      3 -rwx     2160256  Mar  01 2013 04:18:48  c2960x-dmon-mz-150-2r.EX
      4 -rwx       1048  Mar  01 2013 00:01:39  multiple-fs
      6 drwx       512  Mar  01 2013 23:11:42  c2960x-universalk9-mz.150-2.EX
    645 drwx       512  Mar  01 2013 00:01:11  dc_profile_dir
    647 -rwx      4316  Mar  01 2013 01:14:05  config.text
    648 -rwx         5  Mar  01 2013 00:01:39  private-config.text

96453632 bytes available (25732096 bytes used)
```

**Table 66: dir Field Descriptions**

Field	Description
2	Index number of the file.
-rwx	File permission, which can be any or all of the following: <ul style="list-style-type: none"> <li>• d—directory</li> <li>• r—readable</li> <li>• w—writable</li> <li>• x—executable</li> </ul>

Field	Description
1644045	Size of the file.
<date>	Last modification date.
env_vars	Filename.

# emergency-install

To perform an emergency installation on your system, use the **emergency-install** command in boot loader mode.

**emergency-install** *url://<url>*

<b>Syntax Description</b>	<i>&lt;url&gt;</i> URL and name of the file containing the emergency installation bundle image.
---------------------------	---

<b>Command Default</b>	No default behavior or values.
------------------------	--------------------------------

<b>Command Modes</b>	Boot loader
----------------------	-------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	The boot flash is erased during the installation operation.
-------------------------	---

## Example

This example shows how to perform the emergency install operation using the contents of an image file:

```
Device: emergency-install tftp:<url>
The bootflash will be erased during install operation, continue (y/n)?y
Starting emergency recovery (tftp:<url> ...
Reading full image into memory.....done
Nova Bundle Image
-----
Kernel Address      : 0x6042d5c8
Kernel Size         : 0x317ccc/3243212
Initramfs Address  : 0x60745294
Initramfs Size     : 0xdc6774/14444404
Compression Format: .mzip

Bootable image at @ ram:0x6042d5c8
Bootable image segment 0 address range [0x81100000, 0x81b80000] is in range
[0x80180000, 0x90000000].
@oooooooooooooooooooooooooooooooooooooooooooo
File "sda9:c3850-recovery.bin" uncompressed and installed, entry point: 0x811060f0
Loading Linux kernel with entry point 0x811060f0 ...
Bootloader: Done loading app on core_mask: 0xf

### Launching Linux Kernel (flags = 0x5)

\

Initiating Emergency Installation of bundle
tftp:<url>

\

Downloading bundle tftp:<url>...
```

```
Validating bundle tftp:<url>...
Installing bundle tftp:<url>...
Verifying bundle tftp:<url>...
Package cat3k_caa-base.SPA.03.02.00SE.pkg is Digitally Signed
Package cat3k_caa-drivers.SPA.03.02.00.SE.pkg is Digitally Signed
Package cat3k_caa-infra.SPA.03.02.00SE.pkg is Digitally Signed
Package cat3k_caa-iosd-universalk9.SPA.150-1.EX.pkg is Digitally Signed
Package cat3k_caa-platform.SPA.03.02.00.SE.pkg is Digitally Signed
Package cat3k_caa-wcm.SPA.10.0.100.0.pkg is Digitally Signed
Preparing flash...
Syncing device...
Emergency Install successful... Rebooting
Restarting system.\ufffd
```

```
Booting...(use DDR clock 667 MHz) Initializing and Testing RAM
+++@@@@####...++@@++@@++@@++@@++@@++@@done.
Memory Test Pass!
```

```
Base ethernet MAC Address: 20:37:06:ce:25:80
Initializing Flash...
```

```
flashfs[7]: 0 files, 1 directories
flashfs[7]: 0 orphaned files, 0 orphaned directories
flashfs[7]: Total bytes: 6784000
flashfs[7]: Bytes used: 1024
flashfs[7]: Bytes available: 6782976
flashfs[7]: flashfs fsck took 1 seconds....done Initializing Flash.
```

```
The system is not configured to boot automatically. The
following command will finish loading the operating system
software:
```

```
boot
```

**exit**

# exit

To return to the previous mode or exit from the CLI EXEC mode, use the **exit** command.

## exit

**Syntax Description** This command has no arguments or keywords.

**Command Default** No default behavior or values.

**Command Modes** Privileged EXEC

Global configuration

**Command History**

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

This example shows how to exit the configuration mode:

```
Device(config)# exit  
Device#
```

# factory-reset

To remove all the customer specific data that has been added on the device since the time of shipping from the factory, use the **factory-reset** command in the Privileged EXEC mode.

**factory-reset {all | config | boot-vars}**

Syntax Description	<b>all</b>	Removes all the data from the device, including configuration data, crash information, log files, boot variables, core files, IOS images including the current boot image.
	<b>config</b>	Removes all the configuration data, including user data, startup, and running configuration.
	<b>boot-vars</b>	Resets boot variables.

**Command Default** There are no defaults for this command.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	Cisco IOS XE 16.6.1	This command was introduced.

**Usage Guidelines** No system configuration is required to use the **factory-reset** command. Use the command with all options enabled.

The **factory-reset** command erases IOS images, boot variables, configuration data and all user data. Data can be in the form of configuration, log files, boot variables, and core files.

The system reloads to perform the factory reset and boots into ROMMON mode.

After the **factory reset** command is executed, you can load the IOS image from ROMMON using USB or TFTP.



**Note** Do not unplug the power or interrupt the factory reset operation.

This command is used in the following two scenarios:

- Return Material Authorization (RMA) for a device: If you have to return a device to Cisco for RMA, remove all customer-specific data before obtaining a RMA certificate for the device.
- Recovering the compromised device: If the key material or credentials stored on a device is compromised, reset the device to factory configuration and then reconfigure the device.

# flash\_init

To initialize the flash: file system, use the **flash\_init** command in boot loader mode.

## flash\_init

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Default</b>	The flash: file system is automatically initialized during normal system operation.
------------------------	---

<b>Command Modes</b>	Boot loader
----------------------	-------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	During the normal boot process, the flash: file system is automatically initialized.
-------------------------	--

Use this command to manually initialize the flash: file system. For example, you use this command during the recovery procedure for a lost or forgotten password.

# help

To display the available commands, use the **help** command in boot loader mode.

## help

**Syntax Description** This command has no arguments or keywords.

**Command Default** No default behavior or values.

**Command Modes** Boot loader

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

## Example

This example shows how to display a list of available boot loader commands:

```
Device:help
? -- Present list of available commands
arp -- Show arp table or arp-resolve an address
boot -- Load and boot an executable image
cat -- Concatenate (type) file(s)
copy -- Copy a file
delete -- Delete file(s)
dir -- List files in directories
emergency-install -- Initiate Disaster Recovery
...
...
...
unset -- Unset one or more environment variables
version -- Display boot loader version
```

# install

To install Software Maintenance Upgrade (SMU) packages, use the **install** command in privileged EXEC mode.

```
install {abort | activate | file {bootflash: | flash: | harddisk: | webui:} [{auto-abort-timer timer
prompt-level {all | none}}] | add file {bootflash: | flash: | ftp: | harddisk: | http: | https: | pram: |
rep: | scp: | tftp: | webui:} [{activate [{auto-abort-timer timer prompt-level {all | none}}commit]}]
| commit | auto-abort-timer stop | deactivate file {bootflash: | flash: | harddisk: | webui:} | label
id{description description | label-name name} | remove {file {bootflash: | flash: | harddisk: | webui:}
| inactive } | rollback to {base | committed | id {install-ID } | label {label-name}}}
```

Syntax Description		
<b>abort</b>		Terminates the current install operation.
<b>activate</b>		Validates whether the SMU is added through the <b>install add</b> command.  This keyword runs a compatibility check, updates package status, and if the package can be restarted, it triggers post-install scripts to restart the necessary processes, or triggers a reload for non-restartable packages.
<b>file</b>		Specifies the package to be activated.
{bootflash:   flash:   harddisk:   webui:}		Specifies the location of the installed package.
<b>auto-abort-timer timer</b>		(Optional) Installs an automatic timer to terminate the installation.
<b>prompt-level {all   none}</b>		(Optional) Prompts the user about installation activities.  For example, the <b>activate</b> keyword, automatically triggers a reload for packages that require a reload. Before activating the package, a message will prompt users as to whether they want to continue.  The <b>all</b> keyword allows you to enable prompts. The <b>none</b> keyword disables prompts.
<b>add</b>		Copies files from a remote location (via FTP, TFTP) to a device and performs Software Maintenance Upgrade (SMU) compatibility check for the platform and image versions.  This keyword runs base compatibility checks to ensure that a specified package is supported on a platform. It also adds an entry in the package file, so that the status can be monitored and maintained.
{ bootflash:   flash:   ftp:   harddisk:   http:   https:   pram:   rep:   scp:   tftp:   webui:}		Specifies the package to be added.

<b>commit</b>	Makes SMU changes persistent over reloads.  You can do a commit after activating a package, while the system is up, or after the first reload. If a package is activated, but not committed, it remains active after the first reload, but not after the second reload.
<b>auto-abort-timer stop</b>	Stops the automatic timer for installation.
<b>deactivate</b>	Deactivates an installed package.  Deactivating a package also updates the package status and triggers a process restart or a reload.
<b>label <i>id</i></b>	Specifies the id of the install point to label.
<b>description</b>	Adds a description to specified install point.
<b>label-name <i>name</i></b>	Adds a description to specified install point.
<b>remove</b>	Remove installed packages.  The package file is removed from the file system. The <b>remove</b> keyword can only be used on packages that are currently inactive.
<b>inactive</b>	Removes all inactive packages from the device.
<b>rollback</b>	Rollbacks the data model interface (DMI) package (DMP) SMU to the base version, the last committed version, or a known commit ID.
<b>to base</b>	Returns to the base image.
<b>committed</b>	Returns to the installation state when the last commit operation was performed.
<b>id <i>install-ID</i></b>	Returns to the specific install point ID. Valid values are from 1 to 4294967295.

**Command Default** Packages are not installed.

**Command Modes** Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
Cisco IOS XE Everest 16.6.1	This command was introduced.	

**Usage Guidelines** An SMU is a package that can be installed on a system to provide a patch fix or security resolution to a released image. This package contain a minimal set of files for patching the release along with some metadata that describes the contents of the package.

Packages must be added prior to activating the SMU.

A package must be deactivated, before it is removed from the bootflash. A removed package must be added again.

### Example

The following example shows how to add an install package on a device:

```
Device# install add file tftp://172.16.0.1/tftpboot/folder1/cat3k-
universalk9.2017-01-10_13.15.1.CSCxxxxxx.SSA.dmp.bin

install_add: START Sun Feb 26 05:57:04 UTC 2017
Downloading file tftp://172.16.0.1/tftpboot/folder1/cat3k-universalk9.2017-01-10_13.15.1.
CSCvb12345.SSA.dmp.bin
Finished downloading file
tftp://172.16.0.1/tftpboot/folder1/cat3k-universalk9.2017-01-10_13.15.1.
CSCxxxxxx.SSA.dmp.bin to
bootflash:cat3k-universalk9.2017-01-10_13.15.1.CSCxxxxxx.SSA.dmp.bin
SUCCESS: install_add /bootflash/cat3k-universalk9.2017-01-10_13.15.1.CSCxxxxxx.SSA.dmp.bin

Sun Feb 26 05:57:22 UTC 2017
```

The following example shows how to activate an install package:

```
Device# install activate file bootflash:cat3k-universalk9.2017-01-10_13.15.1.
CSCxxxxxx.SSA.dmp.bin

install_activate: START Sun Feb 26 05:58:41 UTC 2017
DMP package.
Netconf processes stopped
SUCCESS: install_activate
/bootflash/cat3k-universalk9.2017-01-10_13.15.1.CSCxxxxxx.SSA.dmp.bin
Sun Feb 26 05:58:58 UTC 2017
*Feb 26 05:58:47.655: %DMI-4-CONTROL_SOCKET_CLOSED: SIP0: nesd:
Confd control socket closed Lost connection to Confd (45): EOF on socket to Confd.
*Feb 26 05:58:47.661: %DMI-4-SUB_READ_FAIL: SIP0: vtyserverutild:
Confd subscription socket read failed Lost connection to Confd (45):
EOF on socket to Confd.
*Feb 26 05:58:47.667: %DMI-4-CONTROL_SOCKET_CLOSED: SIP0: syncfd:
Confd control socket closed Lost connection to Confd (45): EOF on socket to Confd.
*Feb 26 05:59:43.269: %DMI-5-SYNC_START: SIP0: syncfd:
External change to running configuration detected.
The running configuration will be synchronized to the NETCONF running data store.
*Feb 26 05:59:44.624: %DMI-5-SYNC_COMPLETE: SIP0: syncfd:
The running configuration has been synchronized to the NETCONF running data store.
```

The following example shows how to commit an installed package:

```
Device# install commit

install_commit: START Sun Feb 26 06:46:48 UTC 2017
SUCCESS: install_commit Sun Feb 26 06:46:52 UTC 2017
```

The following example shows how to rollback to the base SMU package:

```
Device# install rollback to base

install_rollback: START Sun Feb 26 06:50:29 UTC 2017
7 install_rollback: Restarting impacted processes to take effect
7 install_rollback: restarting confd

*Feb 26 06:50:34.957: %DMI-4-CONTROL_SOCKET_CLOSED: SIP0: syncfd:
```

```
Confd control socket closed Lost connection to Confd (45): EOF on socket to Confd.  
*Feb 26 06:50:34.962: %DMI-4-CONTROL_SOCKET_CLOSED: SIP0: nesd:  
Confd control socket closed Lost connection to Confd (45): EOF on socket to Confd.  
*Feb 26 06:50:34.963: %DMI-4-SUB_READ_FAIL: SIP0: vtyserverutild:  
Confd subscription socket read failed Lost connection to Confd (45):  
EOF on socket to Confd.Netconf processes stopped  
7 install_rollback: DMP activate complete  
SUCCESS: install_rollback Sun Feb 26 06:50:41 UTC 2017  
*Feb 26 06:51:28.901: %DMI-5-SYNC_START: SIP0: syncfd:  
External change to running configuration detected.  
The running configuration will be synchronized to the NETCONF running data store.  
*Feb 26 06:51:30.339: %DMI-5-SYNC_COMPLETE: SIP0: syncfd:  
The running configuration has been synchronized to the NETCONF running data store.
```

**Related Commands**

Command	Description
<b>show install</b>	Displays information about install packages.

# I2 traceroute

To enable the Layer 2 traceroute server, use the **I2 traceroute** command in global configuration mode. Use the **no** form of this command to disable the Layer 2 traceroute server.

**I2 traceroute**  
**no I2 traceroute**

<b>Syntax Description</b>	This command has no arguments or keywords.	
<b>Command Modes</b>	Global configuration (config#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	The command was introduced.

<b>Usage Guidelines</b>	Layer 2 traceroute is enabled by default and opens a listening socket on User Datagram Protocol (UDP) port 2228. To close the UDP port 2228 and disable Layer 2 traceroute, use the <b>no I2 traceroute</b> command in global configuration mode.
-------------------------	---

The following example shows how to configure Layer 2 traceroute using the **I2 traceroute** command.

```
Device# configure terminal
Device(config)# I2 traceroute
```

# license boot level

To boot a new software license on the device, use the **license boot level** command in global configuration mode. Use the **no** form of this command to remove all software licenses from the device.

**license boot level *base-license-level* *addon* *addon-license-level***  
**no license boot level**

## Syntax Description

*base-license-level* Level at which the switch is booted, for example, **ipservice**

Base licenses that are available are:

- LAN Base
- IP Base
- IP Service

*addon-license-level* Additional licenses that can be subscribed for a fixed term of three, five, or seven years.

Add-on licenses that are available are:

- Digital Networking Architecture (DNA) Essentials
- DNA Advantage (includes DNA Essentials)

## Command Default

The switch boots the configured image.

## Command Modes

Global configuration (config)

## Command History

Release	Modification
Cisco IOS XE Fuji 16.9.1	This command was introduced.

## Usage Guidelines

Use the **license boot level** command for these purposes:

- Downgrade or upgrade licenses
- Enable or disable an evaluation or extension license
- Clear an upgrade license

This command forces the licensing infrastructure to boot the configured license level instead of the license hierarchy maintained by the licensing infrastructure for a given module:

- When the switch reloads, the licensing infrastructure checks the configuration in the startup configuration for licenses, if any. If there is a license in the configuration, the switch boots with that license. If there is no license, the licensing infrastructure follows the image hierarchy to check for licenses.
- If the forced boot evaluation license expires, the licensing infrastructure follows the regular hierarchy to check for licenses.

**license boot level**

- If the configured boot license has already expired, the licensing infrastructure follows the hierarchy to check for licenses.

**Examples**

The following example shows how to activate the *ipbase* license on a switch at the next reload:

```
Device(config)# license boot level ipbase
```

# license smart conversion start

To migrate all the installed traditional licenses from the device to Cisco Smart Software Manager (CSSM), use the **license smart conversion start** command in privileged EXEC mode.

## license smart conversion start

**Syntax Description** This command has no arguments or keywords.

**Command Default** Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Fuji 16.9.1	This command was introduced.

**Usage Guidelines** On executing the **license smart conversion start** command, the device converts the traditional license and sends the migration data to CSSM. CSSM creates license entitlements, which is deposited in the user account.



**Note** License conversion takes an hour or more to complete.

**Examples** The following shows how to start license conversion:

```
Device# license smart conversion start
```

Related Commands	Command	Description
	<b>license smart conversion stop</b>	Cancels license conversion
	<b>show license status</b>	Displays compliance status of a license.
	<b>show license usage</b>	Displays license usage information

# license smart conversion stop

To cancel license conversion if network failure occurs, use the **license smart conversion stop** command in privileged EXEC mode.

## **license smart conversion stop**

**Syntax Description** This command has no arguments or keywords.

**Command Default** Privileged EXEC (#)

**Command History**

Release	Modification
Cisco IOS XE Fuji 16.9.1	This command was introduced.

## Example

This example shows how to stop license conversion:

```
Device# license smart conversion stop
Some Smart Licensing Conversion jobs stopped successfully.
```

**Related Commands**

Command	Description
<b>license smart conversion start</b>	Starts license conversion
<b>show license status</b>	Displays compliance status of a license.
<b>show license usage</b>	Displays license usage information

# license smart deregister

To cancel device registration from Cisco Smart Software Manager (CSSM), use the **license smart deregister** command in privileged EXEC mode.

## license smart deregister

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Default</b>	Privileged EXEC (#)
------------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Fuji 16.9.1	This command was introduced.

<b>Usage Guidelines</b>	Use the <b>license smart deregister</b> command for these purposes:
	<ul style="list-style-type: none"> <li>• When your device is taken off the inventory</li> <li>• When your device is shipped elsewhere for redeployment</li> <li>• When your device is returned to Cisco for replacement using the return merchandise authorization (RMA) process</li> </ul>

## Example

This example shows how to deregister a device from CSSM:

```
Device# license smart deregister
*Jun 25 00:20:13.291 PDT: %SMART_LIC-6-AGENT_DEREG_SUCCESS: Smart Agent for Licensing
De-registration with the Cisco Smart Software Manager or satellite was successful
*Jun 25 00:20:13.291 PDT: %SMART_LIC-5-EVAL_START: Entering evaluation period
*Jun 25 00:20:13.291 PDT: %SMART_LIC-6-EXPORT_CONTROLLED: Usage of export controlled features
is Not Allowed for udi PID:ISR4461/K9,SN:FDO2213A0GL
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>license smart register idtoken</b>	Registers a device in CSSM.
	<b>show license all</b>	Displays entitlements information.
	<b>show license status</b>	Displays compliance status of a license.
	<b>show license summary</b>	Displays summary of all active licenses.
	<b>show license usage</b>	Displays license usage information

# license smart register idtoken

To register a device with the token generated from Cisco Smart Software Manager (CSSM), use the **license smart register idtoken** command in privileged EXEC mode.

**license smart register idtoken *token\_ID* {force}**

<b>Syntax Description</b>	<i>token_ID</i>	Device with the token generated from CSSM.
	<b>force</b>	Forcefully registers your device irrespective of whether the device is registered or not.
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Fuji 16.9.1	This command was introduced.

## Example

This example shows how to register a device on CSSM:

```
Device# license smart register idtoken
$Tl4UytrNxBzbEs1ck8veUtWaG5abnZJOFdDa1FwbVRa%0Ab1RMbz0%3D%0A
Registration process is in progress. Use the 'show license status' command to check the
progress and result
Device#% Generating 2048 bit RSA keys, keys will be exportable...
[OK] (elapsed time was 0 seconds)
```

Related Commands	Command	Description
	<b>license smart deregister</b>	Cancels the device registration from CSSM.
	<b>show license all</b>	Displays entitlements information.
	<b>show license status</b>	Displays compliance status of a license.
	<b>show license summary</b>	Displays summary of all active licenses.
	<b>show license usage</b>	Displays license usage information

# license smart renew

To manually renew your device's ID or authorization with Cisco Smart Software Manager (CSSM), use the **license smart renew** command in privileged EXEC mode.

**license smart renew {auth | id}**

<b>Syntax Description</b>	<b>auth</b>	Renews your authorization.
	<b>id</b>	Renews your ID.
<b>Command Default</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Fuji 16.9.1	This command was introduced.

**Usage Guidelines** Authorization periods are renewed by the smart licensing system every 30 days. As long as the license is in an *Authorized* or *Out of compliance* state, the authorization period is renewed. The grace period starts when an authorization period expires. During the grace period or when the license is in the *Expired* state, the system continues to try and renew the authorization period. If a retry is successful, a new authorization period starts.

## Example

This example shows how to renew a device license:

```
Device# license smart renew auth
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>show license all</b>	Displays entitlements information.
	<b>show license status</b>	Displays compliance status of a license.
	<b>show license usage</b>	Displays license usage information

# location

To configure location information for an endpoint, use the **location** command in global configuration mode. To remove the location information, use the **no** form of this command.

```
location {admin-tag string | civic-location identifier {hostid} | civic-location identifier {hostid} | elin-location {string | identifier id} | geo-location identifier {hostid} | prefer{ cdp weight priority-value | llldp-med weight priority-value | static config weight priority-value}
no location {admin-tag string | civic-location identifier {hostid} | civic-location identifier {hostid} | elin-location {string | identifier id} | geo-location identifier {hostid} | prefer{ cdp weight priority-value | llldp-med weight priority-value | static config weight priority-value}
```

<b>Syntax Description</b>	<table border="0"> <tr> <td><b>admin-tag</b><i>string</i></td><td>Configures administrative tag or site information. Site or location information in alphanumeric format.</td></tr> <tr> <td><b>civic-location</b></td><td>Configures civic location information.</td></tr> <tr> <td><b>identifier</b></td><td>Specifies the name of the civic location, emergency, or geographical location.</td></tr> <tr> <td><b>host</b></td><td>Defines the host civic or geo-spatial location.</td></tr> <tr> <td><i>id</i></td><td>Name of the civic, emergency, or geographical location.</td></tr> <tr> <td><b>elin-location</b></td><td>Configures emergency location information (ELIN).</td></tr> <tr> <td><b>geo-location</b></td><td>Configures geo-spatial location information.</td></tr> <tr> <td><b>prefer</b></td><td>Sets location information source priority.</td></tr> </table>	<b>admin-tag</b> <i>string</i>	Configures administrative tag or site information. Site or location information in alphanumeric format.	<b>civic-location</b>	Configures civic location information.	<b>identifier</b>	Specifies the name of the civic location, emergency, or geographical location.	<b>host</b>	Defines the host civic or geo-spatial location.	<i>id</i>	Name of the civic, emergency, or geographical location.	<b>elin-location</b>	Configures emergency location information (ELIN).	<b>geo-location</b>	Configures geo-spatial location information.	<b>prefer</b>	Sets location information source priority.
<b>admin-tag</b> <i>string</i>	Configures administrative tag or site information. Site or location information in alphanumeric format.																
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<b>geo-location</b>	Configures geo-spatial location information.																
<b>prefer</b>	Sets location information source priority.																
<b>Command Default</b>	No default behavior or values.																
<b>Command Modes</b>	Global configuration																
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<b>Release</b>	<b>Modification</b>																
Cisco IOS XE 3.2SE	This command was introduced.																

**Usage Guidelines** After entering the **location civic-location identifier** global configuration command, you enter civic location configuration mode. After entering the **location geo-location identifier** global configuration command, you enter geo location configuration mode.

The civic-location identifier must not exceed 250 bytes.

The host identifier configures the host civic or geo-spatial location. If the identifier is not a host, the identifier only defines a civic location or geo-spatial template that can be referenced on the interface.

The **host** keyword defines the device location. The civic location options available for configuration using the **identifier** and the **host** keyword are the same. You can specify the following civic location options in civic location configuration mode:

- **additional-code**—Sets an additional civic location code.
- **additional-location-information**—Sets additional civic location information.
- **branch-road-name**—Sets the branch road name.
- **building**—Sets building information.
- **city**—Sets the city name.
- **country**—Sets the two-letter ISO 3166 country code.
- **county**—Sets the county name.
- **default**—Sets a command to its defaults.
- **division**—Sets the city division name.
- **exit**—Exits from the civic location configuration mode.
- **floor**—Sets the floor number.
- **landmark**—Sets landmark information.
- **leading-street-dir**—Sets the leading street direction.
- **name**—Sets the resident name.
- **neighborhood**—Sets neighborhood information.
- **no**—Negates the specified civic location data and sets the default value.
- **number**—Sets the street number.
- **post-office-box**—Sets the post office box.
- **postal-code**—Sets the postal code.
- **postal-community-name**—Sets the postal community name.
- **primary-road-name**—Sets the primary road name.
- **road-section**—Sets the road section.
- **room**—Sets room information.
- **seat**—Sets seat information.
- **state**—Sets the state name.
- **street-group**—Sets the street group.
- **street-name-postmodifier**—Sets the street name postmodifier.
- **street-name-premodifier**—Sets the street name premodifier.
- **street-number-suffix**—Sets the street number suffix.
- **street-suffix**—Sets the street suffix.
- **sub-branch-road-name**—Sets the sub-branch road name.
- **trailing-street-suffix**—Sets the trailing street suffix.
- **type-of-place**—Sets the type of place.
- **unit**—Sets the unit.

You can specify the following geo-spatial location information in geo-location configuration mode:

- **altitude**—Sets altitude information in units of floor, meters, or feet.
- **latitude**—Sets latitude information in degrees, minutes, and seconds. The range is from -90 degrees to 90 degrees. Positive numbers indicate locations north of the equator.

- **longitude**—Sets longitude information in degrees, minutes, and seconds. The range is from -180 degrees to 180 degrees. Positive numbers indicate locations east of the prime meridian.
- **resolution**—Sets the resolution for latitude and longitude. If the resolution value is not specified, default value of 10 meters is applied to latitude and longitude resolution parameters. For latitude and longitude, the resolution unit is measured in meters. The resolution value can also be a fraction.
- **default**—Sets the geographical location to its default attribute.
- **exit**—Exits from geographical location configuration mode.
- **no**—Negates the specified geographical parameters and sets the default value.

Use the **no lldp med-tlv-select location information** interface configuration command to disable the location TLV. The location TLV is enabled by default.

This example shows how to configure civic location information on the switch:

```
Device(config)# location civic-location identifier 1
Device(config-civic)# number 3550
Device(config-civic)# primary-road-name "Cisco Way"
Device(config-civic)# city "San Jose"
Device(config-civic)# state CA
Device(config-civic)# building 19
Device(config-civic)# room C6
Device(config-civic)# county "Santa Clara"
Device(config-civic)# country US
Device(config-civic)# end
```

You can verify your settings by entering the **show location civic-location** privileged EXEC command.

This example shows how to configure the emergency location information on the switch:

```
Device(config)# location elin-location 14085553881 identifier 1
```

You can verify your settings by entering the **show location elin** privileged EXEC command.

The example shows how to configure geo-spatial location information on the switch:

```
Device(config)# location geo-location identifier host
Device(config-geo)# latitude 12.34
Device(config-geo)# longitude 37.23
Device(config-geo)# altitude 5 floor
Device(config-geo)# resolution 12.34
```

You can use the **show location geo-location identifier** command to display the configured geo-spatial location details.

# location plm calibrating

To configure path loss measurement (CCX S60) request for calibrating clients, use the **location plm calibrating** command in global configuration mode.

**location plm calibrating {multiband | uniband}**

<b>Syntax Description</b>	<b>multiband</b> Specifies the path loss measurement request for calibrating clients on the associated 802.11a or 802.11b/g radio. <b>uniband</b> Specifies the path loss measurement request for calibrating clients on the associated 802.11a/b/g radio.				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"><thead><tr><th>Release</th><th>Modification</th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** The uniband is useful for single radio clients (even if the radio is a dual band and can operate in the 2.4-GHz and the 5-GHz bands). The multiband is useful for multiple radio clients.

This example shows how to configure the path loss measurement request for calibrating clients on the associated 802.11a/b/g radio:

```
Device# configure terminal
Device(config)# location plm calibrating uniband
Device(config)# end
```

# mac address-table move update

To enable the MAC address table move update feature, use the **mac address-table move update** command in global configuration mode on the switch stack or on a standalone switch. To return to the default setting, use the **no** form of this command.

```
mac address-table move update {receive | transmit}
no mac address-table move update {receive | transmit}
```

<b>Syntax Description</b>	<b>receive</b> Specifies that the switch processes MAC address-table move update messages. <b>transmit</b> Specifies that the switch sends MAC address-table move update messages to other switches in the network if the primary link goes down and the standby link comes up.				
<b>Command Default</b>	By default, the MAC address-table move update feature is disabled.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>					
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<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>The MAC address-table move update feature allows the switch to provide rapid bidirectional convergence if a primary (forwarding) link goes down and the standby link begins forwarding traffic.</p> <p>You can configure the access switch to send the MAC address-table move update messages if the primary link goes down and the standby link comes up. You can configure the uplink switches to receive and process the MAC address-table move update messages.</p>				

## Examples

This example shows how to configure an access switch to send MAC address-table move update messages:

```
Device# configure terminal
Device(config)# mac address-table move update transmit
Device(config)# end
```

This example shows how to configure an uplink switch to get and process MAC address-table move update messages:

```
Device# configure terminal
Device(config)# mac address-table move update receive
Device(config)# end
```

You can verify your setting by entering the **show mac address-table move update** privileged EXEC command.

# mgmt\_init

To initialize the Ethernet management port, use the **mgmt\_init** command in boot loader mode.

## mgmt\_init

**Syntax Description** This command has no arguments or keywords.

**Command Default** No default behavior or values.

**Command Modes** Boot loader

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** Use the **mgmt\_init** command only during debugging of the Ethernet management port.

**Examples** This example shows how to initialize the Ethernet management port:

```
Device: mgmt_init
```

# mkdir

To create one or more directories on the specified file system, use the **mkdir** command in boot loader mode.

**mkdir** *filesystem:/directory-url...*

## Syntax Description

*filesystem:* Alias for a file system. Use **usbflash0:** for USB memory sticks.

*/directory-url...* Name of the directories to create. Separate each directory name with a space.

## Command Default

No default behavior or values.

## Command Modes

Boot loader

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

Directory names are case sensitive.

Directory names are limited to 127 characters between the slashes (/); the name cannot contain control characters, spaces, deletes, slashes, quotes, semicolons, or colons.

## Example

This example shows how to make a directory called Saved\_Configs:

```
Device: mkdir usbflash0:Saved_Configs
Directory "usbflash0:Saved_Configs" created
```

# more

To display the contents of one or more files, use the **more** command in boot loader mode.

**more** *filesystem:/file-url...*

## Syntax Description

*filesystem*: Alias for a file system. Use **flash** for the system board flash device.

*/file-url...* Path (directory) and name of the files to display. Separate each filename with a space.

## Command Default

No default behavior or values.

## Command Modes

Boot loader

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

Filenames and directory names are case sensitive.

If you specify a list of files, the contents of each file appears sequentially.

## Examples

This example shows how to display the contents of a file:

```
Device: more flash:image_file_name
version_suffix: universal-122-xx.SEx
version_directory: image_file_name
image_system_type_id: 0x00000002
image_name: image_file_name.bin
ios_image_file_size: 8919552
total_image_file_size: 11592192
image_feature: IP|LAYER_3|PLUS|MIN_DRAM_MEG=128
image_family: family
stacking_number: 1.34
board_ids: 0x00000068 0x00000069 0x0000006a 0x0000006b
info_end:
```

**no debug all**

# no debug all

To disable debugging on a switch, use the **no debug all** command in Privileged EXEC mode.

## no debug all

<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table><thead><tr><th>Release</th><th>Modification</th></tr></thead><tbody><tr><td>Cisco IOS XE Release 16.1</td><td>This command was introduced.</td></tr></tbody></table>	Release	Modification	Cisco IOS XE Release 16.1	This command was introduced.
Release	Modification				
Cisco IOS XE Release 16.1	This command was introduced.				

**Examples** This example shows how to disable debugging on a switch.

```
Device: no debug all  
All possible debugging has been turned off.
```

# rename

To rename a file, use the **rename** command in boot loader mode.

**rename** *filesystem:/source-file-url filesystem:/destination-file-url*

## Syntax Description

*filesystem:* Alias for a file system. Use **usbflash0:** for USB memory sticks.

*/source-file-url* Original path (directory) and filename.

*/destination-file-url* New path (directory) and filename.

## Command Default

No default behavior or values.

## Command Modes

Boot loader

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

Filenames and directory names are case sensitive.

Directory names are limited to 127 characters between the slashes (/); the name cannot contain control characters, spaces, deletes, slashes, quotes, semicolons, or colons.

Filenames are limited to 127 characters; the name cannot contain control characters, spaces, deletes, slashes, quotes, semicolons, or colons.

## Examples

This example shows a file named *config.text* being renamed to *config1.text*:

```
Device: rename usbflash0:config.text usbflash0:config1.text
```

You can verify that the file was renamed by entering the **dir** *filesystem:* boot loader command.

request consent-token accept-response shell-access

# request consent-token accept-response shell-access

To submit the Consent Token response to a previously generated challenge, use the **request consent-token accept-response shell-access** command.

**request consent-token accept-response shell-access *response-string***

## Syntax Description

Syntax	Description
<i>response-string</i>	Specifies the character string representing the response.

**Command Modes** Privileged EXEC mode (#)

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

**Usage Guidelines** You must enter the response string within 30 minutes of challenge generation. If it is not entered, the challenge expires and a new challenge must be requested.

## Example

The following is sample output from the **request consent-token accept-response shell-access *response-string*** command:

```
Device# request consent-token accept-response shell-access
[REDACTED]
% Consent token authorization success
*Jan 18 02:51:37.807: %CTOKEN-6-AUTH_UPDATE: Consent Token Update (authentication success:
Shell access 0).
```

# request consent-token generate-challenge shell-access

To generate a Consent Token challenge for system shell access, use the **request consent-token generate-challenge shell-access** command.

**request consent-token generate-challenge shell-access auth-timeout *time-validity-slot***

## Syntax Description

Syntax	Description
<b>auth-timeout <i>time-validity-slot</i></b>	Specifies the time slot in minutes for which shell-access is requested.

**Command Modes** Privileged EXEC mode (#)

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

**Usage Guidelines** When the requested time-slot for system shell expires, the session gets terminated automatically. The maximum authorization timeout for system shell access is seven days.

## Example

The following is sample output from the **request consent-token generate-challenge shell-access auth-timeout *time-validity-slot*** command:

```
Device# request consent-token generate-challenge shell-access auth-timeout 900
Device#
*Jan 18 02:47:06.733: %CTOKEN-6-AUTH_UPDATE: Consent Token Update (challenge generation attempt: Shell access 0).
```

**request consent-token terminate-auth**

# request consent-token terminate-auth

To terminate the Consent Token based authorization to system shell, use the **request consent-token terminate-auth** command.

## request consent-token terminate-auth

<b>Command Modes</b>	Privileged EXEC mode (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

<b>Usage Guidelines</b>	In system shell access scenario, exiting the shell does not terminate authorization until the authorization timeout occurs.  We recommend that you force terminate system shell authorization by explicitly issuing the <b>request consent-token terminate-auth</b> command once the purpose of system shell access is complete.  If the current authentication is terminated using the <b>request consent-token terminate-auth</b> command, the user will have to repeat the authentication process to gain access to system shell.
-------------------------	--

## Example

The following is sample output from the **request consent-token terminate-auth** command:

```
Device# request consent-token terminate-auth shell-access
% Consent token authorization termination success

Device#
*Mar 13 01:45:39.197: %CTOKEN-6-AUTH_UPDATE: Consent Token Update (terminate authentication:
    Shell access 0).
Device#
```

# request platform software console attach switch

To start a session on a member switch, use the **request platform software console attach switch** command in privileged EXEC mode.



**Note** On stacking switches (Catalyst 3650/3850/9200/9300 switches), this command can only be used to start a session on the standby console. On Catalyst 9500 switches, this command is supported only in a stackwise virtual setup. You cannot start a session on member switches. By default, all consoles are already active, so a request to start a session on the active console will result in an error.

**request platform software console attach switch { *switch-number* | **active** | **standby** } { **0/0** | **R0** }**

## Syntax Description

***switch-number*** Specifies the switch number. The range is from 1 to 9.

**active** Specifies the active switch.

**Note** This argument is not supported on Catalyst 9500 switches.

**standby** Specifies the standby switch.

**0/0** Specifies that the SPA-Inter-Processor slot is 0, and bay is 0.

**Note** Do not use this option with stacking switches. It will result in an error.

**R0** Specifies that the Route-Processor slot is 0.

## Command Default

By default, all switches in the stack are active.

## Command Modes

Privileged EXEC (#)

## Command History

### Release

Cisco IOS XE Denali  
16.1.1

### Modification

This command was introduced.

## Usage Guidelines

To start a session on the standby switch, you must first enable it in the configuration.

## Examples

This example shows how to session to the standby switch:

```
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# redundancy
Device(config-red)# main-cpu
Device(config-r-mc)# standby console enable
Device(config-r-mc)# end
```

request platform software console attach switch

```
Device# request platform software console attach switch standby R0
#
# Connecting to the IOS console on the route-processor in slot 0.
# Enter Control-C to exit.
#
Device-stby> enable
Device-stby#
```

# request platform software package clean

To remove media files that are not required, use the **request platform software package clean** command in privileged EXEC mode.

```
request platform software package clean [{file URL | pattern URL | switch
switch-ID {file URL | pattern URL}}]
```

<b>Syntax Description</b>	<b>file URL</b>  <b>pattern URL</b>  <b>switch switch-ID</b>	(Optional) Specifies the URL to the file. The URL contains the file system, directories, and the filename.  (Optional) Specifies the pattern to clean one or more matching paths.  (Optional) Specifies the switch for provisioning.				
<b>Command Default</b>	No default behavior or values					
<b>Command Modes</b>	Privileged EXEC (#)					
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td><td>This command was introduced.</td></tr> </tbody> </table>		<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.1.1	This command was introduced.
<b>Release</b>	<b>Modification</b>					
Cisco IOS XE Denali 16.1.1	This command was introduced.					

## Usage Guidelines

### Example

The following example shows how to clean unused media files from the device:

```
Device# request platform software package clean

This operation may take several minutes...
Running command on switch 1
Cleaning up unnecessary package files
No path specified, will use booted path consolidated:packages.conf
Cleaning sw/ios
  Scanning boot directory for packages ... done.
  Preparing packages list to delete ...
    cat3k_caa-guestshell.BLD_V168_THROTTLE_LATEST_20180925_154546_V16_8_1_191_2.SSA.pkg
      File is in use, will not delete.
    cat3k_caa-rpbase.BLD_V168_THROTTLE_LATEST_20180925_154546_V16_8_1_191_2.SSA.pkg
      File is in use, will not delete.
    cat3k_caa-rpcore.BLD_V168_THROTTLE_LATEST_20180925_154546_V16_8_1_191_2.SSA.pkg
      File is in use, will not delete.
    cat3k_caa-srdriver.BLD_V168_THROTTLE_LATEST_20180925_154546_V16_8_1_191_2.SSA.pkg
      File is in use, will not delete.
    cat3k_caa-webui.BLD_V168_THROTTLE_LATEST_20180925_154546_V16_8_1_191_2.SSA.pkg
      File is in use, will not delete.
  packages.conf
```

**request platform software package clean**

```
File is in use, will not delete.  
done.
```

```
SUCCESS: No extra package or provisioning files found on media. Nothing to clean.
```

**Related Commands**

Command	Description
<b>request platform software package install file</b>	Upgrades a consolidated package or sub-package.
<b>request platform software package install rollback</b>	Rolls back a previous software upgrade.

# request platform software package copy

To copy a Cisco IOS XE image file, use the **request platform software package copy** command in privileged EXEC mode.

**request platform software package copy switch *switch-ID* file *file-URL* to *file-URL***

## Syntax Description

**switch *switch-ID*** Specifies the switch for provisioning.

**file *file-URL*** URL to the consolidated package or sub-package.

**to** Specifies the destination URL to where the files are to be copied.

## Command Default

No default behavior or values.

## Command Modes

Privileged EXEC (#)

## Command History

Release	Modification
---------	--------------

Cisco IOS XE Denali 16.1.1

This command was introduced.

## Usage Guidelines

### Example

The following example shows how to copy an image file to a destination directory:

```
Device# request platform software package copy switch all file
tftp://10.10.11.250/cat3k_caa-universalk9.16.08.05.SPA.bin to
ftp:cat3k_caa-universalk9.16.08.05.SPA.bin
```

Command	Description
<b>request platform software package install file</b>	Upgrades a consolidated package or sub-package.
<b>request platform software package install rollback</b>	Rolls back a previous software upgrade.

request platform software package describe file

# request platform software package describe file

To gather descriptive information about an individual module or a Cisco IOS-XE image file, use the **request platform software package describe file** command in privileged EXEC or diagnostic mode.

**request platform software package describe file URL [detail] [verbose]**

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>URL</b></td><td>Specifies the URL to the file. The <i>URL</i> contains the file system, directories, and the filename.</td></tr> <tr> <td><b>detail</b></td><td>(Optional) Specifies detailed output.</td></tr> <tr> <td><b>verbose</b></td><td>(Optional) Displays verbose information, meaning that all information about the file is displayed on the console.</td></tr> </table>	<b>URL</b>	Specifies the URL to the file. The <i>URL</i> contains the file system, directories, and the filename.	<b>detail</b>	(Optional) Specifies detailed output.	<b>verbose</b>	(Optional) Displays verbose information, meaning that all information about the file is displayed on the console.
<b>URL</b>	Specifies the URL to the file. The <i>URL</i> contains the file system, directories, and the filename.						
<b>detail</b>	(Optional) Specifies detailed output.						
<b>verbose</b>	(Optional) Displays verbose information, meaning that all information about the file is displayed on the console.						

**Command Default** No default behavior or values.

**Command Modes** Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

**Usage Guidelines** This command can only be used to gather information on individual module and Cisco IOS-XE image files. Using this command to collect information on any other file will generate output, but the generated output is useless.

The output of this command can be used for the following functions:

- To confirm the individual module files that are part of a Cisco IOS-XE image.
- To confirm whether or not a file is bootable.
- To confirm the contexts in which a file must be reloaded or booted.
- To confirm whether or not a file is corrupted.
- To confirm file and header sizes, build dates, and various other general information.

## Examples

In the following example, this command is entered to gather information about an individual SIP Base module file on the bootflash: file system.

```
Device# request platform software package describe file
bootflash:cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin

Package: cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin
Size: 36954316
Timestamp: 2018-11-07 15:36:27 UTC
Canonical path: /bootflash/cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin

Raw disk-file SHA1sum:
3ee3cdbe276316968866b16df7d8a5733a1502e
```

```

Computed SHA1sum:
f2db80416a1245a5b1abf2988088860b38ce7898
Contained SHA1sum:
f2db80416a1245a5b1abf2988088860b38ce7898
Hashes match. Package is valid.

Header size: 204 bytes
Package type: 10000
Package flags: 0
Header version: 0

Internal package information:
Name: cc
BuildTime: 2018-11-07_05.24
ReleaseDate: Wed 07-Nov-18 01:00
RouteProcessor: rpl
Platform: Cat3XXX
User: mcpre
PackageName: ipbasek9
Build: cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin

```

Package is bootable on SIP when specified  
by packages provisioning file.

In the following example, this command is used to gather information about a Cisco IOS-XE image on the bootflash: file system.

```

Device# request platform software package describe file
bootflash:cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin

Package: cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin
Size: 218783948
Timestamp: 2018-11-07 17:14:09 UTC
Canonical path: /bootflash/cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin

Raw disk-file SHA1sum:
d2999fc7e27e01344903a42ffacd62c156eba4cc

Computed SHA1sum:
5f8cda8518d01d8282d80ecd34f7715783f4a813
Contained SHA1sum:
5f8cda8518d01d8282d80ecd34f7715783f4a813
Hashes match. Package is valid.

Header size: 204 bytes
Package type: 30000
Package flags: 0
Header version: 0

Internal package information:
Name: rp_super
BuildTime: 2018-11-07_05.24
ReleaseDate: Wed 07-Nov-18 01:00
RouteProcessor: rpl
Platform: Cat3XXX
User: mcpre
PackageName: ipbasek9
Build: cat3k_caa-universalk9_universalk9.16.09.02

```

Package is bootable from media and tftp.  
Package contents:

**request platform software package describe file**

```

Package: cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin
Size: 52072652
Timestamp: 2018-11-07 13:33:13 UTC

Raw disk-file SHA1sum:
f1aad6d687256aa327a4efa84deab949fbed12b8

Computed SHA1sum:
15502fd1b8f9ffd4af4014ad4d8026c837929fe6
Contained SHA1sum:
15502fd1b8f9ffd4af4014ad4d8026c837929fe6
Hashes match. Package is valid.

Header size: 204 bytes
Package type: 20000
Package flags: 0
Header version: 0

Internal package information:
Name: fp
BuildTime: 2018-11-07_05.24
ReleaseDate: Wed 07-Nov-18 01:00
RouteProcessor: rpl
Platform: Cat3XXX
User: mcpre
PackageName: ipbasek9
Build: cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin

```

Package is bootable on ESP when specified  
by packages provisioning file.

```

Package: cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin
Size: 21844172
Timestamp: 2018-11-07 13:33:01 UTC

Raw disk-file SHA1sum:
025e6159dd91cef9d254ca9fff2602d8ce065939

Computed SHA1sum:
ea1b358324ba5815b9ea623b453a98800ea1c78
Contained SHA1sum:
ea1b358324ba5815b9ea623b453a98800ea1c78
Hashes match. Package is valid.

Header size: 204 bytes
Package type: 30004
Package flags: 0
Header version: 0

Internal package information:
Name: ipbasek9
BuildTime: 2018-11-07_05.24
ReleaseDate: Wed 07-Nov-07 01:00
RouteProcessor: rpl
Platform: Cat3XXXX
User: mcpre
PackageName: ipbasek9
Build: 16.9.20180925:160127

```

Package is not bootable.

```

Package: cat3k_caa-universalk9.16.09.02.SPA.bin
Size: 21520588
Timestamp: 2007-12-04 13:33:06 UTC

Raw disk-file SHA1sum:
432dfa61736d8a51baefbb2d70199d712618dcf2

Computed SHA1sum:
83c0335a3adcea574bff237a6c8640a110a045d4
Contained SHA1sum:
83c0335a3adcea574bff237a6c8640a110a045d4
Hashes match. Package is valid.

Header size: 204 bytes
Package type: 30001
Package flags: 0
Header version: 0

Internal package information:
Name: rp_base
BuildTime: 2007-12-04_05.24
ReleaseDate: Tue 04-Dec-07 01:00
RouteProcessor: rp1
Platform: Cat3XXX
User: mcpre
PackageName: ipbasek9
Build: v_16.9.20180925:160127

Package is bootable on RP when specified
by packages provisioning file.

Package: cat3k_caa-universalk9_universalk9.16.09.02.SPA.bin
Size: 24965324
Timestamp: 2018-11-07 13:33:08 UTC

Raw disk-file SHA1sum:
eb964b33d4959c21b605d0989e7151cd73488a8f

Computed SHA1sum:
19b58886f97c79f885ab76c1695d1a6f4348674e
Contained SHA1sum:
19b58886f97c79f885ab76c1695d1a6f4348674e
Hashes match. Package is valid.

Header size: 204 bytes
Package type: 30002
Package flags: 0
Header version: 0

Internal package information:
Name: rp_daemons
BuildTime: 2018-11-07_05.24
ReleaseDate: Wed 07-Nov-07 01:00
RouteProcessor: rp1
Platform: Cat3XXX
User: mcpre
PackageName: ipbasek9
Build: v_16.9.20180925:160127

Package is not bootable.

Package: cat3k_caa-universalk9.16.09.02.SPA.bin

```

**request platform software package describe file**

```

Size: 48515276
Timestamp: 2007-12-04 13:33:13 UTC

Raw disk-file SHA1sum:
bc13462d6a4af7a817a7346a44a0ef7270e3a81b

Computed SHA1sum:
f1235d703cc422e53bce850c032ff3363b587d70
Contained SHA1sum:
f1235d703cc422e53bce850c032ff3363b587d70
Hashes match. Package is valid.

Header size: 204 bytes
Package type: 30003
Package flags: 0
Header version: 0

Internal package information:
Name: rp_iosd
BuildTime: 2007-12-04_05.24
ReleaseDate: Tue 04-Dec-07 01:00
RouteProcessor: rpl
Platform: Cat3XXX
User: mcpred
PackageName: ipbasek9
Build: v_16.9.20180925:160127

Package is not bootable.

Package: cat3k_caa-universalk9.16.09.02.SPA.bin
Size: 36954316
Timestamp: 2007-12-04 13:33:11 UTC

Raw disk-file SHA1sum:
3ee37cdbe276316968866b16df7d8a5733a1502e

Computed SHA1sum:
f2db80416a1245a5b1abf2988088860b38ce7898
Contained SHA1sum:
f2db80416a1245a5b1abf2988088860b38ce7898
Hashes match. Package is valid.

Header size: 204 bytes
Package type: 10000
Package flags: 0
Header version: 0

Internal package information:
Name: cc
BuildTime: 2007-12-04_05.24
ReleaseDate: Tue 04-Dec-07 01:00
RouteProcessor: rpl
Platform: Cat3XXX
User: mcpred
PackageName: ipbasek9
Build: v_16.9.20180925:160127

Package is bootable on SIP when specified
by packages provisioning file.

Package: cat3k_caa-universalk9.16.09.02.SPA.bin
Size: 19933388

```

```
Timestamp: 2007-12-04 13:33:06 UTC

Raw disk-file SHA1sum:
44b6d15cba31fb0e9b27464665ee8a24b92adfd2

Computed SHA1sum:
b1d5faf093b183e196c7c8e1023fe1f7aafdd36d
Contained SHA1sum:
b1d5faf093b183e196c7c8e1023fe1f7aafdd36d
Hashes match. Package is valid.

Header size: 204 bytes
Package type: 10001
Package flags: 0
Header version: 0

Internal package information:
Name: cc_spa
BuildTime: 2007-12-04_05.24
ReleaseDate: Tue 04-Dec-07 01:00
RouteProcessor: rpl
Platform: Cat3XXX
User: mcpre
PackageName: ipbasek9
Build: v_16.9.20180925:160127
```

Package is not bootable.

**Related Commands**

Command	Description
<b>request platform software package install file</b>	Upgrades an individual package or a superpackage file.

# request platform software package expand

To extract the individual modules from a Cisco IOS-XE image, use the **request platform software package expand** command in privileged EXEC mode.

```
request platform software package expand {file source-URL | switch switch-ID file source-URL}[to destination-URL] [auto-copy] [force] [over-write] [retain-source-file] [verbose] [wipe]
```

Syntax Description	<p><b>source-URL</b> Specifies the URL to the Cisco IOS-XE file that stores the contents that will be extracted.</p>
	<p><b>switch switch-ID</b> Specifies the switch ID.</p>
	<p><b>to destination-URL</b> (Optional) Specifies the destination URL where the files that were extracted from the Cisco IOS-XE file are left after the operation is complete. If this option is not entered, the Cisco IOS-XE image file contents are extracted onto the same directory where the Cisco IOS-XE image file is currently stored.</p>
	<p><b>auto-copy</b> (Optional) Copies packages to provisioning directory.</p>
	<p><b>force</b> (Optional) Specifies that the operation will be forced, meaning that the upgrade will proceed despite any warning messages.</p>
	<p><b>over-write</b> (Optional) Overwrites non-identical packages and unused provisioning files.</p>
	<p><b>retain-to-source</b> (Optional) Retains the source file after expansion.</p>
	<p><b>verbose</b> (Optional) Displays verbose information, meaning all output that can be displayed on the console during the process will be displayed.</p>
	<p><b>wipe</b> (Optional) Erases all content on the destination snapshot directory before extracting the files and placing them on the snapshot directory.</p>

<b>Command Default</b>	No default behavior or values
------------------------	-------------------------------

<b>Command Modes</b>	Privileged EXEC (#)
----------------------	---------------------

Command History	Release	Modification
	Cisco IOS XE Denali 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	This command only extracts individual module files and a provisioning file from the Cisco IOS-XE image. Additional configuration is needed to configure the router to boot using the provisioning files and run using the individual modules.
-------------------------	---

When this command is used, copies of each module and the provisioning file within the Cisco IOS-XE image are copied and placed on the destination directory. The Cisco IOS-XE image file is unchanged after the operation is complete.

If the **to** destination-URL option is not entered, the Cisco IOS-XE image contents will be extracted onto the same directory where the Cisco IOS-XE image is currently stored.

If this command is used to extract individual module files onto a directory that already contains individual module files, the files are extracted to an automatically created directory on the destination device.

## Examples

The following example shows how to extract individual modules and the provisioning file from a Cisco IOS-XE image that has already been placed in the directory where the user wants to store the individual modules and the provisioning file.

Output of the directory before and after the extraction is given to confirm that files were extracted.

```
Device# dir bootflash:
Directory of bootflash:/
 11 drwx      16384 Dec  4 2018 11:26:07 +00:00 lost+found
14401 drwx       4096 Dec  4 2018 11:27:41 +00:00 .installer
 12 -rw-    218783948 Dec  4 2018 12:12:16 +00:00 cat3k_caa-universalk9.16.09.02.SPA.bin

Device# request platform software package expand file
bootflash:cat3k_caa-universalk9.16.09.02.SPA.bin

Verifying parameters
Validating package type
Copying package files

Device# dir bootflash:
Directory of bootflash:/
 11 drwx      16384 Dec  4 2018 11:26:07 +00:00 lost+found
14401 drwx       4096 Dec  4 2018 11:27:41 +00:00 .installer
 12 -rw-    218783948 Dec  4 2018 12:12:16 +00:00 cat3k_caa-universalk9.16.09.02.SPA.bin
28802 -rw-       7145 Dec  4 2018 12:14:22 +00:00 packages.conf
928833536 bytes total (483700736 bytes free)
```

## Related Commands

Command	Description
<b>request platform software package install file</b>	Upgrades an individual module or a Cisco IOS-XE file.

request platform software package install auto-upgrade

# request platform software package install auto-upgrade

To initiate automatic upgrade of software on all incompatible switches, use the **request platform software package install auto-upgrade** command in privileged EXEC mode.

**request platform software package install auto-upgrade**

**Syntax Description** This command has no arguments or keywords.

**Command Default** No default behavior or values.

**Command Modes** Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Denali 16.1.1	This command was introduced.

**Examples** The following example shows how to automatically upgrade the software:

```
Device# request platform software package install auto-upgrade
```

Related Commands	Command	Description
	<b>request platform software package install file</b>	Upgrades a consolidated package or sub-package.
	<b>request platform software package install rollback</b>	Rolls back a previous software upgrade.

# request platform software package install commit

To cancel the rollback timer and commit a software upgrade, use the **request platform software package install commit** command in privileged EXEC mode.

**request platform software package install switch *switch-ID*commit [verbose]**

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>switch <i>switch-ID</i></b></td><td>Specifies the switch ID.</td></tr> <tr> <td><b>verbose</b></td><td>(Optional) Displays verbose information, meaning all information that can be displayed on the console during the process will be displayed.</td></tr> </table>	<b>switch <i>switch-ID</i></b>	Specifies the switch ID.	<b>verbose</b>	(Optional) Displays verbose information, meaning all information that can be displayed on the console during the process will be displayed.
<b>switch <i>switch-ID</i></b>	Specifies the switch ID.				
<b>verbose</b>	(Optional) Displays verbose information, meaning all information that can be displayed on the console during the process will be displayed.				

**Command Default** No default behavior or values.

**Command Modes** Privileged EXEC (#)

<b>Release</b>	<b>Modification</b>
Cisco IOS XE Denali 16.1.1	This command was introduced.

**Usage Guidelines** This command is entered after the **request platform software package install switch *switch-ID* file auto-rollback** command is used to begin an individual sub-package or a consolidated package upgrade. When the **auto-rollback minutes** option is used, a rollback timer that cancels the upgrade after the number of specified minutes cancels the upgrade if the **request platform software package install switch *switch-ID* commit** command is not entered to commit the upgrade.

The rollback timer expires and the upgrade does not complete; and the device continues running the previous sub-package or consolidated package.

**Examples** The following example shows how to commit an upgrade:

```
Device# request platform software package install switch all commit
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>request platform software package install file</b>	Upgrades a consolidated package or sub-package.
	<b>request platform software package install rollback</b>	Rolls back a previous software upgrade.

# request platform software package install file

To upgrade a consolidated package or an individual sub-package, use the **request platform software package install file** command in privileged EXEC mode.

```
request platform software package install switch switch-ID file file-URL [auto-rollback minutes] [interface-module-delay seconds] [provisioning-file provisioning-file-URL] [slot slot-number] [bay bay-number] [auto-copy] [force] [ignore-compact-check] [mdr] [new] [on-reboot] [retain-source-file] [verbose]
```

Syntax Description	
<b>switch</b> <i>switch-ID</i>	Specifies the switch for provisioning.
<b>file</b> <i>file-URL</i>	URL to the consolidated package or sub-package.
<b>auto-rollback</b> <i>minutes</i>	(Optional) Specifies the setting of a rollback timer, and sets the number of minutes on the rollback timer before the rollback timer expires.
<b>interface-module-delay</b> <i>seconds</i>	(Optional) Specifies the interface module restart timeout delay.
<b>provisioning-file</b> <i>provisioning-file-URL</i>	(Optional) Specifies the URL to the provisioning file. A provisioning file is used for booting only when a device is booted using individual sub-packages.
<b>slot</b> <i>slot-number</i>	(Optional) Specifies the device slot number where a shared port adapter interface processor (SIP) can be installed.
<b>bay</b> <i>bay-number</i>	(Optional) Specifies the shared port adapter (SPA) bay number within a SIP.
<b>auto-copy</b>	(Optional) Specifies that the device will automatically copy packages to provisioning directory.
<b>force</b>	(Optional) Specifies that the operation will be forced, meaning that the upgrade will proceed despite any warning messages.
<b>ignore-compact-check</b>	(Optional) Specifies that the compatibility check is ignored.
<b>mdr</b>	(Optional) Specifies that minimal disruptive restart is used.
<b>new</b>	(Optional) Creates a new package provisioning file.
<b>on-reboot</b>	(Optional) Specifies that the installation will not be completed until the next RP reboot.
<b>retain-source-file</b>	(Optional) Retains the source file after installation.
<b>verbose</b>	(Optional) Displays verbose information, meaning all output that can be displayed on the console during the process will be displayed.

## Command Default

If you do not enter the **request platform software package install file** command, the consolidated or sub package upgrades are not initiated on the device.

**Command Modes**

Privileged EXEC (#)

**Command History**

<b>Release</b>	<b>Modification</b>
Cisco IOS XE Denali 16.1.1	This command was introduced.

**Usage Guidelines**

This command is used to upgrade consolidated packages and individual sub-packages.

When the **auto-rollback minutes** option is used, the **request platform software package install switch switch-ID commit** command must be entered before the rollback timer expires to complete the upgrade. If this command is not entered, the device rolls back to the previous software version. The rollback timer expires after the number of specified *minutes*. If the **auto-rollback minutes** option is not used, the upgrade automatically happens.

In the following example, the **request platform software package install** command is used to upgrade a consolidated package. The **force** option, which forces the upgrade past any prompt (such as, already having the same consolidated package installed), is used in this example.

```
Device# request platform software package install rp 0 file
bootflash:cat3k_caa-universalk9.16.03.05.SPA.bin force

--- Starting installation state synchronization ---
Finished installation state synchronization
--- Starting file path checking ---
Finished file path checking
--- Starting image file verification ---
Checking image file names
Verifying image file locations
Locating image files and validating name syntax
Inspecting image file types
Processing image file constraints
Extracting super package content
Verifying parameters
Validating package type
Copying package files
Checking and verifying packages contained in super package
Creating candidate provisioning file

WARNING:
WARNING: Candidate software will be installed upon reboot
WARNING:

Finished image file verification
--- Starting candidate package set construction ---
Verifying existing software set
Processing candidate provisioning file
Constructing working set for candidate package set
Constructing working set for running package set
Checking command output
Constructing merge of running and candidate packages
Finished candidate package set construction
--- Starting compatibility testing ---
Determining whether candidate package set is compatible
WARNING:
WARNING: Candidate software combination not found in compatibility database
WARNING:
Determining whether installation is valid
Determining whether installation is valid ... skipped
Checking IPC compatibility with running software
```

**request platform software package install file**

```

Checking IPC compatibility with running software ... skipped
Checking candidate package set infrastructure compatibility
Checking infrastructure compatibility with running software
Checking infrastructure compatibility with running software ... skipped
Finished compatibility testing
--- Starting commit of software changes ---
Updating provisioning rollback files
Creating pending provisioning file
Committing provisioning file
Finished commit of software changes
SUCCESS: Software provisioned. New software will load on reboot.

```

Device# **reload**



**Note** A reload must be performed to finish this procedure.

Related Commands	Command	Description
	<b>request platform software package install commit</b>	Cancels the rollback timer and commits a software upgrade.
	<b>request platform software package install rollback</b>	Rolls back a previous software upgrade.
	<b>request platform software package install snapshot</b>	Creates a snapshot directory that will contain all the files extracted from a consolidated package.

# request platform software package install rollback

To roll back a previous software upgrade, use the **request platform software package install rollback** command in privileged EXEC mode.

```
request platform software package install switch switch-ID rollback [{as-booted | provisioning-file provisioning-file-URL}] [auto-copy] [force] [ignore-compact-check] [new] [on-reboot] [retain-source-file] [verbose]
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>switch</b> <i>switch-ID</i></td><td>Specifies the switch for provisioning.</td></tr> <tr> <td><b>as-booted</b></td><td>(Optional) Specifies that the software update will not occur, and that the device will instead boot using the same procedure that it used during the last reboot.</td></tr> <tr> <td><b>provisioning-file</b> <i>provisioning-file-URL</i></td><td>(Optional) Specifies that the software update will not occur, and that the device will instead boot using the specified provisioning file.</td></tr> <tr> <td><b>auto-copy</b></td><td>(Optional) Specifies that the device will automatically copy packages to provisioning directory.</td></tr> <tr> <td><b>force</b></td><td>(Optional) Specifies that the operation will be forced, meaning that the upgrade will proceed despite any warning messages.</td></tr> <tr> <td><b>ignore-compact-check</b></td><td>(Optional) Specifies that the compatibility check is ignored.</td></tr> <tr> <td><b>new</b></td><td>(Optional) Creates a new package provisioning file.</td></tr> <tr> <td><b>on-reboot</b></td><td>(Optional) Specifies that the installation will not be completed until the next reboot.</td></tr> <tr> <td><b>retain-source-file</b></td><td>(Optional) Retains the source file after installation,</td></tr> <tr> <td><b>verbose</b></td><td>(Optional) Displays verbose information, meaning all output that can be displayed on the console during the process will be displayed.</td></tr> </table>	<b>switch</b> <i>switch-ID</i>	Specifies the switch for provisioning.	<b>as-booted</b>	(Optional) Specifies that the software update will not occur, and that the device will instead boot using the same procedure that it used during the last reboot.	<b>provisioning-file</b> <i>provisioning-file-URL</i>	(Optional) Specifies that the software update will not occur, and that the device will instead boot using the specified provisioning file.	<b>auto-copy</b>	(Optional) Specifies that the device will automatically copy packages to provisioning directory.	<b>force</b>	(Optional) Specifies that the operation will be forced, meaning that the upgrade will proceed despite any warning messages.	<b>ignore-compact-check</b>	(Optional) Specifies that the compatibility check is ignored.	<b>new</b>	(Optional) Creates a new package provisioning file.	<b>on-reboot</b>	(Optional) Specifies that the installation will not be completed until the next reboot.	<b>retain-source-file</b>	(Optional) Retains the source file after installation,	<b>verbose</b>	(Optional) Displays verbose information, meaning all output that can be displayed on the console during the process will be displayed.
<b>switch</b> <i>switch-ID</i>	Specifies the switch for provisioning.																				
<b>as-booted</b>	(Optional) Specifies that the software update will not occur, and that the device will instead boot using the same procedure that it used during the last reboot.																				
<b>provisioning-file</b> <i>provisioning-file-URL</i>	(Optional) Specifies that the software update will not occur, and that the device will instead boot using the specified provisioning file.																				
<b>auto-copy</b>	(Optional) Specifies that the device will automatically copy packages to provisioning directory.																				
<b>force</b>	(Optional) Specifies that the operation will be forced, meaning that the upgrade will proceed despite any warning messages.																				
<b>ignore-compact-check</b>	(Optional) Specifies that the compatibility check is ignored.																				
<b>new</b>	(Optional) Creates a new package provisioning file.																				
<b>on-reboot</b>	(Optional) Specifies that the installation will not be completed until the next reboot.																				
<b>retain-source-file</b>	(Optional) Retains the source file after installation,																				
<b>verbose</b>	(Optional) Displays verbose information, meaning all output that can be displayed on the console during the process will be displayed.																				

<b>Command Default</b>	No default behavior or values
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<b>Command Modes</b>	Privileged EXEC (#)
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.1.1	This command was introduced.

<b>Usage Guidelines</b>	This command rolls back a configuration that has an active rollback timer. Active rollback timers are used when the <b>auto-rollback</b> option is entered when software is being upgraded using the <b>request platform software package install file</b> command.
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**request platform software package install rollback****Examples**

The following example shows that an upgrade using a rollback timer is rolled back to the previous configuration:

```
Device# request platform software package install switch all rollback
```

**Related Commands**

Command	Description
<b>request platform software package install commit</b>	Cancel the rollback timer and commits a software upgrade.
<b>request platform software package install file</b>	Upgrades a consolidated package or an individual sub-package.

# request platform software package install snapshot

To create a snapshot directory that contains all the files extracted from a consolidated package, use the **request platform software package install snapshot** command in privileged EXEC mode.

```
request platform software package install switch switch-ID snapshot to URL [as snapshot-provisioning-filename] [force] [verbose] [wipe]
```

<b>Syntax Description</b>	<table border="1"> <tr> <td><b>switch <i>switch-ID</i></b></td><td>Specifies the switch for provisioning.</td></tr> <tr> <td><b>snapshot to <i>URL</i></b></td><td> <p>Creates a directory and extracts all files from the consolidated package into that directory. The directory is named in the command-line as part of the <i>URL_FS</i>.</p> <p>If the <i>URL_FS</i> is specified as a file system, the files in the consolidated package will be extracted onto the file system and not a directory on the file system.</p> </td></tr> <tr> <td><b>as <i>snapshot-provisioning-filename</i></b></td><td>(Optional) Renames the provisioning file in the snapshot directory. If this option is not used, the existing provisioning filename of the provisioning file in the consolidated package is used.</td></tr> <tr> <td><b>wipe</b></td><td>(Optional) Erases all content on the destination snapshot directory before extracting files and placing them on the snapshot directory.</td></tr> <tr> <td><b>force</b></td><td>(Optional) Specifies that the operation will be forced; meaning that the upgrade will proceed despite any warning messages.</td></tr> <tr> <td><b>verbose</b></td><td>(Optional) Displays verbose information, meaning all output is displayed on the console during the provisioning process.</td></tr> </table>	<b>switch <i>switch-ID</i></b>	Specifies the switch for provisioning.	<b>snapshot to <i>URL</i></b>	<p>Creates a directory and extracts all files from the consolidated package into that directory. The directory is named in the command-line as part of the <i>URL_FS</i>.</p> <p>If the <i>URL_FS</i> is specified as a file system, the files in the consolidated package will be extracted onto the file system and not a directory on the file system.</p>	<b>as <i>snapshot-provisioning-filename</i></b>	(Optional) Renames the provisioning file in the snapshot directory. If this option is not used, the existing provisioning filename of the provisioning file in the consolidated package is used.	<b>wipe</b>	(Optional) Erases all content on the destination snapshot directory before extracting files and placing them on the snapshot directory.	<b>force</b>	(Optional) Specifies that the operation will be forced; meaning that the upgrade will proceed despite any warning messages.	<b>verbose</b>	(Optional) Displays verbose information, meaning all output is displayed on the console during the provisioning process.
<b>switch <i>switch-ID</i></b>	Specifies the switch for provisioning.												
<b>snapshot to <i>URL</i></b>	<p>Creates a directory and extracts all files from the consolidated package into that directory. The directory is named in the command-line as part of the <i>URL_FS</i>.</p> <p>If the <i>URL_FS</i> is specified as a file system, the files in the consolidated package will be extracted onto the file system and not a directory on the file system.</p>												
<b>as <i>snapshot-provisioning-filename</i></b>	(Optional) Renames the provisioning file in the snapshot directory. If this option is not used, the existing provisioning filename of the provisioning file in the consolidated package is used.												
<b>wipe</b>	(Optional) Erases all content on the destination snapshot directory before extracting files and placing them on the snapshot directory.												
<b>force</b>	(Optional) Specifies that the operation will be forced; meaning that the upgrade will proceed despite any warning messages.												
<b>verbose</b>	(Optional) Displays verbose information, meaning all output is displayed on the console during the provisioning process.												

**Command Default** No default behavior or values

**Command Modes** Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Everest 16.1.1	This command was introduced.

**Usage Guidelines** This command is used to create a directory at the destination device and extract the individual sub-packages in a consolidated package to that directory.

The **request platform software package expand** command is the only other command that can be used to extract individual sub-packages from a consolidated package.

**Examples** In the following example, a snapshot directory named snapdir1\_snap is created in the bootflash: file system, and the individual sub-package files from the consolidated package are extracted into the snapshot directory.

## request platform software package install snapshot

The second portion of the example first sets up the router to reboot using the files in the snapshot directory (deletes all previous boot system commands, configures the configuration register, then enters a boot system command to boot using the extracted provisioning file), saves the new configuration, then reboots so the device will boot using the extracted provisioning file, which allows the router to run using the extracted individual sub-package files.

```
Device# request platform software package install switch all snapshot to
bootflash:snapdir1_snap

--- Starting active image file snapshot --- Validating snapshot parameters Creating
destination directory
Copying files to destination media
Copied provisioning file as packages.conf
Moving files into final location Finished active image file snapshot
Device(config)# no boot system
Device(config)# config-register 0x1
Device(config)# boot system harddisk:snapdir1_snap/packages.conf
Device(config)# exit
*May 11 01:31:04.815: %SYS-5-CONFIG_I: Configured from console by con
Device# write memory

Building configuration...
[OK]

Device# reload
```

Related Commands	Command	Description
	<b>request platform software package install file</b>	Upgrades a consolidated package or an individual sub-package.

# request platform software package verify

To verify the In-Service Software Upgrade (ISSU) software package compatibility, use the **requestplatform software package verify** command in privileged EXEC mode.

```
request platform software package verify switch switch-ID file file-URL [bay bay-number]
[slot slot-number] [auto-copy] [force] [mdr]
```

## Syntax Description

<b>switch</b> <i>switch-ID</i>	Specifies the switch for provisioning.
<i>file-URL</i>	URL to the consolidated package or sub-package.
<b>bay</b> <i>bay-number</i>	(Optional) Specifies the shared port adapter (SPA) bay number within a SIP.
<b>slot</b> <i>slot-number</i>	(Optional) Specifies the device slot number where a shared port adapter interface processor (SIP) can be installed.
<b>auto-copy</b>	(Optional) Specifies that the device will automatically copy packages to provisioning directory.
<b>force</b>	(Optional) Specifies that the operation will be forced, meaning that the upgrade will proceed despite any warning messages.
<b>mdr</b>	(Optional) Specifies that minimal disruptive restart is used.

## Command Default

No default behavior or values.

## Command Modes

Privileged EXEC (#)

## Command History

Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.

## Example

The following example shows how to verify Cisco IOS XE image:

```
Device# request platform software package verify switch all file
bootflash:cat3k_caa-universalk9.16.03.05.SPA.bin
```

## Related Commands

Command	Description
<b>request platform software package install commit</b>	Cancels the rollback timer and commits a software upgrade.
<b>request platform software package install rollback</b>	Rolls back a previous software upgrade.
<b>request platform software package install snapshot</b>	Creates a snapshot directory that will contain all the files extracted from a consolidated package.

request platform software package uninstall

# request platform software package uninstall

To uninstall a software package, use the **request platform software package uninstall** command in privileged EXEC mode.

```
request platform software package uninstall switch switch-ID file file-URL [bay bay-number]
[slot slot-number] [auto-copy] [force] [mdr]
```

## Syntax Description

<b>switch</b> <i>switch-ID</i>	Specifies the switch for provisioning.
<b>file-URL</b>	URL to the consolidated package or sub-package.
<b>bay</b> <i>bay-number</i>	(Optional) Specifies the shared port adapter (SPA) bay number within a SIP.
<b>slot</b> <i>slot-number</i>	(Optional) Specifies the device slot number where a shared port adapter interface processor (SIP) can be installed.
<b>auto-copy</b>	(Optional) Specifies that the device will automatically copy packages to provisioning directory.
<b>force</b>	(Optional) Specifies that the operation will be forced, meaning that the upgrade will proceed despite any warning messages.
<b>mdr</b>	(Optional) Specifies that minimal disruptive restart is used.

## Command Default

No default behavior or values.

## Command Modes

Privileged EXEC (#)

## Command History

Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.

## Example

The following example shows how to uninstall a software package:

```
Device# request platform software package uninstall
```

## Related Commands

Command	Description
<b>request platform software package install commit</b>	Cancels the rollback timer and commits a software upgrade.
<b>request platform software package install rollback</b>	Rolls back a previous software upgrade.
<b>request platform software package install snapshot</b>	Creates a snapshot directory that will contain all the files extracted from a consolidated package.

# reset

To perform a hard reset on the system, use the **reset** command in boot loader mode. A hard reset is similar to power-cycling the device; it clears the processor, registers, and memory.

**reset**

**Syntax Description** This command has no arguments or keywords.

**Command Default** No default behavior or values.

**Command Modes** Boot loader

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Examples** This example shows how to reset the system:

```
Device: reset
Are you sure you want to reset the system (y/n)? y
System resetting...
```

# rmdir

To remove one or more empty directories from the specified file system, use the **rmdir** command in boot loader mode.

**rmdir** *filesystem:/directory-url...*

## Syntax Description

*filesystem:* Alias for a file system. Use **usbflash0:** for USB memory sticks.

*/directory-url...* Path (directory) and name of the empty directories to remove. Separate each directory name with a space.

## Command Default

No default behavior or values.

## Command Modes

Boot loader

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

Directory names are case sensitive and limited to 45 characters between the slashes (/); the name cannot contain control characters, spaces, deletes, slashes, quotes, semicolons, or colons.

Before removing a directory, you must first delete all of the files in the directory.

The device prompts you for confirmation before deleting each directory.

## Example

This example shows how to remove a directory:

```
Device: rmdir usbflash0:Test
```

You can verify that the directory was deleted by entering the **dir** *filesystem:* boot loader command.

# sdm prefer

To specify the SDM template for use on the switch, use the **sdm prefer** command in global configuration mode.

**sdm prefer**  
{**advanced**}

<b>Syntax Description</b>	<b>advanced</b> Supports advanced features such as NetFlow.				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"><thead><tr><th><b>Release</b></th><th><b>Modification</b></th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** In a device stack, all stack members must use the same SDM template that is stored on the active device. When a new device is added to a stack, the SDM configuration that is stored on the active device overrides the template configured on an individual device.

## Example

This example shows how to configure the advanced template:

```
Device(config)# sdm prefer advanced
Device(config)# exit
Device# reload
```

set

# set

To set or display environment variables, use the **set** command in boot loader mode. Environment variables can be used to control the boot loader or any other software running on the device.

**set** *variable value*

---

## Syntax Description

<i>variable</i>	Use one of the following keywords for <i>variable</i> and the appropriate value for <i>value</i> :
<i>value</i>	<b>MANUAL_BOOT</b> —Decides whether the device automatically or manually boots.  Valid values are 1/Yes and 0/No. If it is set to 0 or No, the boot loader attempts to automatically boot the system. If it is set to anything else, you must manually boot the device from the boot loader mode.
<b>BOOT</b> <i>filesystem:/file-url</i>	Identifies a semicolon-separated list of executable files to try to load and execute when automatically booting.  If the BOOT environment variable is not set, the system attempts to load and execute the first executable image it can find by using a recursive, depth-first search through the flash: file system. If the BOOT variable is set but the specified images cannot be loaded, the system attempts to boot the first bootable file that it can find in the flash: file system.
<b>ENABLE_BREAK</b>	Allows the automatic boot process to be interrupted when the user presses the <b>Break</b> key on the console.  Valid values are 1, Yes, On, 0, No, and Off. If set to 1, Yes, or On, you can interrupt the automatic boot process by pressing the <b>Break</b> key on the console after the flash: file system has initialized.
<b>HELPER</b> <i>filesystem:/file-url</i>	Identifies a semicolon-separated list of loadable files to dynamically load during the boot loader initialization. Helper files extend or patch the functionality of the boot loader.
<b>PS1</b> <i>prompt</i>	Specifies a string that is used as the command-line prompt in boot loader mode.
<b>CONFIG_FILE</b> <i>flash:/file-url</i>	Specifies the filename that Cisco IOS uses to read and write a nonvolatile copy of the system configuration.
<b>BAUD</b> <i>rate</i>	Specifies the number of bits per second (b/s) that is used for the baud rate for the console. The Cisco IOS software inherits the baud rate setting from the boot loader and continues to use this value unless the configuration file specifies another setting. The range is from 0 to 128000 b/s. Valid values are 50, 75, 110, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 56000, 57600, 115200, and 128000.  The most commonly used values are 300, 1200, 2400, 9600, 19200, 57600, and 115200.
<b>SWITCH_NUMBER</b> <i>stack-member-number</i>	Changes the member number of a stack member.
<b>SWITCH_PRIORITY</b> <i>priority-number</i>	Changes the priority value of a stack member.

---

## Command Default

The environment variables have these default values:

MANUAL\_BOOT: No (0)

BOOT: Null string

ENABLE\_BREAK: No (Off or 0) (the automatic boot process cannot be interrupted by pressing the **Break** key on the console).

HELPER: No default value (helper files are not automatically loaded).

PS1 device:

CONFIG\_FILE: config.text

BAUD: 9600 b/s

SWITCH\_NUMBER: 1

SWITCH\_PRIORITY: 1



- Note** Environment variables that have values are stored in the flash: file system in various files. Each line in the files contains an environment variable name and an equal sign followed by the value of the variable.
- A variable has no value if it is not listed in these files; it has a value if it is listed even if the value is a null string. A variable that is set to a null string (for example, “ ”) is a variable with a value.
- Many environment variables are predefined and have default values.

<b>Command Modes</b>	Boot loader
----------------------	-------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	Environment variables are case sensitive and must be entered as documented.  Environment variables that have values are stored in flash memory outside of the flash: file system.  Under typical circumstances, it is not necessary to alter the setting of the environment variables.  The MANUAL_BOOT environment variable can also be set by using the <b>boot manual</b> global configuration command.  The BOOT environment variable can also be set by using the <b>boot system filesystem:/file-url</b> global configuration command.  The ENABLE_BREAK environment variable can also be set by using the <b>boot enable-break</b> global configuration command.  The HELPER environment variable can also be set by using the <b>boot helper filesystem: /file-url</b> global configuration command.  The CONFIG_FILE environment variable can also be set by using the <b>boot config-file flash: /file-url</b> global configuration command.  The SWITCH_NUMBER environment variable can also be set by using the <b>switch current-stack-member-number renumber new-stack-member-number</b> global configuration command.
-------------------------	--

**set**

The SWITCH\_PRIORITY environment variable can also be set by using the device *stack-member-number priority priority-number* global configuration command.

The boot loader prompt string (PS1) can be up to 120 printable characters not including the equal sign (=).

### Example

This example shows how to set the SWITCH\_PRIORITY environment variable:

```
Device: set SWITCH_PRIORITY 2
```

You can verify your setting by using the **set** boot loader command.

# show avc client

To display information about top number of applications, use the **show avc client** command in privileged EXEC mode.

```
show avc client client-mac top n application [aggregate | upstream | downstream]
```

## Syntax Description

**client *client-mac*** Specifies the client MAC address.

**top *n* application** Specifies the number of top "N" applications for the given client.

## Command Default

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.3SE This command was introduced.

The following is sample output from the **show avc client** command:

```
Device# sh avc client 0040.96ae.65ec top 10 application aggregate
```

Cumulative Stats:

No.	AppName	Packet-Count	Byte-Count	AvgPkt-Size	usage%
<hr/>					
1	skinny	7343	449860	61	94
2	unknown	99	13631	137	3
3	dhcp	18	8752	486	2
4	http	18	3264	181	1
5	tftp	9	534	59	0
6	dns	2	224	112	0

Last Interval(90 seconds) Stats:

No.	AppName	Packet-Count	Byte-Count	AvgPkt-Size	usage%
<hr/>					
1	skinny	9	540	60	100

**show cable-diagnostics tdr**

# show cable-diagnostics tdr

To display the Time Domain Reflector (TDR) results, use the **show cable-diagnostics tdr** command in privileged EXEC mode.

**show cable-diagnostics tdr interface *interface-id***

<b>Syntax Description</b>	<i>interface-id</i> Specifies the interface on which TDR is run.				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	TDR is supported only on 10/100/100 copper Ethernet ports. It is not supported on 10-Gigabit Ethernet ports and small form-factor pluggable (SFP) module ports.				

## Examples

This example shows the output from the **show cable-diagnostics tdr interface *interface-id*** command on a device:

```
Device# show cable-diagnostics tdr interface gigabitethernet1/0/23
TDR test last run on: March 01 00:04:08
Interface  Speed  Local pair  Pair length      Remote pair  Pair status
-----  -----
Gi1/0/23   1000M  Pair A      1    +/- 1 meters  Pair A       Normal
            Pair B      1    +/- 1 meters  Pair B       Normal
            Pair C      1    +/- 1 meters  Pair C       Normal
            Pair D      1    +/- 1 meters  Pair D       Normal
```

**Table 67: Field Descriptions for the show cable-diagnostics tdr Command Output**

Field	Description
Interface	The interface on which TDR is run.
Speed	The speed of connection.
Local pair	The name of the pair of wires that TDR is testing on the local interface.

Field	Description
Pair length	The location of the problem on the cable, with respect to your device. TDR can only find the location in one of these cases: <ul style="list-style-type: none"> <li>• The cable is properly connected, the link is up, and the interface speed is 1000 Mb/s.</li> <li>• The cable is open.</li> <li>• The cable has a short.</li> </ul>
Remote pair	The name of the pair of wires to which the local pair is connected. TDR can learn about the remote pair only when the cable is properly connected and the link is up.
Pair status	The status of the pair of wires on which TDR is running: <ul style="list-style-type: none"> <li>• Normal—The pair of wires is properly connected.</li> <li>• Not completed—The test is running and is not completed.</li> <li>• Not supported—The interface does not support TDR.</li> <li>• Open—The pair of wires is open.</li> <li>• Shorted—The pair of wires is shorted.</li> <li>• ImpedanceMis—The impedance is mismatched.</li> <li>• Short/Impedance Mismatched—The impedance mismatched or the cable is short.</li> <li>• InProgress—The diagnostic test is in progress.</li> </ul>

This example shows the output from the **show interface *interface-id*** command when TDR is running:

```
Device# show interface gigabitethernet1/0/2
gigabitethernet1/0/2 is up, line protocol is up (connected: TDR in Progress)
```

This example shows the output from the **show cable-diagnostics tdr interface *interface-id*** command when TDR is not running:

```
Device# show cable-diagnostics tdr interface gigabitethernet1/0/2
% TDR test was never issued on gigabitethernet1/0/2
```

If an interface does not support TDR, this message appears:

```
% TDR test is not supported on device 1
```

**show debug**

# show debug

To display all the debug commands available on a switch, use the **show debug** command in Privileged EXEC mode.

## show debug

**show debug condition** *Condition identifier / All conditions*

<b>Syntax Description</b>	<i>Condition identifier</i> Sets the value of the condition identifier to be used. Range is between 1 and 1000. <i>All conditions</i> Shows all conditional debugging options available.				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Release 16.1</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Release 16.1	This command was introduced.
Release	Modification				
Cisco IOS XE Release 16.1	This command was introduced.				
<b>Usage Guidelines</b>	Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use debug commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff. Moreover, it is best to use debug commands during periods of lower network traffic and fewer users. Debugging during these periods decreases the likelihood that increased debug command processing overhead will affect system use.				

## Examples

This example shows the output of a **show debug** command:

```
Device# show debug condition all
```

To disable debugging, use the **no debug all** command.

# show env

To display fan, temperature, and power information for the switch (standalone switch, active switch, or standby switch), use the **show env** command in EXEC modes.

```
show env { all | fan | power [all | switch [switch-number] ] | stack [stack-number] | temperature [status] }
```

## Syntax Description

<b>all</b>	Displays fan, temperature and power environmental status.
<b>fan</b>	Displays the switch fan status.
<b>power</b>	Displays the power supply status.
<b>all</b>	(Optional) Displays the status for all power supplies.
<b>switch</b> <i>switch-number</i>	(Optional) Displays the power supply status for a specific switch.
<b>stack</b> <i>switch-number</i>	(Optional) Displays all environmental status for each switch in the stack or for a specified switch. The range is 1 to 9, depending on the switch member numbers in the stack.
<b>temperature</b>	Displays the switch temperature status.
<b>status</b>	(Optional) Displays the temperature status and threshold values.

## Command Default

No default behavior or values.

## Command Modes

User EXEC

Privileged EXEC

## Command History

### Release Modification

Cisco IOS XE 3.2SE This command was introduced.

## Usage Guidelines

Use the **show env stack [switch-number]** command to display information about any switch in the stack from any member switch.

Use the **show env temperature status** command to display the switch temperature states and threshold levels.

## Examples

This example shows how to display information about member switch 1 from the active switch:

```
Device> show env stack 1
Device 1:
Device Fan 1 is OK
Device Fan 2 is OK
Device Fan 3 is OK
FAN-PS1 is OK
```

**show env**

```
FAN-PS2 is NOT PRESENT
Device 1: SYSTEM TEMPERATURE is OK
Temperature Value: 32 Degree Celsius
Temperature State: GREEN
Yellow Threshold : 41 Degree Celsius
Red Threshold : 56 Degree Celsius
```

Device>

This example shows how to display temperature value, state, and threshold values:

```
Device> show env temperature status
Temperature Value: 32 Degree Celsius
Temperature State: GREEN
Yellow Threshold : 41 Degree Celsius
Red Threshold : 56 Degree Celsius
```

Device>

**Table 68: States in the show env temperature status Command Output**

State	Description
Green	The switch temperature is in the <i>normal</i> operating range.
Yellow	The temperature is in the <i>warning</i> range. You should check the external temperature around the switch.
Red	The temperature is in the <i>critical</i> range. The switch might not run properly if the temperature is in this range.

# show env xps

To display budgeting, configuration, power, and system power information for the Cisco eXpandable Power System (XPS) 2200, use the **show env xps** command in privileged EXEC mode.

```
show env xps { budgeting | configuration | port [ all | number ] | power | system | thermal | upgrade | version }
```

<b>Syntax Description</b>	<b>budgeting</b>	Displays XPS power budgeting, the allocated and budgeted power of all switches in the power stack.
	<b>configuration</b>	Displays the configuration resulting from the power xps privileged EXEC commands. The XPS configuration is stored in the XPS. Enter the show env xps configuration command to retrieve the non-default configuration.
	<b>port [all   number ]</b>	Displays the configuration and status of all ports or the specified XPS port. Port numbers are from 1 to 9.
	<b>power</b>	Displays the status of the XPS power supplies.
	<b>system</b>	Displays the XPS system status.
	<b>thermal</b>	Displays the XPS thermal status.
	<b>upgrade</b>	Displays the XPS upgrade status.
	<b>version</b>	Displays the XPS version details.

<b>Command Modes</b>	Privileged EXEC
----------------------	-----------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(55)SE1	This command was introduced.

<b>Usage Guidelines</b>	Use the <b>show env xps</b> privileged EXEC command to display the information for XPS 2200.
-------------------------	--

<b>Examples</b>	This is an example of output from the show env xps budgeting command:
-----------------	---

```
Switch#
=====
XPS 0101.0100.0000 :
=====
Data          Current   Power      Power Port Switch # PS A PS B Role-State
Committed
Budget
---- ----- ----- ----- ----- ----- 1      -      -      715  SP-PS
223
1543
```

show env xps

```

2      -      -      -      SP-PS      223      223
3      -      -      -      -          -          -
4      -      -      -      -          -          -
5      -      -      -      -          -          -
6      -      -      -      -          -          -
7      -      -      -      -          -          -
8      -      -      -      -          -          -
9      1      1100  -      RPS-NB      223      070
XPS   -      -      1100  -          -          -

```

This is an example of output from the show env xps configuration command:

```

Switch# show env xps configuration
=====
XPS 0101.0100.0000 :
=====
power xps port 4 priority 5
power xps port 5 mode disable
power xps port 5 priority 6
power xps port 6 priority 7
power xps port 7 priority 8
power xps port 8 priority 9
power xps port 9 priority 4

```

This is an example of output from the show env xps port all command:

```

Switch#
XPS 010

-----
Port name      : -
Connected      : Yes
Mode           : Enabled (On)
Priority       : 1
Data stack switch # : - Configured role    : Auto-SP
Run mode        : SP-PS : Stack Power Power-Sharing Mode
Cable faults    : 0x0 XPS 0101.0100.0000 Port 2
-----
Port name      : -
Connected      : Yes
Mode           : Enabled (On)
Priority       : 2
Data stack switch # : - Configured role    : Auto-SP
Run mode        : SP-PS : Stack Power Power-Sharing Mode
Cable faults    : 0x0 XPS 0101.0100.0000 Port 3
-----
Port name      : -
Connected      : No
Mode           : Enabled (On)
Priority       : 3
Data stack switch # : - Configured role    : Auto-SP Run mode      : -
Cable faults
<output truncated>

```

This is an example of output from the show env xps power command:

```

=====
XPS 0101.0100.0000 :
=====
Port-Supply SW PID          Serial#     Status      Mode Watts
-----  -----  -----  -----
XPS-A      Not present
XPS-B      NG3K-PWR-1100WAC  LIT13320NTV OK          SP    1100
1-A       -      -          -          -

```

1-B	- -		-	-	SP	715
2-A	- -		-	-		
2-B	- -		-	-		
9-A		100WAC	LIT141307RK	OK	RPS	1100
9-B		esent				

This is an example of output from the show env xps system command:

Switch#

---

XPS 0101.0100.0000 :								
XPS		Cfg	Cfg	RPS	Switch	Current	Data Port	XPS Port Name
Mode	Role	Pri	Conn	Role-State	Switch	#		
1	-			On	Auto-SP	1	Yes	SP-PS
2	-			On	Auto-SP	2	Yes	SP-PS
3	-			On	Auto-SP	3	No	-
4	none			On	Auto-SP	5	No	-
5	-			Off	Auto-SP	6	No	-
6	-			On	Auto-SP	7	No	-
7	-			On	Auto-SP	8	No	-
8	-			On	Auto-SP	9	No	-
9	test			On	Auto-SP	4	Yes	RPS-NB

This is an example of output from the show env xps thermal command:

Switch#

---

```
XPS 0101.0100.0000 :  
=====
```

Fan	Status
1	OK
2	OK
3	NOT PRESENT PS-1 NOT PRESENT PS-2 OK Temperature is OK

This is an example of output from the show env xps upgrade command when no upgrade is occurring:

```
Switch# show env xps upgrade  
No XPS is connected and upgrading
```

These are examples of output from the show env xps upgrade command when an upgrade is in process:

```
Switch# show env xps upgrade
XPS Upgrade Xfer

SW Status Prog
-----
1 Waiting 0%
Switch#
*Mar 22 03:12:46.723: %PLATF
started through the Service
Switch# show env xps upgrade
XPS Upgrade Xfer
SW Status Prog
-----
1 Receiving 1%
Switch# show env xps upgrade
```

**show env xps**

```

XPS Upgrade Xfer
SW Status Prog
-- -----
1 Receiving 5%
Switch# show env xps upgrade
XPS Upgrade Xfer
SW Status Prog
-- -----
1 Reloading 100%
Switch#
*Mar 22 03:16:01.733: %PLATFORM_XPS-6-UPGRADE_DONE: XPS 0022.bdd7.9b14 upgrade has
completed and the XPS is reloading.

```

This is an example of output from the `show env xps version` command:

```

Switch# show env xps version
=====
XPS 0022.bdd7.9b14:
=====
Serial Number: FDO13490KUT
Hardware Version: 8
Bootloader Version: 7
Software Version: 18

```

**Table 69: Related Commands**

Command	Description
<code>power xps</code> (global configuration command)	Configures XPS and XPS port names.
<code>power xps</code> (privileged EXEC command)	Configures the XPS ports and system.

# show flow monitor

To display the status and statistics for a Flexible NetFlow flow monitor, use the **show flow monitor** command in privileged EXEC mode.

```
show flow monitor [{broker [{detail | picture}] | [name] monitor-name [{cache [format {csv | record | table} | aggregate | filter | sort}] | provisioning | statistics}]}
```

<b>Syntax Description</b>	
<b>broker</b>	(Optional) Displays information about the state of the broker for the flow monitor
<b>detail</b>	(Optional) Displays detailed information about the flow monitor broker.
<b>picture</b>	(Optional) Displays a picture of the broker state.
<b>name</b>	(Optional) Specifies the name of a flow monitor.
<i>monitor-name</i>	(Optional) Name of a flow monitor that was previously configured.
<b>cache</b>	(Optional) Displays the contents of the cache for the flow monitor.
<b>format</b>	(Optional) Specifies the use of one of the format options for formatting the display output.
<b>aggregate</b>	(Optional) Displays an aggregate of the given fields.
<b>filter</b>	(Optional) Filters and displays only matching flow records.
<b>sort</b>	(Optional) Sorts the resulting flow records in the required order.
<b>csv</b>	(Optional) Displays the flow monitor cache contents in comma-separated variables (CSV) format.
<b>record</b>	(Optional) Displays the flow monitor cache contents in record format.
<b>table</b>	(Optional) Displays the flow monitor cache contents in table format.
<b>provisioning</b>	(Optional) Displays the flow monitor provisioning information.
<b>statistics</b>	(Optional) Displays the statistics for the flow monitor.

<b>Command Modes</b>	Privileged EXEC	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE This command was introduced.	

<b>Usage Guidelines</b>	The <b>cache</b> keyword uses the record format by default.  The uppercase field names in the display output of the <b>show flowmonitor monitor-name cache</b> command are key fields that Flexible NetFlow uses to differentiate flows. The lowercase field names in the display output of the <b>show flow monitor monitor-name cache</b> command are nonkey fields from which Flexible NetFlow collects values as additional data for the cache.
-------------------------	---

**show flow monitor****Examples**

The following example displays the status for a flow monitor:

```
Device# show flow monitor FLOW-MONITOR-1

Flow Monitor FLOW-MONITOR-1:
  Description:      Used for basic traffic analysis
  Flow Record:     flow-record-1
  Flow Exporter:   flow-exporter-1
                    flow-exporter-2
  Cache:
    Type:          normal
    Status:        allocated
    Size:          4096 entries / 311316 bytes
    Inactive Timeout: 15 secs
    Active Timeout:   1800 secs
    Update Timeout:   1800 secs
```

This table describes the significant fields shown in the display.

**Table 70: show flow monitor monitor-name Field Descriptions**

Field	Description
Flow Monitor	Name of the flow monitor that you configured.
Description	Description that you configured or the monitor, or the default description User defined.
Flow Record	Flow record assigned to the flow monitor.
Flow Exporter	Exporters that are assigned to the flow monitor.
Cache	Information about the cache for the flow monitor.
Type	<p>Flow monitor cache type.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• immediate—Flows are expired immediately.</li> <li>• normal—Flows are expired normally.</li> <li>• Permanent—Flows are never expired.</li> </ul>
Status	<p>Status of the flow monitor cache.</p> <p>The possible values are:</p> <ul style="list-style-type: none"> <li>• allocated—The cache is allocated.</li> <li>• being deleted—The cache is being deleted.</li> <li>• not allocated—The cache is not allocated.</li> </ul>
Size	Current cache size.
Inactive Timeout	Current value for the inactive timeout in seconds.
Active Timeout	Current value for the active timeout in seconds.

Field	Description
Update Timeout	Current value for the update timeout in seconds.

The following example displays the status, statistics, and data for the flow monitor named FLOW-MONITOR-1:

```
Device# show flow monitor FLOW-MONITOR-1 cache
Cache type: Normal (Platform cache)
Cache size: Unknown
Current entries: 1

Flows added: 3
Flows aged: 2
- Active timeout ( 300 secs) 2

DATALINK MAC SOURCE ADDRESS INPUT: 0000.0000.1000
DATALINK MAC DESTINATION ADDRESS INPUT: 6400.F125.59E6
IPV6 SOURCE ADDRESS: 2001:DB8::1
IPV6 DESTINATION ADDRESS: 2001:DB8:1::1
TRNS SOURCE PORT: 1111
TRNS DESTINATION PORT: 2222
IP VERSION: 6
IP PROTOCOL: 6
IP TOS: 0x05
IP TTL: 11
tcp flags: 0x20
counter bytes long: 132059538
counter packets long: 1158417
```

This table describes the significant fields shown in the display.

**Table 71: show flow monitor monitor-name cache Field Descriptions**

Field	Description
Cache type	Flow monitor cache type. The value is always normal, as it is the only supported cache type.
Cache Size	Number of entries in the cache.
Current entries	Number of entries in the cache that are in use.
Flows added	Flows added to the cache since the cache was created.
Flows aged	Flows expired from the cache since the cache was created.
Active timeout	Current value for the active timeout in seconds.
Inactive timeout	Current value for the inactive timeout in seconds.
DATALINK MAC SOURCE ADDRESS INPUT	MAC source address of input packets.
DATALINK MAC DESTINATION ADDRESS INPUT	MAC destination address of input packets.
IPV6 SOURCE ADDRESS	IPv6 source address.

show flow monitor

Field	Description
IPV6 DESTINATION ADDRESS	IPv6 destination address.
TRNS SOURCE PORT	Source port for the transport protocol.
TRNS DESTINATION PORT	Destination port for the transport protocol.
IP VERSION	IP version.
IP PROTOCOL	Protocol number.
IP TOS	IP type of service (ToS) value.
IP TTL	IP time-to-live (TTL) value.
tcp flags	Value of the TCP flags.
counter bytes	Number of bytes that have been counted.
counter packets	Number of packets that have been counted.

The following example displays the status, statistics, and data for the flow monitor named FLOW-MONITOR-1 in a table format:

```
Device# show flow monitor FLOW-MONITOR-1 cache format table
Cache type: Normal (Platform cache)
Cache size: Unknown
Current entries: 1

Flows added: 3
Flows aged: 2
- Active timeout ( 300 secs) 2

DATALINK MAC SRC ADDR INPUT DATALINK MAC DST ADDR INPUT IPV6 SRC ADDR IPV6 DST ADDR
TRNS SRC PORT TRNS DST PORT IP VERSION IP PROT IP TOS IP TTL tcp flags bytes long
pkts long
=====
===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== =====
===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== ===== =====
0000.0000.1000 6400.F125.59E6 2001:DB8::1 2001:DB8:1::1
1111 2222 6 6 0x05 11 0x20 132059538
1158417
```

The following example displays the status, statistics, and data for the flow monitor named FLOW-MONITOR-IPv6 (the cache contains IPv6 data) in record format:

```
Device# show flow monitor name FLOW-MONITOR-IPv6 cache format record
Cache type: Normal (Platform cache)
Cache size: Unknown
Current entries: 1

Flows added: 3
Flows aged: 2
- Active timeout ( 300 secs) 2

DATALINK MAC SOURCE ADDRESS INPUT: 0000.0000.1000
DATALINK MAC DESTINATION ADDRESS INPUT: 6400.F125.59E6
IPV6 SOURCE ADDRESS: 2001::2
IPV6 DESTINATION ADDRESS: 2002::2
```

```
TRNS SOURCE PORT: 1111
TRNS DESTINATION PORT: 2222
IP VERSION: 6
IP PROTOCOL: 6
IP TOS: 0x05
IP TTL: 11
tcp flags: 0x20
counter bytes long: 132059538
counter packets long: 1158417
```

The following example displays the status and statistics for a flow monitor:

```
Device# show flow monitor FLOW-MONITOR-1 statistics
Cache type: Normal (Platform cache)
Cache size: Unknown
Current entries: 1

Flows added: 3
Flows aged: 2
- Active timeout ( 300 secs) 2
```

show install

# show install

To display information about install packages, use the **show install** command in privileged EXEC mode.

```
show install {active | committed | inactive | log | package {bootflash: | flash: | webui:} | rollback | summary | uncommitted}
```

<b>Syntax Description</b>					
<b>active</b>	Displays information about active packages.				
<b>committed</b>	Displays package activations that are persistent.				
<b>inactive</b>	Displays inactive packages.				
<b>log</b>	Displays entries stored in the logging installation buffer.				
<b>package</b>	Displays metadata information about the package, including description, restart information, components in the package, and so on.				
{bootflash:   flash:   harddisk:   webui:}	Specifies the location of the install package.				
<b>rollback</b>	Displays the software set associated with a saved installation.				
<b>summary</b>	Displays information about the list of active, inactive, committed, and superseded packages.				
<b>uncommitted</b>	Displays package activations that are nonpersistent.				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Everest 16.6.1</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Everest 16.6.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Everest 16.6.1	This command was introduced.				
<b>Usage Guidelines</b>	Use the show commands to view the status of the install package.				

## Example

The following is sample output from the **show install package** command:

```
Device# show install package bootflash:cat3k-universalk9.2017-01-10_13.15.1.
CSCxxx.SSA.dmp.bin
Name: cat3k-universalk9.2017-01-10_13.15.1.CSCxxx.SS
Version: 16.6.1.0.199.1484082952.Everest
Platform: Catalyst3k
Package Type: dmp
Defect ID: CSCxxx
Package State: Added
Supersedes List: {}
Smu ID: 1
```

The following is sample output from the **show install summary** command:

```
Device# show install summary

Active Packages:
    bootflash:cat3k-universalk9.2017-01-10_13.15.1.CSCxxx.SSA.dmp.bin

Inactive Packages:
    No packages

Committed Packages:
    bootflash:cat3k-universalk9.2017-01-10_13.15.1.CSCxxx.SSA.dmp.bin

Uncommitted Packages:
    No packages

Device#
```

The table below lists the significant fields shown in the display.

**Table 72: show install summary Field Descriptions**

Field	Description
Active Packages	Name of the active install package.
Inactive Packages	List of inactive packages.
Committed Packages	Install packages that have saved or committed changes to the harddisk, so that the changes become persistent across reloads.
Uncommitted Packages	Intall package activations that are nonpersistent.

The following is sample output from the **show install log** command:

```
Device# show install log

[0|install_op_boot]: START Fri Feb 24 19:20:19 Universal 2017
[0|install_op_boot]: END SUCCESS Fri Feb 24 19:20:23 Universal 2017
[3|install_add]: START Sun Feb 26 05:55:31 UTC 2017
[3|install_add( FATAL )]: File path (scp) is not yet supported for this command
[4|install_add]: START Sun Feb 26 05:57:04 UTC 2017
[4|install_add]: END SUCCESS
/bootflash/cat3k-universalk9.2017-01-10_13.15.1.CSCvb12345.SSA.dmp.bin
Sun Feb 26 05:57:22 UTC 2017
[5|install_activate]: START Sun Feb 26 05:58:41 UTC 2017
```

#### Related Commands

Command	Description
<b>install</b>	Installs SMU packages.

**show license all**

# show license all

To display the entitlements information, use the **show license all** command in privileged EXEC mode.

## show license all

<b>Syntax Description</b>	This command has no arguments or keywords.	
<b>Command Default</b>	Licensing information of multiple show license commands is concatenated and displayed.	
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>		
Release	Modification	
Cisco IOS XE Fuji 16.9.1	This command was introduced.	
Cisco IOS XE Gibraltar 16.12.6	What was EVAL MODE or EVAL EXPIRY prior to Cisco IOS XE Gibraltar 16.12.6, was changed to display IN-USE.	
	This change applies only to a device that meets the following conditions:	
	<ul style="list-style-type: none"> <li>• Was using an evaluation or expired evaluation license prior to Cisco IOS XE Gibraltar 16.12.6.</li> <li>• Is not connected to CSSM</li> <li>• Is running Cisco IOS XE Gibraltar 16.12.6 or later release.</li> </ul>	
	If a device is connected to CSSM, there is no change.	

<b>Usage Guidelines</b>	The command also displays whether smart licensing is enabled, all associated licensing certificates, compliance status, and so on.
-------------------------	--

## Examples

[Registered and Authorized Licenses, on page 1250](#)

[Evaluation Licenses, on page 1252](#)

### Registered and Authorized Licenses

The following is sample output of the **show license all** command on a device that is using registered and authorized licenses:

```
Device# show license all
Smart Licensing Status
=====
Smart Licensing is ENABLED
Registration:
```

Status: REGISTERED  
Smart Account: EG-SA  
Virtual Account: EG-VA  
Export-Controlled Functionality: Allowed  
Initial Registration: SUCCEEDED on Jul 09 10:08:19 2018 UTC  
Last Renewal Attempt: None  
Next Renewal Attempt: Jan 05 10:08:19 2019 UTC  
Registration Expires: Jul 09 10:02:35 2019 UTC

License Authorization:  
Status: AUTHORIZED on Jul 09 11:16:10 2018 UTC  
Last Communication Attempt: SUCCEEDED on Jul 09 11:16:10 2018 UTC  
Next Communication Attempt: Aug 08 11:16:09 2018 UTC  
Communication Deadline: Oct 07 11:10:28 2018 UTC

License Conversion:  
Automatic Conversion Enabled: False  
Active: PID:WS-C3850-24P,SN:FOC1842U0FC  
Status: Successful on Jul 09 11:16:06 2018 UTC  
Standby: PID:WS-C3850-24P,SN:FOC1842U0CZ  
Status: Successful on Jul 09 11:16:06 2018 UTC  
Member: PID:WS-C3850-24P,SN:FOC1842X0FD  
Status: Successful on Jul 09 11:16:06 2018 UTC

Utility:  
Status: DISABLED

Data Privacy:  
Sending Hostname: yes  
Callhome hostname privacy: DISABLED  
Smart Licensing hostname privacy: DISABLED  
Version privacy: DISABLED

Transport:  
Type: Callhome

License Usage  
=====

C3850-DNA-E-24 (C3850-24 DNA Essentials):  
Description: C3850-DNA-E  
Count: 3  
Version: 1.0  
Status: AUTHORIZED

C3850\_24\_Lanbase (C3850-24 LAN Base):  
Description: C3850 24 Port Lanbase  
Count: 3  
Version: 1.0  
Status: AUTHORIZED

Product Information  
=====

UDI: PID:WS-C3850-24P,SN:FOC1842U0FC

HA UDI List:  
Active:PID:WS-C3850-24P,SN:FOC1842U0FC  
Standby:PID:WS-C3850-24P,SN:FOC1842U0CZ  
Member:PID:WS-C3850-24P,SN:FOC1842X0FD

Agent Version  
=====

Smart Agent for Licensing: 4.4.13\_rel/116  
Component Versions: SA:(1\_3\_dev)1.0.15, SI:(dev22)1.2.1, CH:(rel5)1.0.3, PK:(dev18)1.0.3

**show license all**

```
Reservation Info
=====
License reservation: DISABLED
```

### Evaluation Licenses

The following is sample output of the **show license all** command on a device that *was* using evaluation licenses prior to Cisco IOS XE Gibraltar 16.12.6, is not connected to CSSM, and is now running Cisco IOS XE Gibraltar 16.12.6. In the output, note how the status is no longer displayed as EVAL MODE, but IN-USE. There is no change in the registration status of the device - this continues to be displayed as UNREGISTERED.

```
Device# show license all

Smart Licensing Status
=====

Smart Licensing is ENABLED

Registration:
  Status: UNREGISTERED
  Export-Controlled Functionality: NOT ALLOWED

License Authorization:
  Status: IN-USE

License Conversion:
  Automatic Conversion Enabled: False
  Active: PID:WS-C3850-48T,SN:FOC2231L38N
  Status: Not started
  Standby: PID:WS-C3850-48P,SN:FOC2250U0P9
  Status: Not started
  Member: PID:WS-C3850-12X48U,SN:FOC2235X0RY
  Status: Not started
  Member: PID:WS-C3850-12S,SN:FCW2232D1DQ
  Status: Not started

Export Authorization Key:
  Features Authorized:
    <none>

Utility:
  Status: DISABLED

Data Privacy:
  Sending Hostname: yes
  Callhome hostname privacy: DISABLED
  Smart Licensing hostname privacy: DISABLED
  Version privacy: DISABLED

Transport:
  Type: Callhome

License Usage
=====

(C3850-48 LAN Base):
  Description:
  Count: 3
  Version: 1.0
  Status: IN-USE
  Export status: NOT RESTRICTED
```

```
(C3850-12XS LAN Base):
Description:
Count: 1
Version: 1.0
Status: IN-USE
Export status: NOT RESTRICTED

Product Information
=====
UDI: PID:WS-C3850-48T,SN:FOC2231L38N

HA UDI List:
Active:PID:WS-C3850-48T,SN:FOC2231L38N
Standby:PID:WS-C3850-48P,SN:FOC2250U0P9
Member:PID:WS-C3850-12X48U,SN:FOC2235X0RY
Member:PID:WS-C3850-12S,SN:FCW2232D1DQ

Agent Version
=====
Smart Agent for Licensing: 4.8.16_rel/80

Reservation Info
=====
License reservation: DISABLED
```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show license status</b>	Displays compliance status of a license.
<b>show license summary</b>	Displays summary of all active licenses.
<b>show license udi</b>	Displays UDI.
<b>show license usage</b>	Displays license usage information
<b>show tech-support license</b>	Displays the debug output.

**show license status**

# show license status

To display the compliance status of a license, use the **show license status** command in privileged EXEC mode.

## show license status

<b>Syntax Description</b>	This command has no arguments or keywords.	
<b>Command Default</b>	Compliance status of all licenses available on the device is displayed.	
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Fuji 16.9.1	This command was introduced.
	Cisco IOS XE Gibraltar 16.12.6	What was EVAL MODE or EVAL EXPIRED prior to Cisco IOS XE Gibraltar 16.12.6, was changed to display IN-USE.  This change applies only to a device that meets the following conditions: <ul style="list-style-type: none"><li>• Was using an evaluation or expired evaluation license prior to Cisco IOS XE Gibraltar 16.12.6.</li><li>• Is not connected to CSSM</li><li>• Is now running Cisco IOS XE Gibraltar 16.12.6 or a later release.</li></ul>

If a device is connected to CSSM, there is no change.

## Examples

[Registered and Authorized Licenses, on page 1254](#)

[Evaluation Licenses, on page 1255](#)

## Registered and Authorized Licenses

The following is sample output of the **show license status** command on a device that is using registered and authorized licenses:

```
Device# show license status
Smart Licensing is ENABLED

Utility:
    Status: DISABLED

Data Privacy:
    Sending Hostname: yes
        Callhome hostname privacy: DISABLED
        Smart Licensing hostname privacy: DISABLED
    Version privacy: DISABLED
```

```

Transport:
  Type: Callhome

Registration:
  Status: REGISTERED
  Smart Account: EG-SA
  Virtual Account: EG-VA
  Export-Controlled Functionality: Allowed
  Initial Registration: SUCCEEDED on Jul 09 10:08:19 2018 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: Jan 05 10:08:19 2019 UTC
  Registration Expires: Jul 09 10:02:35 2019 UTC

License Authorization:
  Status: AUTHORIZED on Jul 09 11:16:10 2018 UTC
  Last Communication Attempt: SUCCEEDED on Jul 09 11:16:10 2018 UTC
  Next Communication Attempt: Aug 08 11:16:09 2018 UTC
  Communication Deadline: Oct 07 11:10:28 2018 UTC

License Conversion:
  Automatic Conversion Enabled: False
  Active: PID:WS-C3850-24P,SN:FOC1842U0FC
  Status: Successful on Jul 09 11:16:06 2018 UTC
  Standby: PID:WS-C3850-24P,SN:FOC1842U0CZ
  Status: Successful on Jul 09 11:16:06 2018 UTC
  Member: PID:WS-C3850-24P,SN:FOC1842X0FD
  Status: Successful on Jul 09 11:16:06 2018 UTC

```

## Evaluation Licenses

The following is sample output of the **show license status** command on a device that *was* using evaluation licenses prior to Cisco IOS XE Gibraltar 16.12.6, is not connected to CSSM, and is now running Cisco IOS XE Gibraltar 16.12.6. In the output, note how the status is no longer displayed as EVAL MODE, but IN-USE. There is no change in the registration status of the device - this continues to be displayed as UNREGISTERED.

```

Device# show license status

Smart Licensing is ENABLED

Utility:
  Status: DISABLED

Data Privacy:
  Sending Hostname: yes
  Callhome hostname privacy: DISABLED
  Smart Licensing hostname privacy: DISABLED
  Version privacy: DISABLED

Transport:
  Type: Callhome

Registration:
  Status: UNREGISTERED
  Export-Controlled Functionality: NOT ALLOWED

License Authorization:
  Status: IN-USE

License Conversion:
  Automatic Conversion Enabled: False
  Active: PID:WS-C3850-48T,SN:FOC2231L38N
  Status: Not started

```

**show license status**

```

Standby: PID:WS-C3850-48P,SN:FOC2250U0P9
Status: Not started
Member: PID:WS-C3850-12X48U,SN:FOC2235X0RY
Status: Not started
Member: PID:WS-C3850-12S,SN:FCW2232D1DQ
Status: Not started

```

```

Export Authorization Key:
  Features Authorized:
    <none>

```

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show license all</b>	Displays entitlements information.
<b>show license summary</b>	Displays summary of all active licenses.
<b>show license udi</b>	Displays UDI.
<b>show license usage</b>	Displays license usage information
<b>show tech-support license</b>	Displays the debug output.

# show license summary

To display a summary of all active licenses, use the **show license summary** command in privileged EXEC.

## show license summary

<b>Syntax Description</b>	This command has no arguments or keywords.	
<b>Command Default</b>	All available licenses on the device are displayed.	
<b>Command Modes</b>	Privileged EXEC (#)	
<hr/>		
Command History	Release	Modification
	Cisco IOS XE Fuji 16.9.1	This command was introduced.
	Cisco IOS XE Gibraltar 16.12.6	What was EVAL MODE or EVAL EXPIRED prior to Cisco IOS XE Gibraltar 16.12.6, was changed to display IN-USE.  This change applies only to a device that meets the following conditions: <ul style="list-style-type: none"><li>• Was using an evaluation or expired evaluation license prior to Cisco IOS XE Gibraltar 16.12.6.</li><li>• Is not connected to CSSM</li><li>• Is now running Cisco IOS XE Gibraltar 16.12.6 or a later release.</li></ul>
If a device is connected to CSSM, there is no change.		

## Examples

[Registered and Authorized Licenses, on page 1257](#)

[Evaluation Licenses, on page 1258](#)

[Expired Evaluation Licenses, on page 1259](#)

## Registered and Authorized Licenses

The following is sample output of the **show license summary** command on a device that is using registered and authorized licenses:

```
Device# show license summary
Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Smart Account: EG-SA
  Virtual Account: EG-VA
  Export-Controlled Functionality: Allowed
  Last Renewal Attempt: None
  Next Renewal Attempt: Jan 05 10:08:20 2019 UTC
```

**show license summary**

```

License Authorization:
  Status: AUTHORIZED
  Last Communication Attempt: SUCCEEDED
  Next Communication Attempt: Aug 08 11:16:10 2018 UTC

```

License Usage:		Count	Status
License	Entitlement tag		
C3850-DNA-E-24	(C3850-24 DNA Essentials)	3	AUTHORIZED
C3850_24_Lanbase	(C3850-24 LAN Base)	3	AUTHORIZED

**Evaluation Licenses**

The following are sample outputs of the **show license summary** command on a device that *was* using evaluation licenses prior to Cisco IOS XE Gibraltar 16.12.6, is not connected to CSSM, and is now running Cisco IOS XE Gibraltar 16.12.6. In the output, note how the status is no longer displayed as EVAL MODE, but IN-USE. The notification relating to the remaining evaluation period is also no longer displayed. There is no change in the registration status of the device - this continues to be displayed as UNREGISTERED.

Sample output of **show license summary**, prior to Cisco IOS XE Gibraltar 16.12.6:

```

Device# show license summary

Smart Licensing is ENABLED
License Reservation is ENABLED

Registration:
  Status: UNREGISTERED
  Export-Controlled Functionality: NOT ALLOWED

License Authorization:
  Status: EVAL MODE
  Evaluation Period Remaining: 89 days, 22 hours, 47 minutes, 10 seconds

License Usage:
  License          Entitlement tag          Count Status
  -----
  C3850-DNA-E-24  (C3850-24 DNA Essentials)  1  EVAL MODE
  C3850_24_Lanbase (C3850-24 LAN Base)       1  EVAL MODE

```

Sample output of **show license summary**, in Cisco IOS XE Gibraltar 16.12.6:

```

Device# show license summary

Smart Licensing is ENABLED
License Reservation is ENABLED

Registration:
  Status: UNREGISTERED
  Export-Controlled Functionality: NOT ALLOWED

License Authorization:
  Status: IN-USE

License Usage:
  License          Entitlement tag          Count Status
  -----
  C3850-DNA-E-24  (C3850-24 DNA Essentials)  1  IN-USE

```

C3850\_24\_Lanbase (C3850-24 LAN Base)

1 IN-USE

### Expired Evaluation Licenses

The following are "before" and "after" sample outputs of the **show license summary** command on a device that was using expired evaluation licenses prior to Cisco IOS XE Gibraltar 16.12.6, is not connected to CSSM, and is now running Cisco IOS XE Gibraltar 16.12.6. In the output, note how the status is no longer displayed as EVAL EXPIRED, but IN-USE. There is no change in the registration status of the device - this continues to be displayed as UNREGISTERED.

Sample output of **show license summary**, prior to Cisco IOS XE Gibraltar 16.12.6:

```
Device# show license summary

Smart Licensing is ENABLED

Registration:
  Status: UNREGISTERED
  Export-Controlled Functionality: NOT ALLOWED

License Authorization:
  Status: EVAL EXPIRED

License Usage:
  License          Entitlement tag          Count Status
  -----           -----
  (C3850-24XS IP Services)      1 EVAL EXPIRED
  (C3850-12XS DNA Advantage)    1 EVAL EXPIRED
```

Sample output of **show license summary**, in Cisco IOS XE Gibraltar 16.12.6:

```
Device# show license summary

Smart Licensing is ENABLED
License Reservation is ENABLED

Registration:
  Status: UNREGISTERED
  Export-Controlled Functionality: NOT ALLOWED

License Authorization:
  Status: IN-USE

License Usage:
  License          Entitlement tag          Count Status
  -----           -----
  (C3850-24 IP Services)      1 IN-USE
  (C3850-24 DNA Advantage)    1 IN-USE
```

### Related Commands

Command	Description
<b>show license all</b>	Displays entitlements information.
<b>show license status</b>	Displays compliance status of a license.
<b>show license udi</b>	Displays UDI.

**show license summary**

Command	Description
<b>show license usage</b>	Displays license usage information
<b>show tech-support license</b>	Displays the debug output.

# show license tech support

To display detailed licensing information, which the technical support team can use for troubleshooting, use the **show license tech support** command in privileged EXEC mode.

## show license tech support

**Syntax Description** This command has no arguments or keywords.

**Command Default** Detailed licensing information for all available licenses is displayed.

**Command Modes** Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Fuji 16.9.1	This command was introduced.
	Cisco IOS XE Gibraltar 16.12.6	What was EVAL MODE or EVAL EXPIRED prior to Cisco IOS XE Gibraltar 16.12.6, was changed to display IN-USE.  This change applies only to a device that meets the following conditions: <ul style="list-style-type: none"><li>• Was using an evaluation or expired evaluation license prior to Cisco IOS XE Gibraltar 16.12.6.</li><li>• Is not connected to CSSM</li><li>• Is now running Cisco IOS XE Gibraltar 16.12.6 or a later release.</li></ul>

If a device is connected to CSSM, there is no change.

## Examples

The following is sample output of the **show license tech support** command on a device that *was* using evaluation licenses prior to Cisco IOS XE Gibraltar 16.12.6, is not connected to CSSM, and is now running Cisco IOS XE Gibraltar 16.12.6. In the output, note how the status is no longer displayed as EVAL MODE, but IN-USE. There is no change in the registration status of the device - this continues to be displayed as UNREGISTERED.

```
Device# show license tech support
Smart Licensing Tech Support info

Smart Licensing Status
=====

Smart Licensing is ENABLED

Registration:
  Status: UNREGISTERED
  Export-Controlled Functionality: NOT ALLOWED

License Authorization:
  Status: IN-USE

License Conversion:
  Automatic Conversion Enabled: False
  Active: PID:WS-C3850-48T,SN:FOC2231L38N
```

**show license tech support**

```

Status: Not started
Standby: PID:WS-C3850-48P,SN:FOC2250U0P9
Status: Not started
Member: PID:WS-C3850-12X48U,SN:FOC2235X0RY
Status: Not started
Member: PID:WS-C3850-12S,SN:FCW2232D1DQ
Status: Not started

Export Authorization Key:
  Features Authorized:
    <none>

Utility:
  Status: DISABLED

Data Privacy:
  Sending Hostname: yes
  Callhome hostname privacy: DISABLED
  Smart Licensing hostname privacy: DISABLED
  Version privacy: DISABLED

Transport:
  Type: Callhome

License Usage
=====
Handle: 1
  License: <empty>
  Entitlement tag:
  regid.2018-02.com.cisco.C3850_48_Lanbase,1.0_055ff5a5-e741-4c01-892b-345e342308cd
  Description: <empty>
  Count: 3
  Version: 1.0
  Status: IN-USE(6)
  Status time: Jun 22 07:52:45 2021 UTC
  Request Time: Jun 22 07:52:45 2021 UTC
  Export status: NOT RESTRICTED
  Soft Enforced: True

Handle: 4
  License: <empty>
  Entitlement tag:
  regid.2018-02.com.cisco.C3850_XS_12_Lanbase,1.0_269e0b71-86b5-433e-a179-16d428bc95c1
  Description: <empty>
  Count: 1
  Version: 1.0
  Status: IN-USE(6)
  Status time: Jun 22 07:52:45 2021 UTC
  Request Time: Jun 22 07:52:45 2021 UTC
  Export status: NOT RESTRICTED
  Soft Enforced: True

Product Information
=====
UDI: PID:WS-C3850-48T,SN:FOC2231L38N

HA UDI List:
  Active:PID:WS-C3850-48T,SN:FOC2231L38N
  Standby:PID:WS-C3850-48P,SN:FOC2250U0P9
  Member:PID:WS-C3850-12X48U,SN:FOC2235X0RY
  Member:PID:WS-C3850-12S,SN:FCW2232D1DQ

Agent Version
=====

```

```
Smart Agent for Licensing: 4.8.16_rel/80

Upcoming Scheduled Jobs
=====
Current time: Jun 22 10:45:21 2021 UTC
Daily: Jun 23 07:52:02 2021 UTC (21 hours, 6 minutes, 41 seconds remaining)
Init Flag Check: Not Available
Evaluation Expiration Check: Sep 18 13:36:22 2021 UTC (88 days, 2 hours, 51 minutes, 1 seconds remaining)
In Use Countdown: Jul 20 13:36:22 2021 UTC (28 days, 2 hours, 51 minutes, 1 seconds remaining)
Reservation configuration mismatch between nodes in HA mode: Jan 01 00:00:00 1970 UTC
(1158031640 days, 20 hours, 14 minutes, 55 seconds remaining)

License Certificates
=====
Production Cert: True
Not registered. No certificates installed

HA Info
=====
RP Role: Active
Chassis Role: Active
Behavior Role: Active
RMF: True
CF: True
CF State: Stateless
Message Flow Allowed: False

Reservation Info
=====
License reservation: DISABLED

Other Info
=====
Software ID: regid.2014-07.com.cisco.Prd_Catalyst3850,1.0_b5b32167-3385-487e-8ba5-7eea7250ec81
Agent State: unidentified
TS enable: True
Transport: Callhome
Locale: en_US.UTF-8
Debug flags: 0x7
Privacy Send Hostname: True
Privacy Send IP: True
Build type:: Production
sizeof(char) : 1
sizeof(int) : 4
sizeof(long) : 4
sizeof(char *): 8
sizeof(time_t): 4
sizeof(size_t): 8
Endian: Big
Write Erase Occurred: False
XOS version: 0.12.0.0
Config Persist Received: True
Message Version: 1.3
connect_info.name: <empty>
connect_info.version: <empty>
connect_info.additional: <empty>
connect_info.prod: False
connect_info.capabilities: <empty>
agent.capabilities: UTILITY, DLC, AppHA, MULTITIER, EXPORT_2, OK_TRY AGAIN
SmartAgentClientWaitForServer: 2000
SmartAgentCmRetrySend: True
SmartAgentClientIsUnified: True
SmartAgentCmClient: True
```

**show license tech support**

```
SmartAgentClientName: UnifiedClient
builtInEncryption: True
enableOnInit: True
routingReadyByEvent: True
systemInitByEvent: True
evDisplayInUse: True
SmartAgentFederalLicense: True
SmartAgent_Crypto_Exit_CB: 0xAAB8A9EF80
SmartAgent_Crypto_Start_CB: 0xAAB8A9EF78
SmartAgentMultiTenant: False
attr365DayEvalSyslog: True
checkPointWriteOnly: False
SmartAgentDelayCertValidation: False
enableByDefault: False
conversionAutomatic: False
conversionAllowed: True
storageEncryptDisable: False
storageLoadUnencryptedDisable: False
TSPluginDisable: False
bypassUDICheck: False
loggingAddTStamp: False
loggingAddTid: True
platformOverrideEvent: SmartAgentSystemDataListChanged
WaitForHaRole: False
standbyIsHot: True
chkPtType: 2
delayCommInit: False
roleByEvent: True
maxTraceLength: 150
traceAlwaysOn: True
debugFlags: 0
Event log max size: 5120 KB
Event log current size: 250 KB

Platform Provided Mapping Table
=====
<empty>
```

# show license udi

To display the Unique Device Identifier (UDI), use the **show license udi** command in privileged EXEC mode.

## show license udi

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Default</b>	Privileged EXEC (#)
------------------------	---------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Fuji 16.9.1	This command was introduced.

## Example

This example shows a sample output from the **show license udi** command:

```
Device# show license udi
UDI: PID:WS-C3850-24P,SN:FOC1842U0FC

HA UDI List:
  Active:PID:WS-C3850-24P,SN:FOC1842U0FC
  Standby:PID:WS-C3850-24P,SN:FOC1842U0CZ
  Member:PID:WS-C3850-24P,SN:FOC1842X0FD
```

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>show license all</b>	Displays entitlements information.
	<b>show license status</b>	Displays compliance status of a license.
	<b>show license summary</b>	Displays summary of all active licenses.
	<b>show license usage</b>	Displays license usage information
	<b>show tech-support license</b>	Displays the debug output.

**show license usage**

# show license usage

To display license usage information, use the **show license usage** command in privileged EXEC mode.

## show license usage

**Syntax Description** This command has no arguments or keywords.

**Command Default** License usage information is displayed.

**Command Modes** Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Fuji 16.9.1	This command was introduced.

This example shows a sample output from the **show license usage** command:

```
Device# show license usage
License Authorization:
  Status: AUTHORIZED on Jul 09 11:16:10 2018 UTC

C3850-DNA-E-24 (C3850-24 DNA Essentials):
  Description: C3850-DNA-E
  Count: 3
  Version: 1.0
  Status: AUTHORIZED

C3850_24_Lanbase (C3850-24 LAN Base):
  Description: C3850 24 Port Lanbase
  Count: 3
  Version: 1.0
  Status: AUTHORIZED
```

## Related Commands

Command	Description
<b>show license all</b>	Displays entitlements information.
<b>show license status</b>	Displays compliance status of a license.
<b>show license summary</b>	Displays summary of all active licenses.
<b>show license udi</b>	Displays UDI.
<b>show tech-support license</b>	Displays the debug output.

# show location

To display location information, use the **show location** command in privileged EXEC mode.

```
show location {detail mac-addr|plm|statistics|summary rfid|rfid {client|config|detail MAC-addr|summary}}
```

## Syntax Description

<b>detail</b> <i>mac-addr</i>	Displays detailed location information with the RSSI table for a particular client.
<b>plm</b>	Displays location path loss measurement (CCX S60) configuration.
<b>statistics</b>	Displays location-based system statistics.
<b>summary</b>	Displays location-based system summary information.
<b>rfid</b>	Displays the RFID tag tracking information.
<b>client</b>	Displays the summary of RFID tags that are clients.
<b>config</b>	Displays the configuration options for RFID tag tracking.
<b>detail</b> <i>MAC-addr</i>	Displays the detailed information for one rfid tag.
<b>summary</b>	Displays summary information for all known rfid tags.

## Command Default

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

The following is sample output from the **show location plm** command:

```
Device# show location plm
Location Path Loss Configuration

Calibration client      : Disabled, Radio: Multiband
Normal clients          : Disabled
Burst interval          : 60
```

show location ap-detect

## show location ap-detect

To display the location information detected by specified access point, use the **show location ap-detect** command in privileged EXEC mode.

**show location ap-detect {all | client | rfid | rogue-ap | rogue-client} ap-name**

<b>Syntax Description</b>	<b>all</b> Displays information of the client, RFID, rogue access point, and rogue client. <b>client</b> Displays the client information. <b>rfid</b> Displays RFID information. <b>rogue-ap</b> Displays rogue access point information. <b>rogue-client</b> Displays rogue client information. <b>ap-name</b> Specified access point name.
---------------------------	---

**Command Default** No default behavior or values.

**Command Modes** Privileged EXEC

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

The following is sample output from the **show location ap-detect client** command:

```
Device# show location ap-detect client AP02
Clients

MAC Address      Status       Slot   Antenna    RSSI
-----
2477.0389.96ac  Associated   1      0          -60
2477.0389.96ac  Associated   1      1          -61
2477.0389.96ac  Associated   0      0          -46
2477.0389.96ac  Associated   0      1          -41
```

RFID Tags

Rogue AP's

Rogue Clients

```
MAC Address      State        Slot   Rssi
-----
0040.96b3.bce6  Alert        1     -58
586d.8ff0.891a  Alert        1     -72
```



**show logging onboard switch uptime**

# show logging onboard switch uptime

To display a history of all reset reasons for all modules or switches in a system, use the **show logging onboard switch uptime** command.

```
show logging onboard switch { switch-number | active | standby } uptime [ [ [ continuous | detail ] start hour day month [year] [end hour day month year] ] ] | summary
```

## Syntax Description

<b>switch</b> <i>switch-number</i>	Specifies a switch. Enter the switch number.
<b>active</b>	Specifies the active instance.
<b>standby</b>	Specifies the standby instance.
<b>continuous</b>	(Optional) Displays continuous data.
<b>detail</b>	(Optional) Displays detailed data.
<b>start</b> <i>hour day month year</i>	(Optional) Specifies the start time to display data.
<b>end</b> <i>hour day month year</i>	(Optional) Specifies the end time to display data.
<b>summary</b>	(Optional) Displays summary data.

## Command Modes

Privileged EXEC(#)

## Command History

Release	Modification
Cisco IOS XE Denali 16.1.1	This command was introduced.
Cisco IOS XE Gibraltar 16.11.1	The output of this command was updated to display the reload reasons for members in a stack.

## Examples:

The following is a sample output from the **show logging onboard switch active uptime continuous** command:

```
Device# show logging onboard switch active uptime continuous
-----
UPTIME CONTINUOUS INFORMATION
-----
Time Stamp      | Reset           | Uptime
MM/DD/YYYY HH:MM:SS | Reason          | years weeks days hours minutes
-----
06/17/2018 19:42:56 Reload          0   0   0   0   5
06/17/2018 19:56:31 Reload          0   0   0   0   5
06/17/2018 20:10:46 Reload          0   0   0   0   5
06/17/2018 20:23:48 Reload          0   0   0   0   5
06/17/2018 20:37:20 Reload Command 0   0   0   0   5
06/18/2018 17:09:23 Reload Command 0   0   0   20  5
06/18/2018 17:18:39 redundancy force-switchover 0   0   0   0   5
06/18/2018 18:33:33 Reload          0   0   0   1   5
06/18/2018 19:03:05 Reload          0   0   0   0   5
06/18/2018 19:40:30 Reload          0   0   0   0   5
```

```

06/18/2018 20:37:47 Reload 0 0 0 0 5
06/18/2018 20:51:13 Reload 0 0 0 0 5
06/18/2018 21:04:08 Reload 0 0 0 0 5
06/18/2018 21:18:23 Reload 0 0 0 0 5
06/18/2018 21:31:25 Reload 0 0 0 0 5
06/18/2018 21:45:15 Reload 0 0 0 0 5
06/18/2018 21:59:02 Reload 0 0 0 0 5
06/18/2018 22:11:41 Reload 0 0 0 0 5
06/18/2018 22:24:27 Reload 0 0 0 0 5
06/18/2018 22:39:14 Reload Command 0 0 0 0 4
06/19/2018 00:01:59 Reload Command 0 0 0 1 5
06/19/2018 00:13:21 redundancy force-switchover 0 0 0 0 5
06/19/2018 01:05:42 redundancy force-switchover 0 0 0 0 5
06/20/2018 02:37:16 redundancy force-switchover 0 0 1 1 5
06/20/2018 02:50:03 redundancy force-switchover 0 0 0 0 5
06/20/2018 03:02:13 redundancy force-switchover 0 0 0 0 5
06/20/2018 03:14:26 redundancy force-switchover 0 0 0 0 5
06/20/2018 03:26:44 redundancy force-switchover 0 0 0 0 5
06/20/2018 03:38:58 redundancy force-switchover 0 0 0 0 5
06/20/2018 03:52:43 redundancy force-switchover 0 0 0 0 5
06/20/2018 04:05:16 redundancy force-switchover 0 0 0 0 5
.
.
.

```

The following is a sample output from the **show logging onboard switch active uptime detail** command:

```
Device# show logging onboard switch active uptime detail
```

---

#### UPTIME SUMMARY INFORMATION

---

```

First customer power on : 06/10/2017 09:28:22
Total uptime           : 0 years 50 weeks 4 days 13 hours 38 minutes
Total downtime         : 0 years 15 weeks 4 days 11 hours 52 minutes
Number of resets       : 75
Number of slot changes : 9
Current reset reason  : PowerOn
Current reset timestamp: 09/17/2018 10:59:57
Current slot           : 1
Chassis type          : 0
Current uptime         : 0 years 0 weeks 0 days 0 hours 0 minutes

```

---



---

#### UPTIME CONTINUOUS INFORMATION

---

Time Stamp MM/DD/YYYY HH:MM:SS	Reset Reason	Uptime				
		years	weeks	days	hours	minutes
06/10/2017 09:28:22	Reload	0	0	0	0	0
<snip>						
09/17/2018 09:07:44	PowerOn	0	0	3	15	5
09/17/2018 10:16:26	Reload Command	0	0	0	1	5
09/17/2018 10:59:57	PowerOn	0	0	0	0	5

---

The following is a sample output from the **show logging onboard switch standby uptime detail** command:

```
Device# show logging onboard switch standby uptime detail
```

---

#### UPTIME SUMMARY INFORMATION

---

```
First customer power on : 06/10/2017 11:51:26
```

show logging onboard switch uptime

```
Total uptime          : 0 years 46 weeks 0 days 11 hours 44 minutes
Total downtime       : 0 years 20 weeks 1 days 10 hours 45 minutes
Number of resets     : 79
Number of slot changes : 13
Current reset reason : PowerOn
Current reset timestamp : 09/17/2018 10:59:57
Current slot         : 2
Chassis type         : 0
Current uptime        : 0 years 0 weeks 0 days 0 hours 5 minutes
-----
-----
-----  
UPTIME CONTINUOUS INFORMATION  
-----  


| Time Stamp<br>MM/DD/YYYY HH:MM:SS | Reset Reason                | Uptime<br>years weeks days hours minutes |
|-----------------------------------|-----------------------------|------------------------------------------|
| 06/10/2017 11:51:26               | <snip>                      | 0 0 0 0 0                                |
| 08/10/2018 09:13:58               | LocalSoft                   | 0 0 2 5 4                                |
| 08/28/2018 14:21:42               | Reload Slot Command         | 0 0 0 3 5                                |
| 08/28/2018 14:34:29               | System requested reload     | 0 0 0 0 0                                |
| 09/11/2018 09:08:15               | Reload                      | 0 0 1 8 5                                |
| 09/11/2018 19:15:06               | redundancy force-switchover | 0 0 0 9 4                                |
| 09/13/2018 16:50:18               | Reload Command              | 0 0 1 21 6                               |
| 09/17/2018 10:55:09               | PowerOn                     | 0 0 0 0 5                                |


```

The following is a sample output from the **show logging onboard switch active uptime summary** command:

```
Device# show logging onboard switch active uptime summary
-----
-----  
UPTIME SUMMARY INFORMATION  
-----  
First customer power on : 04/26/2018 21:45:39
Total uptime           : 0 years 20 weeks 2 days 12 hours 22 minutes
Total downtime         : 0 years 2 weeks 2 days 8 hours 40 minutes
Number of resets       : 1900
Number of slot changes : 18
Current reset reason  : Reload Command
Current reset timestamp : 09/26/2018 20:43:15
Current slot           : 1
Chassis type          : 91
Current uptime         : 0 years 0 weeks 5 days 22 hours 5 minutes
-----
```

# show mac address-table move update

To display the MAC address-table move update information on the device, use the **show mac address-table move update** command in EXEC mode.

## show mac address-table move update

<b>Syntax Description</b>	This command has no arguments or keywords.
---------------------------	--

<b>Command Default</b>	No default behavior or values.
------------------------	--------------------------------

<b>Command Modes</b>	User EXEC
----------------------	-----------

Privileged EXEC

<b>Command History</b>	<b>Release</b>
------------------------	----------------

Cisco IOS XE 3.2SE

## Example

This example shows the output from the **show mac address-table move update** command:

```
Device# show mac address-table move update

Switch-ID : 010b.4630.1780
Dst mac-address : 0180.c200.0010
Vlans/Macs supported : 1023/8320
Default/Current settings: Rcv Off/On, Xmt Off/On
Max packets per min : Rcv 40, Xmt 60
Rcv packet count : 10
Rcv conforming packet count : 5
Rcv invalid packet count : 0
Rcv packet count this min : 0
Rcv threshold exceed count : 0
Rcv last sequence# this min : 0
Rcv last interface : Po2
Rcv last src-mac-address : 0003.fd6a.8701
Rcv last switch-ID : 0303.fd63.7600
Xmt packet count : 0
Xmt packet count this min : 0
Xmt threshold exceed count : 0
Xmt pak buf unavail cnt : 0
Xmt last interface : None
```

**show platform integrity**

# show platform integrity

To display checksum record for the boot stages , use the **show platform integrity** command in privileged EXEC mode.

**show platform integrity [sign [nonce <nonce>]]**

<b>Syntax Description</b>	<b>sign</b> (Optional) Show signature <b>nonce</b> (Optional) Enter a nonce value				
<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.3.2</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Denali 16.3.2	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Denali 16.3.2	This command was introduced.				

## Examples

This example shows how to view the checksum record for boot stages :

```
Device# show platform integrity sign
PCR0: EE47F8644C2887D9BD4DE3E468DD27EB93F4A606006A0B7006E2928C50C7C9AB
PCR8: E7B61EC32AFA43DA1FF4D77F108CA266848B32924834F5E41A9F6893A9CB7A38
Signature version: 1
Signature:
816C5A29741BBAC1961C109FFC36DA5459A44DBF211025F539AFB4868EF91834C05789
5DAFBC7474F301916B7D0D08ABE5E05E66598426A73E921024C21504383228B6787B74
8526A305B17DAD3CF8705BACFD51A2D55A333415CABC73DAFDEEF8777AA77F482EC4B
731A09826A41FB3EFC46DC02FBA666534DBEC7DCC0C029298DB8462A70DBA26833C2A
1472D1F08D721BA941CB94A418E43803699174572A5759445B3564D8EAE57D64AE304
EE1D2A9C53E93E05B24A92387E261199CED8D8A0CE7134596FF8D2D6E6DA773757C70C
D3BA91C43A591268C248DF32658999276FB972153ABE823F0ACFE9F3B6F0AD1A00E257
4A4CC41C954015A59FB8FE
Platform: WS-C3650-12X48UZ
```

# show platform software fed switch punt cause

To display information about why the packets received on an interface are punted to the Router Processor (RP), use the **show platform software fed switch punt cause** command in privileged EXEC mode.

```
show platform software fed switch {switch-number | active | standby} punt{cause_id | clear | summary}
```

## Syntax Description

<b>switch {switch-number   active   standby}</b>	Displays information about the switch. You have the following options:
	<ul style="list-style-type: none"> <li>• <i>switch-number</i>:</li> <li>• <b>active</b>—Displays information relating to the active switch.</li> <li>• <b>standby</b>—Displays information relating to the standby switch, if available.</li> </ul>
	<b>Note</b> This keyword is not supported.

---

<i>cause_id</i>	Specifies the ID of the cause for which the details have to be displayed.
-----------------	---

---

<b>clear</b>	Clears the statistics for all the causes. Clearing the causes might result in inconsistent statistics.
--------------	--

---

<b>summary</b>	Displays a high-level overview of the punt reason.
----------------	--

## Command Default

None

## Command Modes

Privileged EXEC (#)

## Command History

<b>Release</b>	<b>Modification</b>
----------------	---------------------

Cisco IOS XE Gibraltar 16.11.1 This command was introduced.

## Usage Guidelines

None

## Example

The following is sample output from the **show platform software fed switch active punt cause summary** command.

```
Device# show platform software fed switch active punt cause summary
Statistics for all causes
```

Cause	Cause Info	Rcvd	Dropped
<hr/>			
7	ARP request or response	1	0
21	RP<->QFP keepalive	22314	0
55	For-us control	12	0
60	IP subnet or broadcast packet	21	0
96	Layer2 control protocols	133808	0

```
show platform software fed switch punt cause
```

The following is sample output from the **show platform software fed switch active punt cause *cause-id*** command.

```
Device# show platform software fed switch active punt cause 21
Detailed Statistics

Sub Cause      Rcvd      Dropped
-----
0              22363      0
```

# show platform software fed switch punt cpuq

To display information about the punt traffic on CPU queues, use the **show platform software fed switch punt cpuq** command in privileged EXEC mode.

```
show platform software fed switch {switch-number | active | standby} punt cpuq {cpuq_id | all | brief | clear | rates}
```

## Syntax Description

<b>switch</b> {switch-number <b>active</b> <b>standby</b> }	Displays information about the switch. You have the following options:
• <i>switch-number</i> .	
• <b>active</b> —Displays information relating to the active switch.	
• <b>standby</b> —Displays information relating to the standby switch, if available.	
<b>Note</b>	This keyword is not supported.
<b>punt</b>	Displays the punt information.
<b>cpuq</b>	Displays information about the CPU receive queue.
<i>cpuq_id</i>	Specifies details specific to a particular CPU queue.
<b>all</b>	Displays the statistics for all the CPU queues.
<b>brief</b>	Displays summarized statistics for all the queues like details about punt packets received and dropped.
<b>clear</b>	Clears the statistics for all the CPU queues. Clearing the CPU queue might result in inconsistent statistics.
<b>rates</b>	Displays the rate at which the packets are punted.

## Command Default

None

## Command Modes

Privileged EXEC (#)

## Command History

Release	Modification
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

## Usage Guidelines

None

show platform software fed switch punt cpuq

### Example

The following is sample output from the **show platform software fed switch active punt cpuq brief** command.

```
Device#show platform software fed switch active punt cpuq brief
```

Punt CPU Q Statistics Brief

Q no	Queue Name	Rx prev	Rx cur	Rx delta	Drop prev	Drop cur	Drop delta
0	CPU_Q_DOT1X_AUTH	0	0	0	0	0	0
1	CPU_Q_L2_CONTROL	0	6772	6772	0	0	0
2	CPU_Q_FORUS_TRAFFIC	0	0	0	0	0	0
3	CPU_Q_ICMP_GEN	0	0	0	0	0	0
4	CPU_Q_ROUTING_CONTROL	0	12	12	0	0	0
5	CPU_Q_FORUS_ADDR_RESOLUTION	0	1	1	0	0	0
6	CPU_Q_ICMP_REDIRECT	0	0	0	0	0	0
7	CPU_Q_INTER_FED_TRAFFIC	0	0	0	0	0	0
8	CPU_Q_L2LVX_CONTROL_PKT	0	0	0	0	0	0
9	CPU_Q_EWLC_CONTROL	0	0	0	0	0	0
10	CPU_Q_EWLC_DATA	0	0	0	0	0	0
11	CPU_Q_L2LVX_DATA_PKT	0	0	0	0	0	0
12	CPU_Q_BROADCAST	0	21	21	0	0	0
13	CPU_Q_LEARNING_CACHE_OVFL	0	0	0	0	0	0
14	CPU_Q_SW_FORWARDING	0	0	0	0	0	0
15	CPU_Q_TOPOLOGY_CONTROL	0	127300	127300	0	0	0
16	CPU_Q_PROTO_SNOOPING	0	0	0	0	0	0
17	CPU_Q_BFD_LOW_LATENCY	0	0	0	0	0	0
18	CPU_Q_TRANSIT_TRAFFIC	0	0	0	0	0	0
19	CPU_Q_RPF_FAILED	0	0	0	0	0	0
20	CPU_Q_MCAST_END_STATION_SERVICE	0	0	0	0	0	0
21	CPU_Q_LOGGING	0	0	0	0	0	0
22	CPU_Q_PUNT_WEBAUTH	0	0	0	0	0	0
23	CPU_Q_HIGH_RATE_APP	0	0	0	0	0	0
24	CPU_Q_EXCEPTION	0	0	0	0	0	0
25	CPU_Q_SYSTEM_CRITICAL	0	0	0	0	0	0
26	CPU_Q_NFL_SAMPLED_DATA	0	0	0	0	0	0
27	CPU_Q_LOW_LATENCY	0	0	0	0	0	0
28	CPU_Q_EGR_EXCEPTION	0	0	0	0	0	0
29	CPU_Q_FSS	0	0	0	0	0	0
30	CPU_Q_MCAST_DATA	0	0	0	0	0	0
31	CPU_Q_GOLD_PKT	0	0	0	0	0	0

The table below describes the significant fields shown in the display.

**Table 73: show platform software fed switch active punt cpuq brief Field Descriptions**

Field	Description
Q no	ID of the queue.
Queue Name	Name of the queue.
Rx	Number of packets received.

Field	Description
Drop	Number of packets dropped.

The following is sample output from the **show platform software fed switch active punt cpuq *cpuq\_id*** command.

```
Device#show platform software fed switch active punt cpuq 1
```

```
Punt CPU Q Statistics
=====
CPU Q Id : 1
CPU Q Name : CPU_Q_L2_CONTROL
Packets received from ASIC : 6774
Send to IOSd total attempts : 6774
Send to IOSd failed count : 0
RX suspend count : 0
RX unsuspend count : 0
RX unsuspend send count : 0
RX unsuspend send failed count : 0
RX consumed count : 0
RX dropped count : 0
RX non-active dropped count : 0
RX conversion failure dropped : 0
RX INTACK count : 6761
RX packets dq'd after intack : 0
Active RxQ event : 6761
RX spurious interrupt : 0

Replenish Stats for all rxq:
-----
Number of replenish : 61969
Number of replenish suspend : 0
Number of replenish un-suspend : 0
-----
```

**show platform sudi certificate**

# show platform sudi certificate

To display checksum record for the specific SUDI, use the **show platform sudi certificate** command in privileged EXEC mode.

**show platform sudi certificate [sign [nonce <nonce>] ]**

<b>Syntax Description</b>	<b>sign</b> (Optional) Show signature <b>nonce</b> (Optional) Enter a nonce value
---------------------------	--

<b>Command Modes</b>	Privileged EXEC (#)
<b>Command History</b>	<b>Release</b> <b>Modification</b> Cisco IOS XE Denali 16.3.2 This command was introduced.

## Examples

This example shows how to view the checksum record for a specific SUDI :

```
Device# show platform sudi certificate

-----BEGIN CERTIFICATE-----
MIIDQzCCAiugAwIBAgIQX/h7KctU3I1CoxW1aMmt/zANBgkqhkiG9w0BAQUFADA1
MRYwFAYDVQQKEw1DaXNjbyBTeXN0ZW1zMRSwGQYDVQQDExJDaXNjbyBsb290IENB
IDIwNDgwHhcNMQwNTE0MjAxNzEyWhcNMjkwNTE0MjAyNTQyWjA1MRYwFAYDVQQK
Ew1DaXNjbyBTeXN0ZW1zMRSwGQYDVQQDExJDaXNjbyBsb290IENBIDIwNDgwggEg
MA0GCSqGSIb3DQEBAQAA4IBDQAwggEAoIBAQCwmmrmr68Kd6ficba0ZmKUEiH
xmJVhEAyv8CrLqUccda8bnuoqrpu0hWISEWdovyD0My5j0AmaHBKeN8hF570YQXJ
FcjPFto1YYmUQ96EqDGyEJu5Tm8sUxJszR2tKyS7McQr/4NEb7Y9JHcJ6r8qqB9q
VvYgDxFU14F1pyXOWwqCZe+36ufijXWLbvLdT6ZeYpzPEApk0E5tzivMW/VgpSdH
jWn0f84bcN5wGyDWbs2mAag8EtKpP6BrXruOII6ke0laO6g58QBdKhTCytKmg91
Eg6CTY5j/e/rmxrbU6YTYK/CfdfHbBcl1HP7R2RQgYCUTOG/rksc35LtLgXfAgED
o1EwTzALBgNVHQ8EBAMCAYwDwYDVR0TAQH/BAuAwEB/zAdBgNVHQ4EFgQUJ/Pi
FR5umgIJFq0roIlgX9p7L6owEAYJKwYBBAGCNxUBBAMCAQAwDQYJKoZIhvNAQEF
BQADggEBAJ2dhISjQa18dw3U8pORFBi71R803UXHOjgxkhLtv5MohmBVrBW7hmW
Ycpao2TB9k5UM8Z3/sUcuuVdjcr18JOagxEu5sv4dEX+5wW4q+f fy0vhN4TauYuX
cB7w4ovXsNgOnbFp1iqRe61JT37mjpxYgycc81WhJdtSd9i7rp77rMKSSh0T81asz
Bvt9YAreTiPjsJyp8qS5UwGH0GikJ3+r/+n6yUA4iGe0OcaEb1fJU9u6ju7AQ7L4
CYNu/2bPPu8Xs1gYJQk0XuPL1h5PKSb3TkL4Eq1ZKR4OCXPJDJoBYVL0fdX41Id
kxpUnwVwpxYB5DC2Ae/qPOgRnhCzU=
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
MIIEPDCCAySgAwIBAgIKYQlufQAAAAADDANBgkqhkiG9w0BAQUFADA1MRYwFAYD
VQQKEw1DaXNjbyBTeXN0ZW1zMRSwGQYDVQQDExJDaXNjbyBsb290IENBIDIwNDgw
HhcNMTEwNjMwMTc1NjU3WhcNMjkwNTE0MjAyNTQyWjA1MRYwFAYDVQQKEwVDaXNj
bzEVMBMGA1UEAxMMQUNUMiBTURJIENBMIBIjANBgkqhkiG9w0BAQEFAAOCAQ8A
MIIBCgKCAQEAom513THIxA9tN/hS5qR/6U2Rpdd+9aE2JbFkNjht6gfHKd477Aks
5XAtUs5oxDYvt/zEbs1Zq3+LR6qrqKKQVu6JYvH05UYLBqCj38s76NLk53905Wzp
9pRcmRCPUx+a6tHF/qRuOjJ44mdeDYzo3qPCpxzprWJDpc1M4iYKHumMQmqmrg+
xghHioWS80BOcdiynebeP5rZ7RuewKMpl1T13WdBNjZjnpfjg66F+p4SaDkGb
BXdgj13oVeF+EywFLrFjj97fL2+8oauV43Qrvnf3d/GfqXj7ew+z/sX1XteOjSXJ
URsyMEj53Rdd9tJwHky8neapszs+r+kdVQIDAQABo4IBWjCCAVYwCwYDVR0PBQD
AgHGBM0GA1UdIgQWBRI2PHxwnDVW7t8cwmTr7i4MAP4FzAfBgNVHSMEGDAwBQn
88gVHm6aAgkWrSugiWBF2nsvqjBDBgNVHR8EPDA6MDigNqA0hjJodHRwOi8vd3d3
LmNpc2NvLmNvbS9zZWN1cmloes9wa2kvY3JsL2NyY2EyMDQ4LmNybDBQBgrBgfEF
-----END CERTIFICATE-----
```

```
BQcBAQREMEIwQAYIKwYBBQUHMAKGNGh0dHA6Ly93d3cuY21zY28uY29tL3N1Y3VyaXRS9jZXJ0cy9jcmNhMjA0OC5jZXIwXAYDVR0gBFUwUzBRBgorBgeEAQkVAQwAMEMwQQYIKwYBBQUHAgEWNWh0dHA6Ly93d3cuY21zY28uY29tL3N1Y3VyaXR5L3Bras9wb2xpY211cy9pbmRleC5odG1sMBIGA1UdEwEB/wQIMAYBAf8CAQAwDQYJKoZIhvcNAQEFBQADggEBAGh1qclr9tx4hzWgDERm371yeuEmqcIfi9b9+GbMSJbiZHc/Ccc101Ju0a9zTXA9w47H9/t61eduGxb4WeLxwcCiUgvFtCa51Iklt8nNbCKY/4dw1ex+7amATUQO4QggIE67wVIPu6bgAE3Ja/nRS3xKYSnj8H5TehimBSv6TECi5jUhOWryAK4dvo8hCjkjEkzu3ufBTJapnv89g9OE+H3VKM4L+/KdkUO+52djFKnhy147d7cZR4DY4LIuFM2P1As8YyjzoNPK/urSRI14Wd1lplR1nH7KND15618yfVP0IFJZBGrooCRBjOSwFv8cpWCbmWdPaCQT2nwIjTfy8c=-----END CERTIFICATE-----BEGIN CERTIFICATE-----MIIDhjCCAm6gAwIBAgIDctWkMA0GCSqGSIb3DQEBCwUAMCcxDjAMBgNVBAotBUNpc2NvMRUwEwYDVQQDEwxBQ1QyIFNVREkgQ0EwHhcNMTUwODA2MDgwODI5WhcNMjUwODA2MDgwODI5WjBzMswkKgYDVQQFEyNQSUQ6V1MtQzM2NTAtMTJYNDhVWiBTTjpGRE8xOTMyWDawQzEOMAwGA1UEChMFQ21zY28xGDAwBgNVBAsTD0FDVC0yIExpGUgU1VESTEZMBcGA1UEAxMQV1MtQzM2NTAtMTJYNDhVWiCCASiwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBANZxOGYI0eU14HcSwjL4HO75qTj19C2BHg3ufce9ikkNkwGXj8qg8vKxuB9tRYRaJC5bP1WMoq7+ZJtQA079xE4X14soNbq5NaUh7RB1wDiuRUJvTfCOzVICbNfbzvtB30I75tCarFNmpd0K6AFrIa41U988QGqaCj7R1JrYNajnC73UXXM/hC0HtNR5myqer5Y2qjjzo6tHZYqrrx2eS1XOa262ZSQriAxmaH/KLC97ywyRBdJ1xBRX3hGtKlog8nASB8WpXqB9NCERzUajwU3L/kg2BsCqw9Y2m7HWU1cerTxgthuyUkdNI+Jg6iGApn2+s8E9hsHPBPMcdIsCAwEAAaNvMG0wDgYDVR0PAQH/BAQDAgXgMAwGA1UdEwEB/wQCMAAwTQYDVR0RBElwRKBCBgkrBgeEAQkVAgOgNRMzQ2hpCE1EPVVZSk5ORmRRR1FvN1ZIVmxJRTlqZENBeU9DQXhPRG93T1RveE1TQVg5eWc9MA0GCSqGSIb3DQEBCwUAA4IBAQBKicTRzbVCRjVIR5MqcWXUT086v6EjHahDHTs3YpQoyAVfioNg2x8J6EXcEau4voyVu+eMUuoNL4szPhmmDcULfiCGBcAR3EFuoVMIzNT0geziytsCf728KGw1oGuosgVjNGOOahUELu4+F/My7bIJNbH+PDKjIFmhJpJg0F3q17yClAeXvd13g3W393i35d00Lm5L1WbBfQtyBaOLAbxsHvutrxu1VZ5sdqSTwTkkO9vKMaQjh7a8J/AmJi93jvzM69pe5711P1zqZfYfpIj3cyJ0xfI4brQ1smdczloFD4asF7A+1vor5e4VDBP0ppmeFAJvCQ52JTpj0M0o1D-----END CERTIFICATE-----
```

**show sdm prefer**

# show sdm prefer

To display information about the templates that can be used to maximize system resources for a particular feature, use the **show sdm prefer** command in privileged EXEC mode. To display the current template, use the command without a keyword.

**show sdm prefer [advanced]**

<b>Syntax Description</b>	<b>advanced</b> (Optional) Displays information on the advanced template.				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** If you did not reload the switch after entering the **sdm prefer** global configuration command, the **show sdm prefer** privileged EXEC command displays the template currently in use and not the newly configured template.

The numbers displayed for each template represent an approximate maximum number for each feature resource. The actual number might vary, depending on the actual number of other features configured. For example, in the default template if your device had more than 16 routed interfaces (subnet VLANs), the number of possible unicast MAC addresses might be less than 6000.

## Example

The following is sample output from the **show sdm prefer** command:

```
Device# show sdm prefer
Showing SDM Template Info

This is the Advanced template.
Number of VLANs: 4094
Unicast MAC addresses: 32768
Overflow Unicast MAC addresses: 512
IGMP and Multicast groups: 8192
Overflow IGMP and Multicast groups: 512
Directly connected routes: 32768
Indirect routes: 7680
Security Access Control Entries: 3072
QoS Access Control Entries: 3072
Policy Based Routing ACEs: 1024
Netflow ACEs: 1024
Input Microflow policer ACEs: 256
Output Microflow policer ACEs: 256
Flow SPAN ACEs: 256
Tunnels: 256
```

Control Plane Entries:	512
Input Netflow flows:	8192
Output Netflow flows:	16384
SGT/DGT entries:	4096
SGT/DGT Overflow entries:	512

These numbers are typical for L2 and IPv4 features.  
Some features such as IPv6, use up double the entry size;  
so only half as many entries can be created.

Device#

**show tech-support license**

# show tech-support license

To display the debug output, use the **show license tech support** command in privileged EXEC mode.

## show tech-support license

**Syntax Description** This command has no arguments or keywords.

**Command Default** Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Fuji 16.9.1	This command was introduced.

## Example

This example shows a sample output from the **show tech-support license** command:

```
Device# show tech-support license
Load for five secs: 5%/0%; one minute: 7%; five minutes: 6%
No time source, 12:36:46.732 EDT Tue Jul 17 2018

----- show clock -----

Load for five secs: 5%/0%; one minute: 7%; five minutes: 6%
No time source, 12:36:46.733 EDT Tue Jul 17 2018

12:36:46.733 EDT Tue Jul 17 2018

----- show version -----

Load for five secs: 5%/0%; one minute: 7%; five minutes: 6%
No time source, 12:36:46.734 EDT Tue Jul 17 2018
Cisco IOS XE Software, Version BLD_V169_THROTTLE_LATEST_20180712_092155_2
Cisco IOS Software [Fuji], Catalyst L3 Switch Software (CAT3K_CAA-UNIVERSALK9-M), Experimental
Version 16.9.20180712:083903
[v169_throttle-/scratch/mcpred/BLD-BLD_V169_THROTTLE_LATEST_20180712_092155_143]
Copyright (c) 1986-2018 by Cisco Systems, Inc.
Compiled Thu 12-Jul-18 06:52 by mcpred

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or the applicable URL provided on the flyer accompanying the IOS-XE
software.
!
!
!
```

Related Commands	Command	Description
	<b>show license all</b>	Displays entitlements information.
	<b>show license status</b>	Displays compliance status of a license.
	<b>show license summary</b>	Displays summary of all active licenses.
	<b>show license udi</b>	Displays UDI.
	<b>show license usage</b>	Displays license usage information

**show tech-support platform evpn\_vxlan**

# show tech-support platform evpn\_vxlan

To display Ethernet VPN (EVPN)-Virtual eXtensible LAN (VXLAN)-related platform information for use by technical support, use the **show tech-support platform evpn\_vxlan** command in privileged EXEC mode.

**show tech-support platform evpn\_vxlan switch *switch-number***

<b>Syntax Description</b>	<b>switch <i>switch-number</i></b>	Displays information for the specified switch. Valid values are from 1 to 9.
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>

Cisco IOS XE Gibraltar 16.11.1 This command was introduced.

<b>Usage Guidelines</b>	The output of this command is very long. To better manage this output, you can redirect the output to an external file (for example, <b>show tech-support platform evpn_vxlan switch 1   redirect flash:filename</b> ) in the local writable storage file system or remote file system.
-------------------------	---

## Examples

The following is sample output from the **show tech-support platform evpn\_vxlan** command:

```
Device# show tech-support platform evpn_vxlan switch 1
.
.
.

"show clock"
"show version"
"show running-config"switch no: 1

----- sh sdm prefer -----

Showing SDM Template Info

This is the Advanced template.
Number of VLANs: 4094
Unicast MAC addresses: 32768
Overflow Unicast MAC addresses: 512
L2 Multicast entries: 4096
Overflow L2 Multicast entries: 512
L3 Multicast entries: 4096
Overflow L3 Multicast entries: 512
Directly connected routes: 16384
Indirect routes: 7168
STP Instances: 4096
Security Access Control Entries: 3072
QoS Access Control Entries: 2560
Policy Based Routing ACEs: 1024
Netflow ACEs: 768
Flow SPAN ACEs: 512
Tunnels: 256
LISP Instance Mapping Entries: 256
Control Plane Entries: 512
```

```

Input Netflow flows: 8192
Output Netflow flows: 16384
SGT/DGT (or) MPLS VPN entries: 4096
SGT/DGT (or) MPLS VPN Overflow entries: 512
Wired clients: 2048
MACSec SPD Entries: 256
MPLS L3 VPN VRF: 127
MPLS Labels: 2048
MPLS L3 VPN Routes VRF Mode: 7168
MPLS L3 VPN Routes Prefix Mode: 3072
MVPN MDT Tunnels: 256
L2 VPN EOMPLS Attachment Circuit: 256
MAX VPLS Bridge Domains : 64
MAX VPLS Peers Per Bridge Domain: 8
MAX VPLS/VPWS Pseudowires : 256
These numbers are typical for L2 and IPv4 features.
Some features such as IPv6, use up double the entry size;
so only half as many entries can be created.
* values can be modified by sdm cli.

```

----- show platform software fed switch 1 ifm interfaces nve -----

----- show platform software fed switch 1 ifm interfaces efp -----

----- show platform software fed switch 1 matm macTable -----

```

Total Mac number of addresses:: 0
*a_time=aging_time(secs) *e_time=total_elapsed_time(secs)
Type:
MAT_DYNAMIC_ADDR 0x1 MAT_STATIC_ADDR 0x2 MAT_CPU_ADDR
0x4 MAT_DISCARD_ADDR 0x8
MAT_ALL_VLANS 0x10 MAT_NO_FORWARD 0x20 MAT_IPMULT_ADDR
0x40 MAT_RESYNC 0x80
MAT_DO_NOT_AGE 0x100 MAT_SECURE_ADDR 0x200 MAT_NO_PORT
0x400 MAT_DROP_ADDR 0x800
MAT_DUP_ADDR 0x1000 MAT_NULL_DESTINATION 0x2000 MAT_DOT1X_ADDR
0x4000 MAT_ROUTER_ADDR 0x8000
MAT_WIRELESS_ADDR 0x10000 MAT_SECURE_CFG_ADDR 0x20000 MAT_OPQ_DATA_PRESENT
0x40000 MAT_WIRED_TUNNEL_ADDR 0x80000
MAT_DLR_ADDR 0x100000 MAT_MRP_ADDR 0x200000 MAT_MSRP_ADDR
0x400000 MAT_LISP_LOCAL_ADDR 0x800000
MAT_LISP_REMOTE_ADDR 0x1000000 MAT_VPLS_ADDR 0x2000000
Device#

```

Output fields are self-explanatory.

#### Related Commands

Command	Description
<b>show tech-support platform</b>	Displays detailed information about a platform for use by technical support.

**show tech-support platform fabric**

# show tech-support platform fabric

To display information about the switch fabric, use the **show tech-support platform fabric** command in privileged EXEC mode.

```
show tech-support platform fabric [{display-cli | vrf vrf-name {ipv4 display-cli | ipv6 display-cli | source instance-id instance-id {ipv4 ip-address/ip-prefix | ipv6 ipv6-address/ipv6-prefix | mac mac-address} {dest instance-id instance-id} {ipv4 ip-address/ip-prefix | ipv6 ipv6-address/ipv6-prefix | mac mac-address} [{display-cli]}]}]
```

<b>Syntax Description</b>	<b>display-cli</b>	(Optional) Displays the list of show commands available in the output of this command.
	<b>vrf vrf-name</b>	(Optional) Displays fabric-related information for the specified virtual routing and forwarding (VRF) instance.
	<b>ipv4 ip-address/ip-prefix</b>	(Optional) Displays fabric-related information for the source or destination IP VRF.
	<b>ipv6 ipv6-address/ipv6-prefix</b>	(Optional) Displays fabric-related information for the source or destination IPv6 VRF.
	<b>source</b>	(Optional) Displays fabric-related information for the source VRF.
	<b>instance-id instance-id</b>	(Optional) Displays information about the endpoint identifier (EID) of the source.
	<b>mac mac-address</b>	(Optional) Displays fabric-related information for the source and destination MAC VRF for Layer 2 extension deployments.
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b> Cisco IOS XE Gibraltar 16.11.1	<b>Modification</b> This command was introduced.
<b>Usage Guidelines</b>	The output of this command is very long. To better manage this output, you can redirect the output to an external file (for example, <b>show tech-support platform fabric   redirect flash:filename</b> ) in the local writable storage file system or remote file system.	

The output of this command displays a list commands and their output. These commands may differ based on the platform.

**Examples**

The following is sample output from the **show tech-support platform fabric vrf source instance-id ipv4 dest instance-id ipv4** command:

```
Device# show tech-support platform fabric vrf DEFAULT_VN source instance-id
4098 ipv4 10.1.1.1/32 dest instance-id 4098 ipv4 10.12.12.12/32

.
.

-----show ip lisp eid-table vrf DEFAULT_VN forwarding eid remote 10.12.12.12-----

Prefix          Fwd action  Locator status bits    encaps_iid
10.12.12.12/32  encap      0x00000001        N/A
  packets/bytes   1/576
  path list 7F44F8E86CE8, 4 locks, per-destination, flags 0x49 [shble, rif, hwcn]
    ifnums:
      LISPO.4098(78) : 192.0.2.2
      1 path
        path 7F44F8B5AFF0, share 10/10, type attached nexthop, for IPv4
          nexthop 192.0.2.2 LISPO.4098, IP midchain out of LISPO.4098, addr 192.0.2.2
7F44F8E86CE8
      1 output chain
        chain[0]: IP midchain out of LISPO.4098, addr 192.0.2.2 7F44F8E86CE8
          IP adj out of GigabitEthernet1/0/1, addr 10.0.2.1 7F44F8E87378

-----show lisp instance-id 4098 ipv4 map-cache-----

LISP IPv4 Mapping Cache for EID-table vrf DEFAULT_VN (IID 4098), 3 entries
0.0.0.0/0, uptime: 02:46:01, expires: never, via static-send-map-request
  Encapsulating to proxy ETR
10.1.1.0/24, uptime: 02:46:01, expires: never, via dynamic-EID, send-map-request
  Encapsulating to proxy ETR
10.12.12.12/32, uptime: 02:45:54, expires: 21:14:06, via map-reply, complete
  Locator Uptime State     Pri/Wgt   Encap-IID
  192.0.2.2 02:45:54 up       10/10     -
  - 

-----show lisp instance-id 4098 ipv4 map-cache detail-----

LISP IPv4 Mapping Cache for EID-table vrf DEFAULT_VN (IID 4098), 3 entries
0.0.0.0/0, uptime: 02:46:01, expires: never, via static-send-map-request
  Sources: static-send-map-request
  State: send-map-request, last modified: 02:46:01, map-source: local
  Exempt, Packets out: 2(676 bytes) (~ 02:45:38 ago)
  Configured as EID address space
  Encapsulating to proxy ETR
101.1.0/24, uptime: 02:46:01, expires: never, via dynamic-EID, send-map-request
  Sources: NONE
  State: send-map-request, last modified: 02:46:01, map-source: local
  Exempt, Packets out: 0(0 bytes)
  Configured as EID address space
  Configured as dynamic-EID address space
  Encapsulating dynamic-EID traffic
  Encapsulating to proxy ETR
```

show tech-support platform fabric

```
10.12.12.12/32, uptime: 02:45:54, expires: 21:14:06, via map-reply, complete
  Sources: map-reply
  State: complete, last modified: 02:45:54, map-source: 10.0.1.2
  Idle, Packets out: 1(576 bytes) (~ 02:45:38 ago)
  Locator Uptime State Pri/Wgt Encap-IID
  192.0.2.2 02:45:54 up 10/10 -
    Last up-down state change: 02:45:54, state change count: 1
    Last route reachability change: 02:45:54, state change count: 1
    Last priority / weight change: never/never
    RLOC-probing loc-status algorithm:
      Last RLOC-probe sent: 02:45:54 (rtt 1ms)
```

```
-----show lisp instance-id 4098 ipv4 map-cache 10.12.12.12/32-----
```

```
LISP IPv4 Mapping Cache for EID-table vrf DEFAULT_VN (IID 4098), 3 entries

10.12.12.12/32, uptime: 02:45:54, expires: 21:14:06, via map-reply, complete
  Sources: map-reply
  State: complete, last modified: 02:45:54, map-source: 10.0.1.2
  Idle, Packets out: 1(576 bytes) (~ 02:45:38 ago)
  Locator Uptime State Pri/Wgt Encap-IID
  192.0.2.2 02:45:54 up 10/10 -
    Last up-down state change: 02:45:54, state change count: 1
    Last route reachability change: 02:45:54, state change count: 1
    Last priority / weight change: never/never
    RLOC-probing loc-status algorithm:
      Last RLOC-probe sent: 02:45:54 (rtt 1ms)
```

```
-----show ip cef vrf DEFAULT_VN 10.12.12.12/32 internal-----
```

```
10.12.12.12/32, epoch 1, flags [sc, lisp elig], refcnt 6, per-destination sharing
  sources: LISP, IPL
  feature space:
    Broker: linked, distributed at 1st priority
    subblocks:
      SC owned,sourced: LISP remote EID - locator status bits 0x00000001
      LISP remote EID: 1 packets 576 bytes fwd action encaps, cfg as EID space
      LISP source path list
        path list 7F44EEC2C188, 4 locks, per-destination, flags 0x49 [shble, rif, hwcn]
          ifnums:
            LISPO.4098(78): 192.0.2.2
          1 path
            path 7F44F8B5AFF0, share 10/10, type attached nexthop, for IPv4
              nexthop 192.0.2.2 LISPO.4098, IP midchain out of LISPO.4098, addr 192.0.2.2
            7F44F8E86CE8
              1 output chain
                chain[0]: IP midchain out of LISPO.4098, addr 192.0.2.2 7F44F8E86CE8
                  IP adj out of GigabitEthernet1/0/1, addr 10.0.2.1 7F44F8E87378
                  Dependent covered prefix type LISP, cover 0.0.0.0/0
              2 IPL sources [no flags]
            ifnums:
              LISPO.4098(78): 192.0.2.2
            path list 7F44EEC2C188, 3 locks, per-destination, flags 0x49 [shble, rif, hwcn]
              path 7F44F8B5AFF0, share 10/10, type attached nexthop, for IPv4
              nexthop 192.0.2.2 LISPO.4098, IP midchain out of LISPO.4098, addr 192.0.2.2 7F44F8E86CE8
            output chain:
              PushCounter(LISP:10.12.12.12/32) 7F44F3C8B8D8
              IP midchain out of LISPO.4098, addr 192.0.2.2 7F44F8E86CE8
              IP adj out of GigabitEthernet1/0/1, addr 10.0.2.1 7F44F8E87378
```

```
switch no: 1
.
.

Device# show tech-support platform fabric vrf Campus_VN source instance-id 8189
mac 00b7.7128.00a1 dest instance-id 8189 mac 00b7.7128.00a0 | i show

----- show clock -----
----- show version -----
----- show running-config -----
----- show device-tracking database -----
----- show lisp site -----
----- show mac address-table address 00B7.7128.00A0-----
----- show ip arp vrf Campus_VN-----

Device#
```

Output fields are self-explanatory.

Related Commands	Command	Description
	<b>show tech-support platform</b>	Displays detailed information about a platform for use by technical support.

**show tech-support platform igmp\_snooping**

## show tech-support platform igmp\_snooping

To display Internet Group Management Protocol (IGMP) snooping information about a group, use the **show tech-support platform igmp\_snooping** command in privileged EXEC mode.

**show tech-support platform igmp\_snooping [{Group\_ipAddr *ipv4-address* | [{vlan *vlan-ID*}]}]**

<b>Syntax Description</b>	<b>Group_ipAddr</b>	(Optional) Displays snooping information about the specified group address.				
	<i>ipv4-address</i>	(Optional) IPv4 address of the group.				
	<b>vlan <i>vlan-ID</i></b>	(Optional) Displays IGMP snooping VLAN information. Valid values are from 1 to 4094.				
<b>Command Modes</b>		Privileged EXEC (#)				
<b>Command History</b>		<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td> <td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
<b>Release</b>	<b>Modification</b>					
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.					

The output of this command is very long. To better manage this output, you can redirect the output to a file (for example, **show tech-support platform igmp\_snooping | redirect flash:filename**) in the local writable storage file system or remote file system.

### Examples

The following is sample output from the **show tech-support platform igmp\_snooping** command:

```
Device# show tech-support platform igmp_snooping GroupIPAddr 226.6.6.6 vlan
.
.
.
----- show ip igmp snooping groups | i 226.6.6.6 -----
5          226.6.6.6                  user                   Gi1/0/8, Gi1/0/27, Gi1/0/28,
                                                      
----- show ip igmp snooping groups count -----
Total number of groups:  2

----- show ip igmp snooping mrouter -----
Vlan      ports
----- 
23       Router
24       Router
```

25 Router

----- show ip igmp snooping querier -----

Vlan	IP Address	IGMP Version	Port
23	10.1.1.1	v2	Router
24	10.1.2.1	v2	Router
25	10.1.3.1	v2	Router

----- show ip igmp snooping vlan 5 -----

Global IGMP Snooping configuration:

```
-----
IGMP snooping      : Enabled
Global PIM Snooping : Disabled
IGMPv3 snooping   : Enabled
Report suppression : Enabled
TCN solicit query  : Disabled
TCN flood query count : 2
Robustness variable : 2
Last member query count : 2
Last member query interval : 1000
```

Vlan 5:

```
-----
IGMP snooping      : Enabled
Pim Snooping       : Disabled
IGMPv2 immediate leave : Disabled
Explicit host tracking : Enabled
Multicast router learning mode : pim-dvmrp
CGMP interoperability mode : IGMP_ONLY
Robustness variable : 2
Last member query count : 2
Last member query interval : 1000
```

----- show ip igmp snooping groups vlan 5 -----

Vlan	Group	Type	Version	Port List
5	226.6.6.6	user		Gi1/0/8, Gi1/0/27, Gi1/0/28, Gi2/0/7, Gi2/0/8, Gi2/0/27, Gi2/0/28
5	238.192.0.1	user		Gi2/0/28

----- show platform software fed active ip igmp snooping vlan 5 -----

Vlan 5

```
-----
IGMPSN Enabled    : On
PIMSN Enabled     : Off
Flood Mode        : On
I-Mrouter         : Off
Oper State        : Up
```

**show tech-support platform igmp\_snooping**

```

STP TCN Flood    : Off
Routing Enabled  : Off
PIM Enabled      : Off
PVLAN           : No
In Retry        : 0x0
L3mcast Adj     :
Mrouter PortQ   :
Flood PortQ    :

----- show platform software fed active ip igmp snooping groups | begin 226.6.6.6 -----
Vlan:5 Group:226.6.6.6
-----
Member ports    :
CAPWAP ports   :
Host Type Flags: 0
Failure Flags   : 0
DI handle       : 0x7f11151cbad8
REP RI handle   : 0x7f11151cc018
SI handle       : 0x7f11151cd198
HTM handle      : 0x7f11151cd518

si hdl : 0x7f11151cd198 rep ri hdl : 0x7f11151cc018 di hdl : 0x7f11151cbad8 htm hdl :
0x7f11151cd518
.
.
.
Device#

```

Output fields are self-explanatory.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>ip igmp snooping</b>	Enables IGMP snooping globally or on an interface.
<b>show ip igmp snooping</b>	Displays the IGMP snooping configuration of a device.
<b>show tech-support platform</b>	Displays detailed information about a platform for use by technical support.

# show tech-support platform mld\_snooping

To display Multicast Listener Discovery (MLD) snooping information about a group, use the **show tech-support platform mld\_snooping** command in privileged EXEC mode.

```
show tech-support platform mld_snooping [{Group_ipv6Addr ipv6-address}][{vlan vlan-ID}]
```

<b>Syntax Description</b>	<b>Group_ipv6Addr</b>	(Optional) Displays snooping information about the specified group address.				
	<i>ipv6-address</i>	(Optional) IPv6 address of the group.				
	<b>vlan vlan-ID</b>	(Optional) Displays MLD snooping VLAN information. Valid values are from 1 to 4094.				
<b>Command Modes</b>		Privileged EXEC (#)				
<b>Command History</b>		<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
<b>Release</b>	<b>Modification</b>					
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.					

**Usage Guidelines** The output of this command is very long. To better manage this output, you can redirect the output to an external file (for example, **show tech-support platform mld\_snooping | redirect flash:filename**) in the local writable storage file system or remote file system.

## Examples

The following is sample output from the **show tech-support platform mld\_snooping** command:

```
Device# show tech-support platform mld_snooping GroupIPV6Addr FF02::5:1
.
.
-----
----- show running-config -----
Building configuration...
Current configuration : 11419 bytes
!
! Last configuration change at 09:17:04 UTC Thu Sep 6 2018
!
version 16.10
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
service call-home
no platform punt-keepalive disable-kernel-core
!
hostname Switch
!
!
vrf definition Mgmt-vrf
```

## show tech-support platform mld\_snooping

```

!
address-family ipv4
exit-address-family
!
address-family ipv6
exit-address-family
!
!
no aaa new-model
switch 1 provision ws-c3650-12x48uq
!
!
!
!
call-home
! If contact email address in call-home is configured as sch-smart-licensing@cisco.com
! the email address configured in Cisco Smart License Portal will be used as contact email
address to send SCH notifications.
contact-email-addr sch-smart-licensing@cisco.com
profile "profile-1"
active
destination transport-method http
no destination transport-method email
!
!
!
!
ip admission watch-list expiry-time 0
!
!
!
!
login on-success log
!
!
!
!
!
no device-tracking logging theft
!
crypto pki trustpoint TP-self-signed-559433368
enrollment selfsigned
subject-name cn=IOS-Self-Signed-Certificate-559433368
revocation-check none
rsakeypair TP-self-signed-559433368
!
crypto pki trustpoint SLA-TrustPoint
enrollment pkcs12
revocation-check crl
!
!
crypto pki certificate chain TP-self-signed-559433368
certificate self-signed 01
30820229 30820192 A0030201 02020101 300D0609 2A864886 F70D0101 05050030
30312E30 2C060355 04031325 494F532D 53656C66 2D536967 6E65642D 43657274
69666963 6174652D 35353934 33333336 38301E17 0D313531 32303331 32353432
325A170D 32303031 30313030 30303030 5A303031 2E302C06 03550403 1325494F
532D5365 6C662D53 69676E65 642D4365 72746966 69636174 652D3535 39343333
33363830 819F300D 06092A86 4886F70D 01010105 0003818D 00308189 02818100
AD8C9C3B FEE7FFC8 986837D2 4C126172 446C3C53 E040F798 4BA61C97 7506FDCE
46365D0A E47E3F4F C774CA5B 73E2A8DD B72A2E98 C66DB196 94E8150F 0B669CF6
AA5BC4CD FC2E02F6 FE08B17F 0164FC19 7DC84ABB C99D91D6 398233FF 814EF6DA
6DC8FC20 CA12C0D6 1CB28EDA 6ADD6DFA 7E3E8281 4A189A9A AA44FCC0 BA9BD8A5
02030100 01A35330 51300F06 03551D13 0101FF04 05300301 01FF301F 0603551D

```

```

23041830 16801448 668D668E C92914BB 69E9BA64 F61228DE 132E2030 1D060355
1D0E0416 04144866 8D668EC9 2914BB69 E9BA64F6 1228DE13 2E20300D 06092A86
4886F70D 01010505 00038181 0000F1D3 3DD1E5F1 EB714A95 D5819933 CAD0C943
59927D55 9D70CADO D64830EB D54380AD D2B5B613 F8AF7A5B 1F801134 246F760D
5E5515DB D098304F 5086F6CE 88E8B576 F6B93A88 F458FDCF 91A42D7E FA741908
5C892D78 600FB655 E6C5A4D0 6C1F1B9A 3AECA550 E3DC0881 01C4D004 7AB65BC3
88CF24DE DAA19474 51B535A5 0C
    quit
crypto pki certificate chain SLA-TrustPoint
certificate ca 01
    30820321 30820209 A0030201 02020101 300D0609 2A864886 F70D0101 0B050030
    32310E30 0C060355 040A1305 43697363 6F312030 1E060355 04031317 43697363
    6F204C69 63656E73 696E6720 526F6F74 20434130 1E170D31 33303533 30313934
    3834375A 170D3338 30353330 31393438 34375A30 32310E30 0C060355 040A1305
    43697363 6F312030 1E060355 04031317 43697363 6F204C69 63656E73 696E6720
    526F6F74 20434130 82012230 0D06092A 864886F7 0D010101 05000382 010F0030
    82010A02 82010100 A6BCBD96 131E05F7 145EA72C 2CD686E6 17222EA1 F1EFF64D
    CBB4C798 212AA147 C655D8D7 9471380D 8711441E 1AAF071A 9CAE6388 8A38E520
    1C394D78 462EF239 C659F715 B98C0A59 5BBB5CBD 0CFEBEA3 700A8BF7 D8F256EE
    4AA4E80D DB6FD1C9 60B1FD18 FFC69C96 6FA68957 A2617DE7 104FDC5F EA2956AC
    7390A3EB 2B5436AD C847A2C5 DAB553EB 69A9A535 58E9F3E3 C0BD23CF 58BD7188
    68E69491 20F320E7 948E71D7 AE3BCC84 F10684C7 4BC8E00F 539BA42B 42C68BB7
    C7479096 B4CB2D62 EA2F505D C7B062A4 6811D95B E8250FC4 5D5D5FB8 8F27D191
    C55F0D76 61F9A4CD 3D992327 A8BB03BD 4E6D7069 7CBADF8B DF5F4368 95135E44
    DFC7C6CF 04DD7FD1 02030100 01A34230 40300E06 03551D0F 0101FF04 04030201
    06300F06 03551D13 0101FF04 05300301 01FF301D 0603551D 0E041604 1449DC85
    4B3D31E5 1B3E6A17 606AF333 3D3B4C73 E8300D06 092A8648 86F70D01 010B0500
    03820101 00507F24 D3932A66 86025D9F E838AE5C 6D4DF6B0 49631C78 240DA905
    604EDCDE FF4FED2B 77FC460E CD636FDB DD44681E 3A5673AB 9093D3B1 6C9E3D8B
    D98987BF E40CBD9E 1AECA0C2 2189BB5C 8FA85686 CD98B646 5575B146 8DFC66A8
    467A3DF4 4D565700 6ADF0F0D CF835015 3C04FF7C 21E878AC 11BA9CD2 55A9232C
    7CA7B7E6 C1AF74F6 152E99B7 B1FCF9BB E973DE7F 5BDBEB86 C71E3B49 1765308B
    5FB0DA06 B92AFE7F 494E8A9E 07B85737 F3A58BE1 1A48A229 C37C1E69 39F08678
    80DDCD16 D6BACECA EEB7CF9 8428787B 35202CDC 60E4616A B623CDBD 230E3AFB
    418616A9 4093E049 4D10AB75 27E86F73 932E35B5 8862FDAE 0275156F 719BB2F0
    D697DF7F 28
    quit
!
!
!
diagnostic bootup level minimal
diagnostic monitor syslog
!
spanning-tree mode rapid-pvst
spanning-tree extend system-id
!
!
!
redundancy
mode sso
!
!
!
!
!
!
class-map match-any system-cpp-police-topology-control
description Topology control
class-map match-any system-cpp-police-sw-forward
description Sw forwarding, L2 LVX data, LOGGING
class-map match-any system-cpp-default
description EWIC control, EWIC data, Inter FED
class-map match-any system-cpp-police-sys-data
description Learning cache ovfl, High Rate App, Exception, EGR Exception, NFL SAMPLED

```

show tech-support platform mld\_snooping

```

DATA, RPF Failed
class-map match-any AutoQos-4.0-RT1-Class
  match dscp ef
  match dscp cs6
class-map match-any system-cpp-police-punt-webauth
  description Punt Webauth
class-map match-any AutoQos-4.0-RT2-Class
  match dscp cs4
  match dscp cs3
  match dscp af41
class-map match-any system-cpp-police-l2lvx-control
  description L2 LVX control packets
class-map match-any system-cpp-police-forus
  description Forus Address resolution and Forus traffic
class-map match-any system-cpp-police-multicast-end-station
  description MCAST END STATION
class-map match-any system-cpp-police-multicast
  description Transit Traffic and MCAST Data
class-map match-any system-cpp-police-l2-control
  description L2 control
class-map match-any system-cpp-police-dot1x-auth
  description DOT1X Auth
class-map match-any system-cpp-police-data
  description ICMP redirect, ICMP_GEN and BROADCAST
class-map match-any system-cpp-police-stackwise-virt-control
  description Stackwise Virtual
class-map match-any system-cpp-police-control-low-priority
  description ICMP redirect and general punt
class-map match-any system-cpp-police-wireless-priority1
  description Wireless priority 1
class-map match-any system-cpp-police-wireless-priority2
  description Wireless priority 2
class-map match-any system-cpp-police-wireless-priority3-4-5
  description Wireless priority 3,4 and 5
class-map match-any non-client-nrt-class
class-map match-any system-cpp-police-routing-control
  description Routing control and Low Latency
class-map match-any system-cpp-police-protocol-snooping
  description Protocol snooping
class-map match-any system-cpp-police-dhcp-snooping
  description DHCP snooping
class-map match-any system-cpp-police-system-critical
  description System Critical and Gold Pkt
!
policy-map system-cpp-policy
  class system-cpp-police-data
    police rate 200 pps
  class system-cpp-police-routing-control
    police rate 500 pps
  class system-cpp-police-control-low-priority
  class system-cpp-police-wireless-priority1
  class system-cpp-police-wireless-priority2
  class system-cpp-police-wireless-priority3-4-5
policy-map port_child_policy
  class non-client-nrt-class
    bandwidth remaining ratio 10
!
!
!
!
!
```

```
!
!
interface GigabitEthernet0/0
  vrf forwarding Mgmt-vrf
  no ip address
  speed 1000
  negotiation auto
!
interface GigabitEthernet1/0/1
  switchport mode access
  macsec network-link
!
interface GigabitEthernet1/0/2
!
interface GigabitEthernet1/0/3
!
interface TenGigabitEthernet1/1/1
!
interface TenGigabitEthernet1/1/2
!
interface TenGigabitEthernet1/1/3
!
interface TenGigabitEthernet1/1/4
!
interface Vlan1
  no ip address
  shutdown
!
ip forward-protocol nd
ip http server
ip http authentication local
ip http secure-server
!
ip access-list extended AutoQos-4.0-wlan-Acl-Bulk-Data
  permit tcp any any eq 22
  permit tcp any any eq 465
  permit tcp any any eq 143
  permit tcp any any eq 993
  permit tcp any any eq 995
  permit tcp any any eq 1914
  permit tcp any any eq ftp
  permit tcp any any eq ftp-data
  permit tcp any any eq smtp
  permit tcp any any eq pop3
ip access-list extended AutoQos-4.0-wlan-Acl-MultiEnhanced-Conf
  permit udp any any range 16384 32767
  permit tcp any any range 50000 59999
ip access-list extended AutoQos-4.0-wlan-Acl-Scavenger
  permit tcp any any range 2300 2400
  permit udp any any range 2300 2400
  permit tcp any any range 6881 6999
  permit tcp any any range 28800 29100
  permit tcp any any eq 1214
  permit udp any any eq 1214
  permit tcp any any eq 3689
  permit udp any any eq 3689
  permit tcp any any eq 11999
ip access-list extended AutoQos-4.0-wlan-Acl-Signaling
  permit tcp any any range 2000 2002
  permit tcp any any range 5060 5061
  permit udp any any range 5060 5061
ip access-list extended AutoQos-4.0-wlan-Acl-Transactional-Data
  permit tcp any any eq 443
  permit tcp any any eq 1521
```

show tech-support platform mld\_snooping

```

        permit udp any any eq 1521
        permit tcp any any eq 1526
        permit udp any any eq 1526
        permit tcp any any eq 1575
        permit udp any any eq 1575
        permit tcp any any eq 1630
        permit udp any any eq 1630
        permit tcp any any eq 1527
        permit tcp any any eq 6200
        permit tcp any any eq 3389
        permit tcp any any eq 5985
        permit tcp any any eq 8080
    !
    !
    !
    ipv6 access-list preauth_ipv6_acl
        permit udp any any eq domain
        permit tcp any any eq domain
        permit icmp any any nd-ns
        permit icmp any any nd-na
        permit icmp any any router-solicitation
        permit icmp any any router-advertisement
        permit icmp any any redirect
        permit udp any eq 547 any eq 546
        permit udp any eq 546 any eq 547
        deny ipv6 any any
    !
    control-plane
        service-policy input system-cpp-policy
    !
    !
    line con 0
        stopbits 1
    line aux 0
        stopbits 1
    line vty 0 4
        login
    line vty 5 15
        login
    !
    !
    mac address-table notification mac-move
    !
    !
    !
    !
    !
    end

```

-----show switch | Include Ready-----

*1	Active	188b.9dfc.eb00	1	V00	Ready
----	--------	----------------	---	-----	-------

----- show ipv6 mld snooping address | i FF02::5:1 -----

Vlan	Group	Type	Version	Port List
------	-------	------	---------	-----------

123	FF02::5:1	mld	v2	Gi2/0/1
-----	-----------	-----	----	---------

Device#

Output fields are self-explanatory.

**Related Commands**

Command	Description
<b>ipv6 mld snooping</b>	Enables MLDv2 protocol snooping globally.
<b>show ipv6 mld snooping</b>	Displays MLDv2 snooping information.
<b>show tech-support platform</b>	Displays detailed information about a platform for use by technical support.

**show tech-support platform layer3**

# show tech-support platform layer3

To display Layer 3 platform forwarding information, use the **show tech-support platform layer3** command in privileged EXEC mode.

```
show tech-support platform layer3 {multicast Group_ipAddr ipv4-address switch switch-number srcIP
ipv4-address | unicast {dstIP ipv4-address srcIP ipv4-address | vrf vrf-name destIP ipv4-address srcIP
ipv4-address}}
```

<b>Syntax Description</b>	<b>multicast</b>	Displays multicast information.
	<b>Group_ipv6Addr ipv4-address</b>	Displays information about the specified multicast group address.
	<b>switch switch-number</b>	Displays information about the specified switch. Valid values are from 1 to 9.
	<b>srcIP ipv4-address</b>	Displays information about the specified source address.
	<b>unicast</b>	Displays unicast-related information.
	<b>dstIP ipv4-address</b>	Displays information about the specified destination address.
	<b>vrf vrf-name</b>	Displays unicast-related virtual routing and forwarding (VRF) information.

<b>Command Modes</b>	Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th> <th><b>Modification</b></th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE Gibraltar 16.11.1</td> <td>This command was introduced.</td> </tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE Gibraltar 16.11.1	This command was introduced.				

<b>Usage Guidelines</b>	The output of this command is very long. To better manage this output, you can redirect the output to an external file (for example, <b>show tech-support platform layer3 multicast group 224.1.1.1 switch 1 srcIP 10.10.0.2   redirect flash:filename</b> ) in the local writable storage file system or remote file system.
-------------------------	---

<b>Examples</b>	The following is sample output from the <b>show tech-support platform layer3 multicast group</b> command:
	<pre>Device# show tech-support platform layer3 multicast group_ipAddr 224.1.1.1 switch 1 srcIp 10.10.0.2  . .  destination IP: 224.1.1.1 source IP: 10.10.0.2</pre>

```

switch no: 1

----- show ip mroute 224.1.1.1 10.10.0.2 -----

IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
       L - Local, P - Pruned, R - RP-bit set, F - Register flag,
       T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report,
       Z - Multicast Tunnel, z - MDT-data group sender,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector, p - PIM Joins on route,
       x - VxLAN group, c - PFP-SA cache created entry
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(10.10.0.2, 224.1.1.1), 00:00:22/00:02:37, flags: LFT
  Incoming interface: GigabitEthernet1/0/10, RPF nbr 0.0.0.0, Registering
  Outgoing interface list:
    Vlan20, Forward/Sparse, 00:00:22/00:02:37, A

```

```

----- show ip mfib 224.1.1.1 10.10.0.2 -----

Entry Flags:   C - Directly Connected, S - Signal, IA - Inherit A flag,
               ET - Data Rate Exceeds Threshold, K - Keepalive
               DDE - Data Driven Event, HW - Hardware Installed
               ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
               MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
               MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
                 NS - Negate Signalling, SP - Signal Present,
                 A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
                 MA - MFIB Accept, A2 - Accept backup,
                 RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts:      Total/RPF failed/Other drops
I/O Item Counts:   FS Pkt Count/PS Pkt Count
Default
  (10.10.0.2,224.1.1.1) Flags: HW
    SW Forwarding: 0/0/0/0, Other: 1/1/0
    HW Forwarding: NA/NA/NA/NA, Other: NA/NA/NA
    GigabitEthernet1/0/10 Flags: A
    Vlan20 Flags: F IC
      Pkts: 0/0
    Tunnel0 Flags: F
      Pkts: 0/0

```

```

----- show platform software fed switch 1 ip multicast interface summary -----

Multicast Interface database

```

show tech-support platform layer3

VRF	Interface SVI	IF ID	PIM Status	State	RI Handle
0	GigabitEthernet1/0/10 0x00007fb414b1f108 false	0x0000000000000005f	enabled	0x000000000000000010	
0	Vlan20 0x00007fb414b31a98 true	0x00000000000000060	enabled	0x000000000000000010	

----- show platform software fed switch 1 ip multicast groups summary -----

Multicast Groups database

Mvrf\_id: 0 Mroute: (\*, 224.0.1.40/32) Flags: C IC  
Htm: 0x00007fb414b23ce8 Si: 0x00007fb414b23a08 Di: 0x00007fb414b240e8 Rep\_ri:  
0x00007fb414b245f8

Mvrf\_id: 0 Mroute: (\*, 224.0.0.0/4) Flags: C  
Htm: 0x00007fb4143549e8 Si: 0x00007fb414b20a48 Di: 0x00007fb414b1fe78 Rep\_ri:  
0x00007fb414b20428

Mvrf\_id: 0 Mroute: (\*, 224.1.1.1/32) Flags: C IC  
Htm: 0x00007fb414b2cc98 Si: 0x00007fb414b2b678 Di: 0x00007fb414b2ab98 Rep\_ri:  
0x00007fb414b2b0c8

Mvrf\_id: 0 Mroute: (10.10.0.2, 224.1.1.1/32) Flags: IC  
Htm: 0x00007fb414b2f348 Si: 0x00007fb414b321d8 Di: 0x00007fb414b2dba8 Rep\_ri:  
0x00007fb414b30ed8

----- show platform software fed switch 1 ip multicast groups count -----

Total Number of entries:4

----- show platform software fed switch 1 ip multicast groups 224.1.1.1/32  
source 10.10.0.2 detail -----

MROUTE ENTRY vrf 0 (10.10.0.2, 224.1.1.1/32)  
HW Handle: 140411418055080 Flags: IC  
RPF interface: GigabitEthernet1/0/10(95)):  
HW Handle:140411418055080 Flags:A  
Number of OIF: 3  
Flags: 0x4 Pkts : 0  
OIF Details:  
Tunnel0 Adj: 0xf8000636 F  
Vlan20 Adj: 0xf8000601 F IC  
GigabitEthernet1/0/10 A  
Htm: 0x7fb414b2f348 Si: 0x7fb414b321d8 Di: 0x7fb414b2dba8 Rep\_ri: 0x7fb414b30ed8

DI details

-----  
Handle:0x7fb414b2dba8 Res-Type:ASIC\_RSC\_DI Res-Switch-Num:255 Asic-Num:255  
Feature-ID:AL\_FID\_L3  
MULTICAST\_IPV4 Lkp-ftr-id:LKP\_FEAT\_INVALID ref\_count:1  
priv\_ri/priv\_si Handle:(nil) Hardware Indices/Handles: index0:0x538e  
mtu\_index/13u\_ri\_index0:0x0 index1:0x538e mtu\_index/13u\_ri\_index1:0x0



**show tech-support platform layer3**

The following is sample output from the **show tech-support platform layer3 unicast vrf** command:

```
Device# show tech-support platform layer3 unicast vrf vr1 dstIP 10.0.0.20  
srcIP 10.0.0.10
```

•

•

•

destination IP: 10.0.0.20

source IP: 10.0.0.10

vrf name :

Switch/Stack Mac Address : 5006.ab89.0280 - Local Mac Address  
Mac persistency wait time: Indefinite

Switch#	Role	Mac Address	Priority	H/W Version	Current State
<hr/>					
*1	Active	5006.ab89.0280	1	V02	Ready

----- show switch -----

```
10.0.0.10 -> 10.0.0.20 =>IP adj out of GigabitEthernet1/0/7, addr 10.0.0.20
```

```
----- show ip cef      exact-route platform 10.0.0.10 10.0.0.20 -----
```

```
nexthop is 10.0.0.20
```

Protocol	Interface	Address
IP	GigabitEthernet1/0/7	10.0.0.20(8) 0 packets, 0 bytes epoch 0 sourced in sev-epoch 0 Encap length 14 00211BFDE6495006AB8902C00800 L2 destination address byte offset 0 L2 destination address byte length 6 Link-type after encap: ip ARP

```
----- show adjacency 10.0.0.20 detail -----
```

```
Routing entry for 10.0.0.0/24
Known via "connected", distance 0, metric 0 (connected, via interface)
Routing Descriptor Blocks:
* directly connected, via GigabitEthernet1/0/7
  Route metric is 0, traffic share count is 1
```

```
----- show ip route 10.0.0.20 -----
```

```
10.0.0.20/32, epoch 3, flags [attached]
Adj source: IP adj out of GigabitEthernet1/0/7, addr 10.0.0.20 FF90E67820
  Dependent covered prefix type adjfib, cover 10.0.0.0/24
  attached to GigabitEthernet1/0/7
```

```
----- show ip cef 10.0.0.20 detail -----
```

```
ip prefix: 10.0.0.20/32
```

```
Forwarding Table
```

```
10.0.0.20/32 -> OBJ_ADJACENCY (29), urpf: 30
Connected Interface: 31
Prefix Flags: Directly L2 attached
OM handle: 0x10205416d8
```

```
----- show platform software ip switch 1 R0 cef prefix 10.0.0.20/32 detail -----
```

show tech-support platform layer3

```
OBJ_ADJACENCY found: 29
```

```
Number of adjacency objects: 5
```

```
Adjacency id: 0x1d (29)
  Interface: GigabitEthernet1/0/7, IF index: 31, Link Type: MCP_LINK_IP
  Encap: 0:21:1b:fd:e6:49:50:6:ab:89:2:c0:8:0
  Encap Length: 14, Encap Type: MCP_ET_ARPA, MTU: 1500
  Flags: no-l3-inject
  Incomplete behavior type: None
  Fixup: unknown
  Fixup_Flags_2: unknown
  Nexthop addr: 10.0.0.20
  IP FRR MCP_ADJ_IPFRR_NONE 0
  OM handle: 0x1020541348
```

```
----- show platform software adjacency switch 1 R0 index 29 -----
```

```
Forwarding Table
```

```
10.0.0.20/32 -> OBJ_ADJACENCY (29), urpf: 30
Connected Interface: 31
Prefix Flags: Directly L2 attached
aom id: 393, HW handle: (nil) (created)
```

```
----- show platform software ip switch 1 F0 cef prefix 10.0.0.20/32 detail -----
```

```
OBJ_ADJACENCY found: 29
```

```
Number of adjacency objects: 5
```

```
Adjacency id: 0x1d (29)
  Interface: GigabitEthernet1/0/7, IF index: 31, Link Type: MCP_LINK_IP
  Encap: 0:21:1b:fd:e6:49:50:6:ab:89:2:c0:8:0
  Encap Length: 14, Encap Type: MCP_ET_ARPA, MTU: 1500
  Flags: no-l3-inject
  Incomplete behavior type: None
  Fixup: unknown
  Fixup_Flags_2: unknown
  Nexthop addr: 10.0.0.20
  IP FRR MCP_ADJ_IPFRR_NONE 0
  aom id: 391, HW handle: (nil) (created)
```

```
----- show platform software adjacency switch 1 F0 index 29 -----
```

```
found aom id: 391
```

```
Object identifier: 391
  Description: adj 0x1d, Flags None
  Status: Done, Epoch: 0, Client data: 0xc6a747a8
```

```
----- show platform software object-manager switch 1 F0 object 391 -----
```

```
Object identifier: 66
  Description: intf GigabitEthernet1/0/7, handle 31, hw handle 31, HW dirty: NONE AOM dirty
  NONE
  Status: Done
```

```
----- show platform software object-manager switch 1 F0 object 391 parents -----
```

```
Object identifier: 393
  Description: PREFIX 10.0.0.20/32 (Table id 0)
  Status: Done
```

```
.
```

```
.
```

```
.
```

Output fields are self-explanatory.

#### Related Commands

Command	Description
<b>show tech-support platform</b>	Displays detailed information about a platform for use by technical support.

**show tech-support port**

# show tech-support port

To display port-related information for use by technical support, use the **show tech-support port** command in privileged EXEC mode.

## show tech-support port

<b>Syntax Description</b>	This command has no arguments or keywords.	
<b>Command Modes</b>	Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

<b>Usage Guidelines</b>	The output of the <b>show tech-support port</b> command is very long. To better manage this output, you can redirect the output to an external file (for example, <b>show tech-support port   redirect flash:filename</b> ) in the local writable storage file system or remote file system.
-------------------------	--

The output of this command displays the following commands:

- **show clock**
- **show version**
- **show module**
- **show inventory**
- **show interface status**
- **show interface counters**
- **show interface counters errors**
- **show interfaces**
- **show interfaces capabilities**
- **show controllers**
- **show controllers utilization**
- **show idprom interface**
- **show controller ethernet-controller phy detail**
- **show switch**
- **show platform software fed switch active port summary**
- **show platform software fed switch ifm interfaces ethernet**
- **show platform software fed switch ifm mappings**
- **show platform software fed switch ifm mappings lpn**

- **show platform software fed switch ifm mappings gpn**
- **show platform software fed switch ifm mappings port-le**
- **show platform software fed switch ifm if-id**
- **show platform software fed switch active port if\_id**

## Examples

The following is sample output from the **show tech-support port** command:

```
Device# show tech-support port
.
.
.
----- show controllers utilization -----
Port      Receive Utilization  Transmit Utilization
Gi1/0/1      0    0
Gi1/0/2      0    0
Gi1/0/3      0    0
Gi1/0/4      0    0
Gi1/0/5      0    0
Gi1/0/6      0    0
Gi1/0/7      0    0
Gi1/0/8      0    0
Gi1/0/9      0    0
Gi1/0/10     0    0
Gi1/0/11     0    0
Gi1/0/12     0    0
Gi1/0/13     0    0
Gi1/0/14     0    0
Gi1/0/15     0    0
Gi1/0/16     0    0
Gi1/0/17     0    0
Gi1/0/18     0    0
Gi1/0/19     0    0
Gi1/0/20     0    0
Gi1/0/21     0    0
Gi1/0/22     0    0
Gi1/0/23     0    0
Gi1/0/24     0    0
Gi1/0/25     0    0
Gi1/0/26     0    0
Gi1/0/27     0    0
Gi1/0/28     0    0
Gi1/0/29     0    0
Gi1/0/30     0    0
Gi1/0/31     0    0
Gi1/0/32     0    0
Gi1/0/33     0    0
Gi1/0/34     0    0
Gi1/0/35     0    0
Gi1/0/36     0    0
Te1/0/37     0    0
Te1/0/38     0    0
Te1/0/39     0    0
Te1/0/40     0    0
Te1/0/41     0    0
Te1/0/42     0    0
Te1/0/43     0    0
Te1/0/44     0    0
```

```
show tech-support port
```

```
Te1/0/45      0  0
Te1/0/46      0  0
Te1/0/47      0  0
Te1/0/48      0  0
Te1/1/1       0  0
Te1/1/2       0  0
Te1/1/3       0  0
Te1/1/4       0  0

Total Ports : 52
Total Ports Receive Bandwidth Percentage Utilization : 0
Total Ports Transmit Bandwidth Percentage Utilization : 0

Average Switch Percentage Utilization : 0
```

```
----- show idprom interface Gi1/0/1 -----
```

```
*Sep  7 08:57:24.249:  No module is present
.
.
.
```

The output fields are self-explanatory.

# show tech-support platform

To display detailed information about a platform for use by technical support, use the **show tech-support platform** command in privileged EXEC mode.

## show tech-support platform

**Syntax Description** This command has no arguments or keywords.

**Command Modes** Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Gibraltar 16.11.1	This command was introduced.

**Usage Guidelines** This command is used for platform-specific debugging. The output provides detailed information about a platform, such as CPU usage, Ternary Content Addressable Memory (TCAM) usage, capacity, and memory usage.

The output of the **show tech-support platform** command is very long. To better manage this output, you can redirect the output to an external file (for example, **show tech-support platform | redirect flash:filename**) in the local writable storage file system or remote file system.

The output of the **show tech-support platform** command displays a list commands and their output. These commands may differ based on the platform.

## Examples

The following is sample output from the **show tech-support platform** command:

```
Device# show tech-support platform

.
.
-----
----- show platform hardware capacity -----

Load Average
 Slot Status 1-Min 5-Min 15-Min
1-RP0 Healthy 0.25 0.17 0.12

Memory (kB)
 Slot Status Total Used (Pct) Free (Pct) Committed (Pct)
1-RP0 Healthy 3964428 2212476 (56%) 1751952 (44%) 3420472 (86%)

CPU Utilization
 Slot CPU User System Nice Idle IRQ SIRQ IOwait
1-RP0 0 1.40 0.90 0.00 97.60 0.00 0.10 0.00
      1 2.00 0.20 0.00 97.79 0.00 0.00 0.00
      2 0.20 0.00 0.00 99.80 0.00 0.00 0.00
      3 0.79 0.19 0.00 99.00 0.00 0.00 0.00
      4 5.61 0.50 0.00 93.88 0.00 0.00 0.00
      5 2.90 0.40 0.00 96.70 0.00 0.00 0.00
```

\*: interface is up

show tech-support platform

IHQ: pkts in input hold queue  
 OHQ: pkts in output hold queue  
 RXBS: rx rate (bits/sec)  
 TXBS: tx rate (bits/sec)  
 TRTL: throttle count

IQD: pkts dropped from input queue  
 OQD: pkts dropped from output queue  
 RXPS: rx rate (pkts/sec)  
 TXPS: tx rate (pkts/sec)

Interface			IHQ	IQD	OHQ	OQD	RXBS	RXPS
TXBS	TXPS	TRTL						
Vlan1			0	0	0	0	0	0
0	0	0						
*	GigabitEthernet0/0		0	10179	0	0	2000	4
0	0	0						
	GigabitEthernet1/0/1		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/2		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/3		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/4		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/5		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/6		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/7		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/8		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/9		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/10		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/11		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/12		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/13		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/14		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/15		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/16		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/17		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/18		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/19		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/20		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/21		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/22		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/23		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/24		0	0	0	0	0	0
0	0	0						
	GigabitEthernet1/0/25		0	0	0	0	0	0
0	0	0						

GigabitEthernet1/0/26	0	0	0	0	0	0
0	0	0				
GigabitEthernet1/0/27	0	0	0	0	0	0
0	0	0				
GigabitEthernet1/0/28	0	0	0	0	0	0
0	0	0				
GigabitEthernet1/0/29	0	0	0	0	0	0
0	0	0				
GigabitEthernet1/0/30	0	0	0	0	0	0
0	0	0				
GigabitEthernet1/0/31	0	0	0	0	0	0
0	0	0				
GigabitEthernet1/0/32	0	0	0	0	0	0
0	0	0				
GigabitEthernet1/0/33	0	0	0	0	0	0
0	0	0				
GigabitEthernet1/0/34	0	0	0	0	0	0
0	0	0				
GigabitEthernet1/0/35	0	0	0	0	0	0
0	0	0				
GigabitEthernet1/0/36	0	0	0	0	0	0
0	0	0				
Tel1/0/37		0	0	0	0	0
0	0	0				
Tel1/0/38		0	0	0	0	0
0	0	0				
Tel1/0/39		0	0	0	0	0
0	0	0				
Tel1/0/40		0	0	0	0	0
0	0	0				
Tel1/0/41		0	0	0	0	0
0	0	0				
Tel1/0/42		0	0	0	0	0
0	0	0				
Tel1/0/43		0	0	0	0	0
0	0	0				
Tel1/0/44		0	0	0	0	0
0	0	0				
Tel1/0/45		0	0	0	0	0
0	0	0				
Tel1/0/46		0	0	0	0	0
0	0	0				
Tel1/0/47		0	0	0	0	0
0	0	0				
Tel1/0/48		0	0	0	0	0
0	0	0				
Tel1/1/1		0	0	0	0	0
0	0	0				
Tel1/1/2		0	0	0	0	0
0	0	0				
Tel1/1/3		0	0	0	0	0
0	0	0				
Tel1/1/4		0	0	0	0	0
0	0	0				
ASIC 0 Info						
-----						
ASIC 0 HASH Table 0 Software info: FSE 0						
MAB 0: Unicast MAC addresses srip 0 1						
MAB 1: Unicast MAC addresses srip 0 1						
MAB 2: Unicast MAC addresses srip 0 1						
MAB 3: Unicast MAC addresses srip 0 1						
MAB 4: Unicast MAC addresses srip 0 1						
MAB 5: Unicast MAC addresses srip 0 1						
MAB 6: Unicast MAC addresses srip 0 1						

**show tech-support platform**

```

MAB 7: Unicast MAC addresses srip 0 1
ASIC 0 HASH Table 1 Software info: FSE 0
MAB 0: Unicast MAC addresses srip 0 1
MAB 1: Unicast MAC addresses srip 0 1
MAB 2: Unicast MAC addresses srip 0 1
MAB 3: Unicast MAC addresses srip 0 1
MAB 4: Unicast MAC addresses srip 0 1
MAB 5: Unicast MAC addresses srip 0 1
MAB 6: Unicast MAC addresses srip 0 1
MAB 7: Unicast MAC addresses srip 0 1
ASIC 0 HASH Table 2 Software info: FSE 1
MAB 0: L3 Multicast entries srip 2 3
MAB 1: L3 Multicast entries srip 2 3
MAB 2: SGT_DGT      srip 0 1
MAB 3: SGT_DGT      srip 0 1
MAB 4: (null)        srip
MAB 5: (null)        srip
MAB 6: (null)        srip
MAB 7: (null)        srip
.
.
.
.
```

Output fields are self-explanatory.

**Related Commands**

<b>Command</b>	<b>Description</b>
<b>show tech-support platform evpn_vxlan</b>	Displays EVPN-VXLAN-related platform information.
<b>show tech-support platform fabric</b>	Displays detailed information about the switch fabric.
<b>show tech-support platform igmp_snooping</b>	Displays IGMP snooping information about a group.
<b>show tech-support platform layer3</b>	Displays Layer 3 platform forwarding information.
<b>show tech-support platform mld_snooping</b>	Displays MLD snooping information about a group.

# show version

To display information about the currently loaded software along with hardware and device information, use the **show version** command in user EXEC or privileged EXEC mode.

```
show version
```

<b>Command Modes</b>	User EXEC (>) Privileged EXEC (#)
----------------------	--------------------------------------

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Gibraltar 16.11.1	This command was modified to display the latest reload reason for all switches in a stack in the output.
	Cisco IOS XE 3.2SE	This command was implemented on the Cisco Catalyst 3850 Series Switches

## Example:

```
Device# show version
Cisco IOS XE Software, Version BLD_POLARIS_DEV_LATEST_20180713_195337
Cisco IOS Software [Fuji], Catalyst L3 Switch Software (CAT3K_CAA-UNIVERSALK9-M), Experimental
Version 16.11.20180713:191831
[polaris_dev-/nobackup/mcpred/BLD-BLD_POLARIS_DEV_LATEST_20180713_195337 124]
Copyright (c) 1986-2018 by Cisco Systems, Inc.
Compiled Fri 13-Jul-18 17:11 by mcpred
```

Cisco IOS-XE software, Copyright (c) 2005-2018 by cisco Systems, Inc.  
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licensed under the GNU General Public License ("GPL") Version 2.0. The  
software code licensed under GPL Version 2.0 is free software that comes  
with ABSOLUTELY NO WARRANTY. You can redistribute and/or modify such  
GPL code under the terms of GPL Version 2.0. For more details, see the  
documentation or "License Notice" file accompanying the IOS-XE software,  
or the applicable URL provided on the flyer accompanying the IOS-XE  
software.

```
ROM: IOS-XE ROMMON
BOOTLDR: CAT3K_CAA Boot Loader (CAT3K_CAA-HBOOT-M) Version 4.68, engineering software (D)

--More--      Switch uptime is 8 hours, 28 minutes
Uptime for this control processor is 8 hours, 32 minutes
System returned to ROM by Power Failure or Unknown
System image file is "flash:packages.conf"
Last reload reason: Power Failure or Unknown
```

This product contains cryptographic features and is subject to United States and local country laws governing import, export, transfer and use. Delivery of Cisco cryptographic products does not imply third-party authority to import, export, distribute or use encryption. Importers, exporters, distributors and users are responsible for

show version

compliance with U.S. and local country laws. By using this product you agree to comply with applicable laws and regulations. If you are unable to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:  
<http://www.cisco.com/wwl/export/crypto/tool/stqrg.html>

If you require further assistance please contact us by sending email to [export@cisco.com](mailto:export@cisco.com).

--More--

Technology Package License Information:

Technology-package Current	Type	Technology-package Next reboot
ipservicesk9 None	Smart License Subscription Smart License	ipservicesk9 None

cisco WS-C3850-24U (MIPS) processor (revision PP) with 829450K/6147K bytes of memory.  
Processor board ID FOC1722V0VC  
1 Virtual Ethernet interface  
124 Gigabit Ethernet interfaces  
32 Ten Gigabit Ethernet interfaces  
2 Forty Gigabit Ethernet interfaces  
2048K bytes of non-volatile configuration memory.  
4194304K bytes of physical memory.  
250456K bytes of Crash Files at crashinfo:.  
250456K bytes of Crash Files at crashinfo-2:.  
257008K bytes of Crash Files at crashinfo-3:.  
--More-- 250456K bytes of Crash Files at crashinfo-4:.  
1609272K bytes of Flash at flash:.  
1609272K bytes of Flash at flash-2:.  
1550272K bytes of Flash at flash-3:.  
1609272K bytes of Flash at flash-4:.  
0K bytes of WebUI ODM Files at webui:.

Base Ethernet MAC Address	:	d0:c7:89:56:17:80
Motherboard Assembly Number	:	73-14984-04
Motherboard Serial Number	:	FOC172117CU
Model Revision Number	:	PP
Motherboard Revision Number	:	04
Model Number	:	WS-C3850-24U
System Serial Number	:	FOC172117CU

Switch Ports Model	SW Version	SW Image	Mode
-----	-----	-----	----
* 1 32 WS-C3850-24U	16.11.1	CAT3K_CAA-UNIVERSALK9	INSTALL
2 32 WS-C3850-24U	16.11.1	CAT3K_CAA-UNIVERSALK9	INSTALL
3 62 WS-C3850-12X48U	16.11.1	CAT3K_CAA-UNIVERSALK9	INSTALL
4 32 WS-C3850-24S	16.11.1	CAT3K_CAA-UNIVERSALK9	INSTALL

--More--  
Switch 02  
-----  
Switch uptime : 8 hours, 32 minutes

Base Ethernet MAC Address	:	1c:e8:5d:28:8e:80
Motherboard Assembly Number	:	73-15804-04
Motherboard Serial Number	:	FOC18476XY3
Model Revision Number	:	PP
Motherboard Revision Number	:	03

```
Model Number : WS-C3850-24U
System Serial Number : FOC18476XY3
Last reload reason : Power Failure or Unknown

Switch 03
-----
Switch uptime : 8 hours, 31 minutes

Base Ethernet MAC Address : 50:67:ae:1d:30:00
Motherboard Assembly Number : 73-15755-07
Motherboard Serial Number : FOC19163G0Z
Model Revision Number : A0
Motherboard Revision Number : A0
--More-- Model Number : WS-C3850-12X48U
System Serial Number : FOC19163G0Z
Last reload reason : Power Failure or Unknown

Switch 04
-----
Switch uptime : 8 hours, 31 minutes

Base Ethernet MAC Address : 50:1c:b0:7b:64:00
Motherboard Assembly Number : 73-14445-07
Motherboard Serial Number : FOC21464YEP
Model Revision Number : L0
Motherboard Revision Number : B0
Model Number : WS-C3850-24S
System Serial Number : FOC21464YEP
Last reload reason : Power Failure or Unknown

Configuration register is 0x102
```

**system env temperature threshold yellow**

# system env temperature threshold yellow

To configure the difference between the yellow and red temperature thresholds that determines the value of yellow threshold, use the **system env temperature threshold yellow** command in global configuration mode. To return to the default value, use the **no** form of this command.

```
system env temperature threshold yellow value
no system env temperature threshold yellow value
```

---

## Syntax Description

**value** Specifies the difference between the yellow and red threshold values (in Celsius). The range is 10 to 25.

---

## Command Default

These are the default values

**Table 74: Default Values for the Temperature Thresholds**

Device	Difference between Yellow and Red	Red <sup>11</sup>
Catalyst 3850	14°C	60°C

<sup>11</sup> You cannot configure the red temperature threshold.

---

## Command Modes

Global configuration

---

## Command History

Release	Modification
---------	--------------

Cisco IOS XE 3.2SE	This command was introduced.
--------------------	------------------------------

---



---

## Usage Guidelines

You cannot configure the green and red thresholds but can configure the yellow threshold. Use the **system env temperature threshold yellow** global configuration command to specify the difference between the yellow and red thresholds and to configure the yellow threshold. For example, if the red threshold is 66 degrees C and you want to configure the yellow threshold as 51 degrees C, set the difference between the thresholds as 15 by using the **system env temperature threshold yellow 15** command. For example, if the red threshold is 60 degrees C and you want to configure the yellow threshold as 51 degrees C, set the difference between the thresholds as 15 by using the **system env temperature threshold yellow 9** command.



**Note** The internal temperature sensor in the device measures the internal system temperature and might vary ±5 degrees C.

---



---

## Examples

This example sets 15 as the difference between the yellow and red thresholds:

```
Device(config)# system env temperature threshold yellow 15
Device(config) #
```



# test cable-diagnostics tdr

To run the Time Domain Reflector (TDR) feature on an interface, use the **test cable-diagnostics tdr** command in privileged EXEC mode.

**test cable-diagnostics tdr interface *interface-id***

<b>Syntax Description</b>	<i>interface-id</i> The interface on which to run TDR.				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** TDR is supported only on 10/100/100 copper Ethernet ports. It is not supported on 10-Gigabit Ethernet ports or small form-factor pluggable (SFP) module ports.

After you run TDR by using the **test cable-diagnostics tdr interface *interface-id*** command, use the **show cable-diagnostics tdr interface *interface-id*** privileged EXEC command to display the results.

This example shows how to run TDR on an interface:

```
Device# test cable-diagnostics tdr interface gigabitethernet1/0/2
TDR test started on interface Gi1/0/2
A TDR test can take a few seconds to run on an interface
Use 'show cable-diagnostics tdr' to read the TDR results
```

If you enter the **test cable-diagnostics tdr interface *interface-id*** command on an interface that has an link up status and a speed of 10 or 100 Mb/s, these messages appear:

```
Device# test cable-diagnostics tdr interface gigabitethernet1/0/3
TDR test on Gi1/0/9 will affect link state and traffic
TDR test started on interface Gi1/0/3
A TDR test can take a few seconds to run on an interface
Use 'show cable-diagnostics tdr' to read the TDR results.
```

# traceroute mac

To display the Layer 2 path taken by the packets from the specified source MAC address to the specified destination MAC address, use the **traceroute mac** command in privileged EXEC mode.

```
traceroute mac [interface interface-id] source-mac-address [interface interface-id]
destination-mac-address [vlan vlan-id] [detail]
```

## Syntax Description

<b>interface interface-id</b>	(Optional) Specifies an interface on the source or destination device.
<b>source-mac-address</b>	The MAC address of the source device in hexadecimal format.
<b>destination-mac-address</b>	The MAC address of the destination device in hexadecimal format.
<b>vlan vlan-id</b>	(Optional) Specifies the VLAN on which to trace the Layer 2 path that the packets take from the source device to the destination device. Valid VLAN IDs are 1 to 4094.
<b>detail</b>	(Optional) Specifies that detailed information appears.

## Command Default

No default behavior or values.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

For Layer 2 traceroute to function properly, Cisco Discovery Protocol (CDP) must be enabled on all of the devicees in the network. Do not disable CDP.

When the device detects a device in the Layer 2 path that does not support Layer 2 traceroute, the device continues to send Layer 2 trace queries and lets them time out.

The maximum number of hops identified in the path is ten.

Layer 2 traceroute supports only unicast traffic. If you specify a multicast source or destination MAC address, the physical path is not identified, and an error message appears.

The **traceroute mac** command output shows the Layer 2 path when the specified source and destination addresses belong to the same VLAN.

If you specify source and destination addresses that belong to different VLANs, the Layer 2 path is not identified, and an error message appears.

If the source or destination MAC address belongs to multiple VLANs, you must specify the VLAN to which both the source and destination MAC addresses belong.

If the VLAN is not specified, the path is not identified, and an error message appears.

The Layer 2 traceroute feature is not supported when multiple devices are attached to one port through hubs (for example, multiple CDP neighbors are detected on a port).

**traceroute mac**

When more than one CDP neighbor is detected on a port, the Layer 2 path is not identified, and an error message appears.

This feature is not supported in Token Ring VLANs.

### Examples

This example shows how to display the Layer 2 path by specifying the source and destination MAC addresses:

```
Device# traceroute mac 0000.0201.0601 0000.0201.0201
Source 0000.0201.0601 found on con6[WS-C3750E-24PD] (2.2.6.6)
con6 (2.2.6.6) :Gi0/0/1 => Gi0/0/3
con5 (2.2.5.5) : Gi0/0/3 => Gi0/0/1
con1 (2.2.1.1) : Gi0/0/1 => Gi0/0/2
con2 (2.2.2.2) : Gi0/0/2 => Gi0/0/1
Destination 0000.0201.0201 found on con2[WS-C3550-24] (2.2.2.2)
Layer 2 trace completed
```

This example shows how to display the Layer 2 path by using the **detail** keyword:

```
Device# traceroute mac 0000.0201.0601 0000.0201.0201 detail
Source 0000.0201.0601 found on con6[WS-C3750E-24PD] (2.2.6.6)
con6 / WS-C3750E-24PD / 2.2.6.6 :
    Gi0/0/2 [auto, auto] => Gi0/0/3 [auto, auto]
con5 / WS-C2950G-24-EI / 2.2.5.5 :
    Fa0/3 [auto, auto] => Gi0/1 [auto, auto]
con1 / WS-C3550-12G / 2.2.1.1 :
    Gi0/1 [auto, auto] => Gi0/2 [auto, auto]
con2 / WS-C3550-24 / 2.2.2.2 :
    Gi0/2 [auto, auto] => Fa0/1 [auto, auto]
Destination 0000.0201.0201 found on con2[WS-C3550-24] (2.2.2.2)
Layer 2 trace completed.
```

This example shows how to display the Layer 2 path by specifying the interfaces on the source and destination devices:

```
Device# traceroute mac interface fastethernet0/1 0000.0201.0601 interface fastethernet0/3
0000.0201.0201
Source 0000.0201.0601 found on con6[WS-C3750E-24PD] (2.2.6.6)
con6 (2.2.6.6) :Gi0/0/1 => Gi0/0/3
con5 (2.2.5.5) : Gi0/0/3 => Gi0/0/1
con1 (2.2.1.1) : Gi0/0/1 => Gi0/0/2
con2 (2.2.2.2) : Gi0/0/2 => Gi0/0/1
Destination 0000.0201.0201 found on con2[WS-C3550-24] (2.2.2.2)
Layer 2 trace completed
```

This example shows the Layer 2 path when the device is not connected to the source device:

```
Device# traceroute mac 0000.0201.0501 0000.0201.0201 detail
Source not directly connected, tracing source .....
Source 0000.0201.0501 found on con5[WS-C3750E-24TD] (2.2.5.5)
con5 / WS-C3750E-24TD / 2.2.5.5 :
    Gi0/0/1 [auto, auto] => Gi0/0/3 [auto, auto]
```

```
con1 / WS-C3550-12G / 2.2.1.1 :  
    Gi0/1 [auto, auto] => Gi0/2 [auto, auto]  
con2 / WS-C3550-24 / 2.2.2.2 :  
    Gi0/2 [auto, auto] => Fa0/1 [auto, auto]  
Destination 0000.0201.0201 found on con2[WS-C3550-24] (2.2.2.2)  
Layer 2 trace completed.
```

This example shows the Layer 2 path when the device cannot find the destination port for the source MAC address:

```
Device# traceroute mac 0000.0011.1111 0000.0201.0201  
Error:Source Mac address not found.  
Layer2 trace aborted.
```

This example shows the Layer 2 path when the source and destination devices are in different VLANs:

```
Device# traceroute mac 0000.0201.0601 0000.0301.0201  
Error:Source and destination macs are on different vlans.  
Layer2 trace aborted.
```

This example shows the Layer 2 path when the destination MAC address is a multicast address:

```
Device# traceroute mac 0000.0201.0601 0100.0201.0201  
Invalid destination mac address
```

This example shows the Layer 2 path when source and destination devices belong to multiple VLANs:

```
Device# traceroute mac 0000.0201.0601 0000.0201.0201  
Error:Mac found on multiple vlans.  
Layer2 trace aborted.
```

# traceroute mac ip

To display the Layer 2 path taken by the packets from the specified source IP address or hostname to the specified destination IP address or hostname, use the **traceroute mac ip** command in privileged EXEC mode.

**traceroute mac ip** {*source-ip-address source-hostname*} {*destination-ip-address destination-hostname*} [**detail**]

<b>Syntax Description</b>	<p><i>source-ip-address</i> The IP address of the source device as a 32-bit quantity in dotted-decimal format.</p> <p><i>source-hostname</i> The IP hostname of the source device.</p> <p><i>destination-ip-address</i> The IP address of the destination device as a 32-bit quantity in dotted-decimal format.</p> <p><i>destination-hostname</i> The IP hostname of the destination device.</p> <p><b>detail</b> (Optional) Specifies that detailed information appears.</p>				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>For Layer 2 traceroute to function properly, Cisco Discovery Protocol (CDP) must be enabled on each device in the network. Do not disable CDP.</p> <p>When the device detects a device in the Layer 2 path that does not support Layer 2 traceroute, the device continues to send Layer 2 trace queries and lets them time out.</p> <p>The maximum number of hops identified in the path is ten.</p> <p>The <b>traceroute mac ip</b> command output shows the Layer 2 path when the specified source and destination IP addresses are in the same subnet.</p> <p>When you specify the IP addresses, the device uses Address Resolution Protocol (ARP) to associate the IP addresses with the corresponding MAC addresses and the VLAN IDs.</p> <ul style="list-style-type: none"> <li>If an ARP entry exists for the specified IP address, the device uses the associated MAC address and identifies the physical path.</li> <li>If an ARP entry does not exist, the device sends an ARP query and tries to resolve the IP address. The IP addresses must be in the same subnet. If the IP address is not resolved, the path is not identified, and an error message appears.</li> </ul> <p>The Layer 2 traceroute feature is not supported when multiple devices are attached to one port through hubs (for example, multiple CDP neighbors are detected on a port).</p> <p>When more than one CDP neighbor is detected on a port, the Layer 2 path is not identified, and an error message appears.</p>				

This feature is not supported in Token Ring VLANs.

### Examples

This example shows how to display the Layer 2 path by specifying the source and destination IP addresses and by using the **detail** keyword:

```
Device# traceroute mac ip 2.2.66.66 2.2.22.22 detail
Translating IP to mac .....
2.2.66.66 => 0000.0201.0601
2.2.22.22 => 0000.0201.0201

Source 0000.0201.0601 found on con6[WS-C2950G-24-EI] (2.2.6.6)
con6 / WS-C3750E-24TD / 2.2.6.6 :
    Gi0/0/1 [auto, auto] => Gi0/0/3 [auto, auto]
con5 / WS-C2950G-24-EI / 2.2.5.5 :
    Fa0/3 [auto, auto] => Gi0/1 [auto, auto]
con1 / WS-C3550-12G / 2.2.1.1 :
    Gi0/1 [auto, auto] => Gi0/2 [auto, auto]
con2 / WS-C3550-24 / 2.2.2.2 :
    Gi0/2 [auto, auto] => Fa0/1 [auto, auto]
Destination 0000.0201.0201 found on con2[WS-C3550-24] (2.2.2.2)
Layer 2 trace completed.
```

This example shows how to display the Layer 2 path by specifying the source and destination hostnames:

```
Device# traceroute mac ip con6 con2
Translating IP to mac .....
2.2.66.66 => 0000.0201.0601
2.2.22.22 => 0000.0201.0201

Source 0000.0201.0601 found on con6
con6 (2.2.6.6) :Gi0/0/1 => Gi0/0/3
con5          (2.2.5.5      ) : Gi0/0/3 => Gi0/1
con1          (2.2.1.1      ) : Gi0/0/1 => Gi0/2
con2          (2.2.2.2      ) : Gi0/0/2 => Fa0/1
Destination 0000.0201.0201 found on con2
Layer 2 trace completed
```

This example shows the Layer 2 path when ARP cannot associate the source IP address with the corresponding MAC address:

```
Device# traceroute mac ip 2.2.66.66 2.2.77.77
Arp failed for destination 2.2.77.77.
Layer2 trace aborted.
```

# type

To display the contents of one or more files, use the **type** command in boot loader mode.

**type** *filesystem:/file-url...*

<b>Syntax Description</b>	<i>filesystem:</i> Alias for a file system. Use <b>flash:</b> for the system board flash device; use <b>usbflash0:</b> for USB memory sticks. <i>/file-url...</i> Path (directory) and name of the files to display. Separate each filename with a space.				
<b>Command Default</b>	No default behavior or values.				
<b>Command Modes</b>	Boot loader				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	Filenames and directory names are case sensitive. If you specify a list of files, the contents of each file appear sequentially.				

| **Examples** | This example shows how to display the contents of a file: |

```
Device: type flash:image_file_name
version_suffix: universal-122-xx.SEx
version_directory: image_file_name
image_system_type_id: 0x00000002
image_name: image_file_name.bin
ios_image_file_size: 8919552
total_image_file_size: 11592192
image_feature: IP|LAYER_3|PLUS|MIN_DRAM_MEG=128
image_family: family
stacking_number: 1.34
board_ids: 0x00000068 0x00000069 0x0000006a 0x0000006b
info_end:
```

# unset

To reset one or more environment variables, use the **unset** command in boot loader mode.

**unset** *variable...*

<b>Syntax Description</b>	<i>variable</i>	Use one of these keywords for <i>variable</i> :				
		<b>MANUAL_BOOT</b> —Specifies whether the device automatically or manually boots.				
		<b>BOOT</b> —Resets the list of executable files to try to load and execute when automatically booting. If the BOOT environment variable is not set, the system attempts to load and execute the first executable image it can find by using a recursive, depth-first search through the flash: file system. If the BOOT variable is set but the specified images cannot be loaded, the system attempts to boot the first bootable file that it can find in the flash: file system.				
		<b>ENABLE_BREAK</b> —Specifies whether the automatic boot process can be interrupted by using the <b>Break</b> key on the console after the flash: file system has been initialized.				
		<b>HELPER</b> —Identifies the semicolon-separated list of loadable files to dynamically load during the boot loader initialization. Helper files extend or patch the functionality of the boot loader.				
		<b>PS1</b> —Specifies the string that is used as the command-line prompt in boot loader mode.				
		<b>CONFIG_FILE</b> —Resets the filename that Cisco IOS uses to read and write a nonvolatile copy of the system configuration.				
		<b>BAUD</b> —Resets the rate in bits per second (b/s) used for the console. The Cisco IOS software inherits the baud rate setting from the boot loader and continues to use this value unless the configuration file specifies another setting.				
<b>Command Default</b>	No default behavior or values.					
<b>Command Modes</b>	Boot loader					
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>		Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification					
Cisco IOS XE 3.2SE	This command was introduced.					
<b>Usage Guidelines</b>	<p>Under typical circumstances, it is not necessary to alter the setting of the environment variables.</p> <p>The MANUAL_BOOT environment variable can also be reset by using the <b>no boot manual</b> global configuration command.</p> <p>The BOOT environment variable can also be reset by using the <b>no boot system</b> global configuration command.</p> <p>The ENABLE_BREAK environment variable can also be reset by using the <b>no boot enable-break</b> global configuration command.</p>					

**unset**

The **HELPER** environment variable can also be reset by using the **no boot helper** global configuration command.

The **CONFIG\_FILE** environment variable can also be reset by using the **no boot config-file** global configuration command.

### Example

This example shows how to unset the **SWITCH\_PRIORITY** environment variable:

```
Device: unset SWITCH_PRIORITY
```

# version

To display the boot loader version, use the **version** command in boot loader mode.

## version

**Syntax Description** This command has no arguments or keywords.

**Command Default** No default behavior or values.

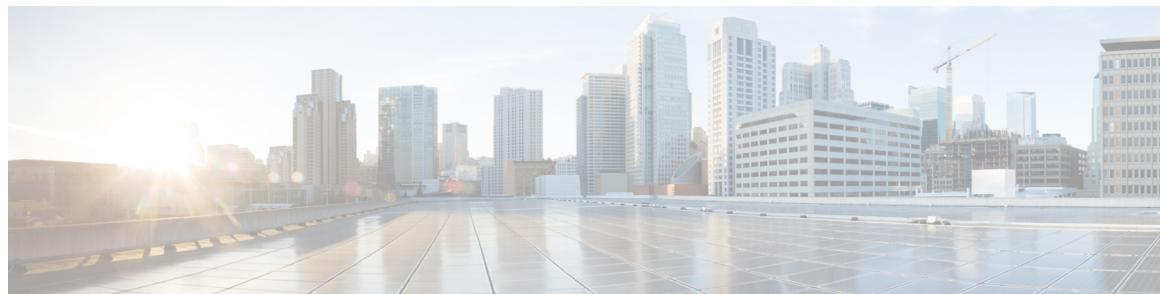
**Command Modes** Boot loader

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Examples** This example shows how to display the boot loader version on a device:

```
Device: version
CAT3K_CAA Boot Loader (CAT3K_CAA-HBOOT-M) Version 1.3, RELEASE SOFTWARE (P)
Compiled Sun Jun 16 18:31:15 PDT 2013 by rel
```





## Tracing

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- [show platform software trace filter-binary, on page 1338](#)
- [show platform software trace message, on page 1339](#)
- [show platform software trace level, on page 1342](#)
- [request platform software trace archive, on page 1345](#)
- [request platform software trace rotate all, on page 1346](#)
- [request platform software trace filter-binary, on page 1347](#)

# set platform software trace

To set the trace level for a specific module within a process, use the **set platform software trace** command in privileged EXEC or user EXEC mode.

**set platform software trace** *process slot module trace-level*

---

Syntax Description		
	<i>process</i>	<p>Process whose tracing level is being set. Options include:</p> <ul style="list-style-type: none"> <li>• <b>chassis-manager</b>—The Chassis Manager process.</li> <li>• <b>cli-agent</b>—The CLI Agent process.</li> <li>• <b>dbm</b>—The Database Manager process.</li> <li>• <b>emd</b>—The Environmental Monitoring process.</li> <li>• <b>fed</b>—The Forwarding Engine Driver process.</li> <li>• <b>forwarding-manager</b>—The Forwarding Manager process.</li> <li>• <b>host-manager</b>—The Host Manager process.</li> <li>• <b>iomd</b>—The Input/Output Module daemon (IOMd) process.</li> <li>• <b>ios</b>—The IOS process.</li> <li>• <b>license-manager</b>—The License Manager process.</li> <li>• <b>logger</b>—The Logging Manager process.</li> <li>• <b>platform-mgr</b>—The Platform Manager process.</li> <li>• <b>pluggable-services</b>—The Pluggable Services process.</li> <li>• <b>replication-mgr</b>—The Replication Manager process.</li> <li>• <b>shell-manager</b>—The Shell Manager process.</li> <li>• <b>smd</b>—The Session Manager process.</li> <li>• <b>table-manager</b>—The Table Manager Server.</li> <li>• <b>wireshark</b>—The Embedded Packet Capture (EPC) Wireshark process.</li> </ul>

---

---

<i>slot</i>	Hardware slot where the process for which the trace level is set, is running. Options include: <ul style="list-style-type: none"><li>• <i>number</i>—Number of the SIP slot of the hardware module where the trace level is set. For instance, if you want to specify the SIP in SIP slot 2 of the switch, enter 2.</li><li>• <i>SIP-slot / SPA-bay</i>—Number of the SIP switch slot and the number of the shared port adapter (SPA) bay of that SIP. For instance, if you want to specify the SPA in bay 2 of the SIP in switch slot 3, enter 3/2.</li><li>• <b>F0</b>—The Embedded-Service-Processor in slot 0.</li><li>• <b>FP active</b>—The active Embedded-Service-Processor.</li><li>• <b>R0</b>—The route processor in slot 0.</li><li>• <b>RP active</b>—The active route processor.</li><li>• <b>switch &lt;number&gt;</b>—The switch with its number specified.</li><li>• <b>switch active</b>—The active switch.</li><li>• <b>switch standby</b>—The standby switch.</li></ul>
<i>module</i>	Module within the process for which the tracing level is set.

---

**set platform software trace**


---

<i>trace-level</i>	<p>Trace level. Options include:</p> <ul style="list-style-type: none"> <li>• <b>debug</b>—Debug level tracing. A debug-level trace message is a non-urgent message providing a large amount of detail about the module.</li> <li>• <b>emergency</b>—Emergency level tracing. An emergency-level trace message is a message indicating that the system is unusable.</li> <li>• <b>error</b>—Error level tracing. An error-level tracing message is a message indicating a system error.</li> <li>• <b>info</b>—Information level tracing. An information-level tracing message is a non-urgent message providing information about the system.</li> <li>• <b>noise</b>—Noise level tracing. The noise level is always equal to the highest tracing level possible and always generates every possible tracing message.</li> </ul> <p>The noise level is always equal to the highest-level tracing message possible for a module, even if future enhancements to this command introduce options that allow users to set higher tracing levels.</p> <ul style="list-style-type: none"> <li>• <b>notice</b>—The message is regarding a significant issue, but the switch is still working normally.</li> <li>• <b>verbose</b>—Verbose level tracing. All possible tracing messages are sent when the trace level is set to verbose.</li> <li>• <b>warning</b>—Warning messages.</li> </ul>
--------------------	---

---

**Command Default** The default tracing level for all modules is **notice**.

**Command Modes** User EXEC (>)

Privileged EXEC (#)

Command History	Release	Modification
	Cisco IOS XE Denali 16.1.1	This command was introduced.

**Usage Guidelines** The *module* options vary by process and by *hardware-module*. Use the ? option when entering this command to see which *module* options are available with each keyword sequence.

Use the **show platform software trace message** command to view trace messages.

Trace files are stored in the *tracelogs* directory in the *harddisk:file system*. These files can be deleted without doing any harm to your switch operation.

Trace file output is used for debugging. The trace level is a setting that determines how much information should be stored in trace files about a module.

**Examples**

This example shows how to set the trace level for all the modules in dbm process:

```
Device# set platform software trace dbm R0 all-modules debug
```

**show platform software trace filter-binary**

# show platform software trace filter-binary

To display the most recent trace information for a specific module, use the **show platform software trace filter-binary** command in privileged EXEC or user EXEC mode.

**show platform software trace filter-binary** [*modules*] [**context** *mac-address*]

<b>Syntax Description</b>	<b>context</b> <i>mac-address</i>	Represents the context used to filter. Additionally, you can filter based on module names and trace levels. The context keyword accepts either a MAC address or any other argument based on which a trace is tagged.
<b>Command Modes</b>	User EXEC (>) Privileged EXEC (#)	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE Denali 16.1.1	This command was introduced.

**Usage Guidelines** This command collates and sorts all the logs present in the `/tmp/.../` across all the processes relevant to the module. The trace logs of all the processes relevant to the specified module are printed to the console. This command also generates a file named `collated_log_{system_time}` with the same content, in the `/crashinfo/tracelogs` directory.

# show platform software trace message

To display the trace messages for a process, use the **set platform software trace** command in privileged EXEC or user EXEC mode.

**show platform software trace message *process slot***

Syntax Description	process	Tracing level that is being set. Options include: <ul style="list-style-type: none"><li>• <b>chassis-manager</b>—The Chassis Manager process.</li><li>• <b>cli-agent</b>—The CLI Agent process.</li><li>• <b>cmm</b>—The CMM process.</li><li>• <b>dbm</b>—The Database Manager process.</li><li>• <b>emd</b>—The Environmental Monitoring process.</li><li>• <b>fed</b>—The Forwarding Engine Driver process.</li><li>• <b>forwarding-manager</b>—The Forwarding Manager process.</li><li>• <b>geo</b>—The Geo Manager process.</li><li>• <b>host-manager</b>—The Host Manager process.</li><li>• <b>interface-manager</b>—The Interface Manager process.</li><li>• <b>iomd</b>—The Input/Output Module daemon (IOMd) process.</li><li>• <b>ios</b>—The IOS process.</li><li>• <b>license-manager</b>—The License Manager process.</li><li>• <b>logger</b>—The Logging Manager process.</li><li>• <b>platform-mgr</b>—The Platform Manager process.</li><li>• <b>pluggable-services</b>—The Pluggable Services process.</li><li>• <b>replication-mgr</b>—The Replication Manager process.</li><li>• <b>shell-manager</b>—The Shell Manager process.</li><li>• <b>sif</b>—The Stack Interface (SIF) Manager process.</li><li>• <b>smd</b>—The Session Manager process.</li><li>• <b>stack-mgr</b>—The Stack Manager process.</li><li>• <b>table-manager</b>—The Table Manager Server.</li><li>• <b>thread-test</b>—The Multithread Manager process.</li><li>• <b>virt-manager</b>—The Virtualization Manager process.</li></ul>
--------------------	---------	--

**show platform software trace message***slot*

Hardware slot where the process for which the trace level is set, is running. Options include:

- ***number***—Number of the SIP slot of the hardware module where the trace level is set. For instance, if you want to specify the SIP in SIP slot 2 of the switch, enter 2.
- ***SIP-slot / SPA-bay***—Number of the SIP switch slot and the number of the shared port adapter (SPA) bay of that SIP. For instance, if you want to specify the SPA in bay 2 of the SIP in switch slot 3, enter 3/2.
- **F0**—The Embedded Service Processor slot 0.
- **FP active**—The active Embedded Service Processor.
- **R0**—The route processor in slot 0.
- **RP active**—The active route processor.
- **switch <number>** —The switch, with its number specified.
- **switch active**—The active switch.
- **switch standby**—The standby switch.
  - ***number***—Number of the SIP slot of the hardware module where the trace level is set. For instance, if you want to specify the SIP in SIP slot 2 of the switch, enter 2.
  - ***SIP-slot / SPA-bay***—Number of the SIP switch slot and the number of the shared port adapter (SPA) bay of that SIP. For instance, if you want to specify the SPA in bay 2 of the SIP in switch slot 3, enter 3/2.
  - **F0**—The Embedded Service Processor in slot 0.
  - **FP active**—The active Embedded Service Processor.
  - **R0**—The route processor in slot 0.
  - **RP active**—The active route processor.

**Command Modes**

User EXEC (&gt;)

Privileged EXEC (#)

**Command History****Release****Modification**

Cisco IOS XE Denali 16.1.1 This command was introduced.

**Examples**

This example shows how to display the trace messages for the Stack Manager and the Forwarding Engine Driver processes:

```
Device# show platform software trace message stack-mgr switch active R0
10/30 09:42:48.767 [btrace] [8974]: (note): Successfully registered module [97] [uiutil]
10/30 09:42:48.762 [btrace] [8974]: (note): Successfully registered module [98]
[tdl_cdlcore_message]
10/29 13:28:19.023 [stack_mngr] [8974]: (note): Examining peer state
10/29 13:28:19.023 [stack_mngr] [8974]: (note): no switch eligible for standby election
presently
10/29 13:28:19.022 [stack_mngr] [8974]: (note): Posting event
stack_fsm_event_wait_standby_elect_timer_expired, curstate stack_fsm_state_active_ready
10/29 13:28:19.022 [stack_mngr] [8974]: (note): Timer HDL - STACK_WAIT_STANDBY_ELECT_TIMER
expired
10/29 13:26:46.584 [btrace] [8974]: (note): Successfully registered module [99]
[tdl_ui_message]
10/29 13:26:46.582 [bipc] [8974]: (note): Pending connection to server 10.129.1.0
10/29 13:26:36.582 [evutil] [8974]: (ERR): Connection attempt for sman-ui-serv (uipeer
uplink to slot 1) failed, invoking disconnect
10/29 13:26:36.582 [evutil] [8974]: (ERR): Asynchronous connect failed for [uipeer uplink
to slot 1] (fd == -1)
10/29 13:26:36.581 [bipc] [8974]: (note): Pending connection to server 10.129.1.0
10/29 13:26:26.581 [evutil] [8974]: (ERR): Connection attempt for sman-ui-serv (uipeer
uplink to slot 1) failed, invoking disconnect

Device# show platform software trace message fed switch active
11/02 10:55:01.832 [btrace]: [11310]: UUID: 0, ra: 0 (note): Successfully registered module
[86] [uiutil]
11/02 10:55:01.848 [btrace]: [11310]: UUID: 0, ra: 0 (note): Single message size is greater
than 1024
11/02 10:55:01.822 [btrace]: [11310]: UUID: 0, ra: 0 (note): Successfully registered module
[87] [tdl_cdlcore_message]
11/01 09:54:41.474 [btrace]: [12312]: UUID: 0, ra: 0 (note): Successfully registered module
[88] [tdl_ngwc_gold_message]
11/01 09:54:11.228 [btrace]: [12312]: UUID: 0, ra: 0 (note): Successfully registered module
[89] [tdl_doppler_iosd_matm_type]
11/01 09:53:37.454 [btrace]: [11310]: UUID: 0, ra: 0 (note): Successfully registered module
[90] [tdl_ui_message]
11/01 09:53:37.382 [bipc]: [11310]: UUID: 0, ra: 0 (note): Pending connection to server
10.129.1.0
11/01 09:53:34.227 [xcvr]: [18846]: UUID: 0, ra: 0 (ERR): FRU hardware authentication Fail,
result = 1.
11/01 09:53:33.775 [ng3k_scc]: [18846]: UUID: 0, ra: 0 (ERR): SMART COOKIE: SCC I2C receive
failed: rc=10
11/01 09:53:33.775 [ng3k_scc]: [18846]: UUID: 0, ra: 0 (ERR):
SMART COOKIE receive failed, try again
11/01 09:53:33.585 [ng3k_scc]: [18846]: UUID: 0, ra: 0 (ERR):
```

**show platform software trace level**

## show platform software trace level

To view the trace levels for all the modules under a specific process, use the **show platform software trace level** command in privileged EXEC or user EXEC mode.

**show platform software trace level** *process slot*

Syntax Description	
	<p><i>process</i> Process whose tracing level is being set. Options include:</p> <ul style="list-style-type: none"> <li>• <b>chassis-manager</b>—The Chassis Manager process.</li> <li>• <b>cli-agent</b>—The CLI Agent process.</li> <li>• <b>cmm</b>—The CMM process.</li> <li>• <b>dbm</b>—The Database Manager process.</li> <li>• <b>emd</b>—The Environmental Monitoring process.</li> <li>• <b>fed</b>—The Forwarding Engine Driver process.</li> <li>• <b>forwarding-manager</b>—The Forwarding Manager process.</li> <li>• <b>geo</b>—The Geo Manager process.</li> <li>• <b>host-manager</b>—The Host Manager process.</li> <li>• <b>interface-manager</b>—The Interface Manager process.</li> <li>• <b>iomd</b>—The Input/Output Module daemon (IOMd) process.</li> <li>• <b>ios</b>—The IOS process.</li> <li>• <b>license-manager</b>—The License Manager process.</li> <li>• <b>logger</b>—The Logging Manager process.</li> <li>• <b>platform-mgr</b>—The Platform Manager process.</li> <li>• <b>pluggable-services</b>—The Pluggable Services process.</li> <li>• <b>replication-mgr</b>—The Replication Manager process.</li> <li>• <b>shell-manager</b>—The Shell Manager process.</li> <li>• <b>sif</b>—The Stack Interface (SIF) Manager process.</li> <li>• <b>smd</b>—The Session Manager process.</li> <li>• <b>stack-mgr</b>—The Stack Manager process.</li> <li>• <b>table-manager</b>—The Table Manager Server.</li> <li>• <b>thread-test</b>—The Multithread Manager process.</li> <li>• <b>virt-manager</b>—The Virtualization Manager process.</li> </ul>

---

<i>slot</i>	<p>Hardware slot where the process for which the trace level is set, is running. Options include:</p> <ul style="list-style-type: none"> <li>• <i>number</i>—Number of the SIP slot of the hardware module where the trace level is set. For instance, if you want to specify the SIP in SIP slot 2 of the switch, enter 2.</li> <li>• <i>SIP-slot / SPA-bay</i>—Number of the SIP switch slot and the number of the shared port adapter (SPA) bay of that SIP. For instance, if you want to specify the SPA in bay 2 of the SIP in switch slot 3, enter 3/2.</li> <li>• <b>F0</b>—The Embedded Service Processor in slot 0.</li> <li>• <b>F1</b>—The Embedded Service Processor in slot 1.</li> <li>• <b>FP active</b>—The active Embedded Service Processor.</li> <li>• <b>R0</b>—The route processor in slot 0.</li> <li>• <b>RP active</b>—The active route processor.</li> <li>• <b>switch &lt;number&gt;</b>—The switch, with its number specified.</li> <li>• <b>switch active</b>—The active switch.</li> <li>• <b>switch standby</b>—The standby switch.</li> <li>• <i>number</i>—Number of the SIP slot of the hardware module where the trace level is set. For instance, if you want to specify the SIP in SIP slot 2 of the switch, enter 2.</li> <li>• <i>SIP-slot / SPA-bay</i>—Number of the SIP switch slot and the number of the shared port adapter (SPA) bay of that SIP. For instance, if you want to specify the SPA in bay 2 of the SIP in switch slot 3, enter 3/2.</li> <li>• <b>F0</b>—The Embedded Service Processor in slot 0.</li> <li>• <b>FP active</b>—The active Embedded Service Processor.</li> <li>• <b>R0</b>—The route processor in slot 0.</li> <li>• <b>RP active</b>—The active route processor.</li> </ul>
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<b>Command Modes</b>	User EXEC (>)
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Privileged EXEC (#)

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
------------------------	----------------	---------------------

Cisco IOS XE Denali 16.1.1 This command was introduced.

<b>Examples</b>	This example shows how to view the trace level:
-----------------	---

```
Device# show platform software trace level dbm switch active R0
```

```
show platform software trace level
```

Module Name	Trace Level
binos	Notice
binos/brand	Notice
bipc	Notice
btrace	Notice
bump_ptr_alloc	Notice
cdllib	Notice
chasfs	Notice
dbal	Informational
dbm	Debug
evlib	Notice
evutil	Notice
file_alloc	Notice
green-be	Notice
ios-avl	Notice
klib	Debug
services	Notice
sw_wdog	Notice
syshw	Notice
tdl_cdllib_message	Notice
tdl_dbal_root_message	Notice
tdl_dbal_root_type	Notice

# request platform software trace archive

To archive all the trace logs relevant to all the processes running on a system since the last reload on the switch and to save this in the specified location, use the **request platform software trace archive** command in privileged EXEC or user EXEC mode.

**request platform software trace archive [last number-of-days [days [target location]]] | target location]**

<b>Syntax Description</b>	<b>last</b> <i>number-of-days</i>	Specifies the number of days for which the trace files have to be archived.
	<b>target</b> <i>location</i>	Specifies the location and name of the archive file.

**Command Modes** User EXEC (>)

Privileged EXEC (#)

**Command History** **Release** **Modification**

Cisco IOS XE Denali 16.1.1 This command was introduced.

**Usage Guidelines** This archive file can be copied from the system, using the tftp or scp commands.

**Examples** This example shows how to archive all the trace logs of the processes running on the switch since the last 5 days:

```
Device# request platform software trace archive last 5 days target flash:test_archive
```

**request platform software trace rotate all**

# request platform software trace rotate all

To rotate all the current in-memory trace logs into the crashinfo partition and start a new in-memory trace log for each process, use the **request platform software trace rotate all** command in privileged EXEC or user EXEC mode.

**request platform software trace rotate all**

<b>Command Modes</b>	User EXEC (>) Privileged EXEC (#)				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE Denali 16.1.1</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE Denali 16.1.1	This command was introduced.
Release	Modification				
Cisco IOS XE Denali 16.1.1	This command was introduced.				
<b>Usage Guidelines</b>	The trace log files are for read-only purpose. Do not edit the contents of the file. If there is a requirement to delete the contents of the file to view certain set of logs, use this command to start a new trace log file.				
<b>Examples</b>	This example shows how to rotate all the in-memory trace logs of the processes running on the switch since the last one day:				

```
Device# request platform software trace slot switch active R0 archive last 1 days target
flash:test
```

# request platform software trace filter-binary

To collate and sort all the archived logs present in the tracelogs subdirectory, use the **request platform software trace filter-binary** command in privileged EXEC or user EXEC mode.

**request platform software trace filter-binary** *modules* [**context** *mac-address*]

Syntax Description	<b>context</b> <i>mac-address</i>	
<b>Command Modes</b>	User EXEC (> Privileged EXEC (#)	
Command History	Release	Modification
	Cisco IOS XE Denali 16.1.1 This command was introduced.	
Usage Guidelines	This command collates and sorts all the archived logs present in the tracelogs subdirectory, across all the processes relevant to the module. This command also generates a file named <code>collated_log_{system time}</code> with the same content, in the <code>/crashinfo/tracelogs</code> directory.	

request platform software trace filter-binary



## PART XV

# VLAN

- [VLAN Commands, on page 1351](#)





## VLAN Commands

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- [client vlan](#), on page 1352
- [clear vtp counters](#), on page 1353
- [debug platform vlan](#), on page 1354
- [debug sw-vlan](#), on page 1355
- [debug sw-vlan ifs](#), on page 1357
- [debug sw-vlan notification](#), on page 1358
- [debug sw-vlan vtp](#), on page 1359
- [interface vlan](#), on page 1361
- [private-vlan](#), on page 1362
- [private-vlan mapping](#), on page 1364
- [show interfaces private-vlan mapping](#), on page 1366
- [show platform vlan](#), on page 1367
- [show vlan](#), on page 1368
- [show vtp](#), on page 1372
- [switchport mode private-vlan](#), on page 1378
- [switchport priority extend](#), on page 1380
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- [vtp \(global configuration\)](#), on page 1390
- [vtp \(interface configuration\)](#), on page 1395
- [vtp primary](#), on page 1396

# client vlan

To configure a WLAN interface or an interface group, use the **client vlan** command. To disable the WLAN interface, use the **no** form of this command.

```
client vlan interface-id-name-or-group-name
no client vlan
```

---

<b>Syntax Description</b>	<i>interface-id-name-or-group-name</i> Interface ID, name, or VLAN group name. The interface ID can also be in digits too.				
<b>Command Default</b>	The default interface is configured.				
<b>Command Modes</b>	WLAN configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	You must disable the WLAN before using this command. See Related Commands section for more information on how to disable a WLAN.				

---

This example shows how to enable a client VLAN on a WLAN:

```
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# wlan wlan1
Device(config-wlan)# client vlan client-vlan1
Device(config-wlan)# end
```

This example shows how to disable a client VLAN on a WLAN:

```
Device# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)# wlan wlan1
Device(config-wlan)# no client vlan
Device(config-wlan)# end
```

# clear vtp counters

To clear the VLAN Trunking Protocol (VTP) and pruning counters, use the **clear vtp counters** command in privileged EXEC mode.

**clear vtp counters**

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Privileged EXEC

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

This example shows how to clear the VTP counters:

```
Device# clear vtp counters
```

You can verify that information was deleted by entering the **show vtp counters** privileged EXEC command.

**debug platform vlan**

# debug platform vlan

To enable debugging of the VLAN manager software, use the **debug platform vlan** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

```
debug platform vlan [{error | event}] [switch switch-number]
no debug platform vlan [{error | event}] [switch switch-number]
```

## Syntax Description

<b>error</b>	(Optional) Displays VLAN error debug messages.
<b>event</b>	(Optional) Displays VLAN platform event debug messages.
<b>switch switch-number</b>	(Optional) Specifies the stack member number on which to enable debugging of the VLAN manager software.  This keyword is supported only on stacking-capable switches.

## Command Default

Debugging is disabled.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

The **undebug platform vlan** command is the same as the **no debug platform vlan** command.

This example shows how to display VLAN error debug messages:

```
Device# debug platform vlan error
```

# debug sw-vlan

To enable debugging of VLAN manager activities, use the **debug sw-vlan** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

```
debug sw-vlan {badpmcookies | cfg-vlan {bootup | cli} | events | ifs | management | mapping | notification | packets | redundancy | registries | vtp}
no debug sw-vlan {badpmcookies | cfg-vlan {bootup | cli} | events | ifs | management | mapping | notification | packets | redundancy | registries | vtp}
```

Syntax Description	<b>badpmcookies</b> Displays debug messages for VLAN manager incidents of bad port manager cookies.	
<b>cfg-vlan</b>	Displays VLAN configuration debug messages.	
<b>bootup</b>	Displays messages when the switch is booting up.	
<b>cli</b>	Displays messages when the command-line interface (CLI) is in VLAN configuration mode.	
<b>events</b>	Displays debug messages for VLAN manager events.	
<b>ifs</b>	Displays debug messages for the VLAN manager IOS file system (IFS). See <a href="#">debug sw-vlan ifs, on page 1357</a> for more information.	
<b>management</b>	Displays debug messages for VLAN manager management of internal VLANs.	
<b>mapping</b>	Displays debug messages for VLAN mapping.	
<b>notification</b>	Displays debug messages for VLAN manager notifications. See <a href="#">debug sw-vlan notification, on page 1358</a> for more information.	
<b>packets</b>	Displays debug messages for packet handling and encapsulation processes.	
<b>redundancy</b>	Displays debug messages for VTP VLAN redundancy.	
<b>registries</b>	Displays debug messages for VLAN manager registries.	
<b>vtp</b>	Displays debug messages for the VLAN Trunking Protocol (VTP) code. See <a href="#">debug sw-vlan vtp, on page 1359</a> for more information.	
Command Default	Debugging is disabled.	
Command Modes	Privileged EXEC	
Command History	Release	Modification
	Cisco IOS XE 3.2SE This command was introduced.	
Usage Guidelines	The <b>undebug sw-vlan</b> command is the same as the <b>no debug sw-vlan</b> command.	

```
debug sw-vlan
```

When you enable debugging on a switch stack, it is enabled only on the active switch. To debug a specific stack member, you can start a CLI session from the active switch by using the **session switch stack-member-number** privileged EXEC command.

This example shows how to display debug messages for VLAN manager events:

```
Device# debug sw-vlan events
```

# debug sw-vlan ifs

To enable debugging of the VLAN manager IOS file system (IFS) error tests, use the **debug sw-vlan ifs** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

```
debug sw-vlan ifs {open {read | write} | read {1 | 2 | 3 | 4} | write}
no debug sw-vlan ifs {open {read | write} | read {1 | 2 | 3 | 4} | write}
```

## Syntax Description

<b>open</b>	Displays VLAN manager IFS file-read operation debug messages.
<b>read</b>	

<b>open</b>	Displays VLAN manager IFS file-write operation debug messages.
<b>write</b>	

<b>read</b>	Displays file-read operation debug messages for the specified error test ( <b>1</b> , <b>2</b> , <b>3</b> , or <b>4</b> ).
-------------	--

<b>write</b>	Displays file-write operation debug messages.
--------------	---

## Command Default

Debugging is disabled.

## Command Modes

Privileged EXEC

## Command History

<b>Release</b>	<b>Modification</b>
----------------	---------------------

Cisco IOS XE 3.2SE	This command was introduced.
-----------------------	------------------------------

## Usage Guidelines

The **undebug sw-vlan ifs** command is the same as the **no debug sw-vlan ifs** command.

When selecting the file read operation, Operation **1** reads the file header, which contains the header verification word and the file version number. Operation **2** reads the main body of the file, which contains most of the domain and VLAN information. Operation **3** reads type length version (TLV) descriptor structures. Operation **4** reads TLV data.

When you enable debugging on a switch stack, it is enabled only on the active switch. To debug a specific stack member, you can start a CLI session from the active switch by using the **session switch stack-member-number** privileged EXEC command.

This example shows how to display file-write operation debug messages:

```
Device# debug sw-vlan ifs write
```

**debug sw-vlan notification**

## debug sw-vlan notification

To enable debugging of VLAN manager notifications, use the **debug sw-vlan notification** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

```
debug sw-vlan notification {accfwdchange | allowedvlancfgchange | fwdchange | linkchange | modechange | pruningcfgchange | statechange}
no debug sw-vlan notification {accfwdchange | allowedvlancfgchange | fwdchange | linkchange | modechange | pruningcfgchange | statechange}
```

<b>Syntax Description</b>	<b>accfwdchange</b> Displays debug messages for VLAN manager notification of aggregated access interface spanning-tree forward changes. <b>allowedvlancfgchange</b> Displays debug messages for VLAN manager notification of changes to the allowed VLAN configuration. <b>fwdchange</b> Displays debug messages for VLAN manager notification of spanning-tree forwarding changes. <b>linkchange</b> Displays debug messages for VLAN manager notification of interface link-state changes. <b>modechange</b> Displays debug messages for VLAN manager notification of interface mode changes. <b>pruningcfgchange</b> Displays debug messages for VLAN manager notification of changes to the pruning configuration. <b>statechange</b> Displays debug messages for VLAN manager notification of interface state changes.
---------------------------	---

**Command Default** Debugging is disabled.

**Command Modes** Privileged EXEC

**Command History**

<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** The **undebug sw-vlan notification** command is the same as the **no debug sw-vlan notification** command.

When you enable debugging on a switch stack, it is enabled only on the active switch. To debug a specific stack member, you can start a CLI session from the active switch by using the **session switch stack-member-number** privileged EXEC command.

This example shows how to display debug messages for VLAN manager notification of interface mode changes:

```
Device# debug sw-vlan notification
```

# debug sw-vlan vtp

To enable debugging of the VLAN Trunking Protocol (VTP) code, use the **debug sw-vlan vtp** command in privileged EXEC mode. To disable debugging, use the **no** form of this command.

```
debug sw-vlan vtp {events | packets | pruning [{packets | xmit}] | redundancy | xmit}
no debug sw-vlan vtp {events | packets | pruning | redundancy | xmit}
```

Syntax Description	<b>events</b> Displays debug messages for general-purpose logic flow and detailed VTP messages generated by the VTP_LOG_RUNTIME macro in the VTP code.				
<b>packets</b>	Displays debug messages for the contents of all incoming VTP packets that have been passed into the VTP code from the Cisco IOS VTP platform-dependent layer, except for pruning packets.				
<b>pruning</b>	Displays debug messages generated by the pruning segment of the VTP code.				
<b>packets</b>	(Optional) Displays debug messages for the contents of all incoming VTP pruning packets that have been passed into the VTP code from the Cisco IOS VTP platform-dependent layer.				
<b>xmit</b>	(Optional) Displays debug messages for the contents of all outgoing VTP packets that the VTP code requests the Cisco IOS VTP platform-dependent layer to send.				
<b>redundancy</b>	Displays debug messages for VTP redundancy.				
<b>xmit</b>	Displays debug messages for the contents of all outgoing VTP packets that the VTP code requests the Cisco IOS VTP platform-dependent layer to send, except for pruning packets.				
<b>Command Default</b>	Debugging is disabled.				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** The **undebbug sw-vlan vtp** command is the same as the **no debug sw-vlan vtp** command.

If no additional parameters are entered after the **pruning** keyword, VTP pruning debugging messages appear. They are generated by the VTP\_PRUNING\_LOG\_NOTICE, VTP\_PRUNING\_LOG\_INFO, VTP\_PRUNING\_LOG\_DEBUG, VTP\_PRUNING\_LOG\_ALERT, and VTP\_PRUNING\_LOG\_WARNING macros in the VTP pruning code.

When you enable debugging on a switch stack, it is enabled only on the active switch. To debug a specific stack member, you can start a CLI session from the active switch by using the **session switch stack-member-number** privileged EXEC command.

```
debug sw-vlan vtp
```

This example shows how to display debug messages for VTP redundancy:

```
Device# debug sw-vlan vtp redundancy
```

# interface vlan

To create or access a dynamic switch virtual interface (SVI) and to enter interface configuration mode, use the **interface vlan** command in global configuration mode. To delete an SVI, use the **no** form of this command.

**interface vlan *vlan-id***  
**no interface vlan *vlan-id***

<b>Syntax Description</b>	<i>vlan-id</i> VLAN number. The range is 1 to 4094.				
<b>Command Default</b>	The default VLAN interface is VLAN 1.				
<b>Command Modes</b>	Global configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** SVIs are created the first time you enter the **interface vlan *vlan-id*** command for a particular VLAN. The *vlan-id* corresponds to the VLAN-tag associated with data frames on an IEEE 802.1Q encapsulated trunk or the VLAN ID configured for an access port.



**Note** When you create an SVI, it does not become active until it is associated with a physical port.

If you delete an SVI using the **no interface vlan *vlan-id*** command, it is no longer visible in the output from the **show interfaces** privileged EXEC command.



**Note** You cannot delete the VLAN 1 interface.

You can reinstate a deleted SVI by entering the **interface vlan *vlan-id*** command for the deleted interface. The interface comes back up, but the previous configuration is gone.

The interrelationship between the number of SVIs configured on a switch or a switch stack and the number of other features being configured might have an impact on CPU utilization due to hardware limitations. You can use the **sdm prefer** global configuration command to reallocate system hardware resources based on templates and feature tables.

You can verify your setting by entering the **show interfaces** and **show interfaces vlan *vlan-id*** privileged EXEC commands.

This example shows how to create a new SVI with VLAN ID 23 and enter interface configuration mode:

```
Device(config)# interface vlan 23
Device(config-if) #
```

# private-vlan

To configure private VLANs and to configure the association between private VLAN primary and secondary VLANs, use the **private-vlan** VLAN configuration command on the switch stack or on a standalone switch. Use the **no** form of this command to return the VLAN to normal VLAN configuration.

```
private-vlan {association [{add | remove}] secondary-vlan-list | community | isolated | primary}
no private-vlan {association | community | isolated | primary}
```

<b>Syntax Description</b>	<b>association</b> Creates an association between the primary VLAN and a secondary VLAN. <b>add</b> Associates a secondary VLAN to a primary VLAN. <b>remove</b> Clears the association between a secondary VLAN and a primary VLAN. <b>secondary-vlan-list</b> One or more secondary VLANs to be associated with a primary VLAN in a private VLAN. <b>community</b> Designates the VLAN as a community VLAN. <b>isolated</b> Designates the VLAN as an isolated VLAN. <b>primary</b> Designates the VLAN as a primary VLAN.				
<b>Command Default</b>	The default is to have no private VLANs configured.				
<b>Command Modes</b>	VLAN configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>Before configuring private VLANs, you must disable VTP (VTP mode transparent). After you configure a private VLAN, you should not change the VTP mode to client or server.</p> <p>VTP does not propagate private VLAN configurations. You must manually configure private VLANs on all switches in the Layer 2 network to merge their Layer 2 databases and to prevent flooding of private VLAN traffic.</p> <p>You cannot include VLAN 1 or VLANs 1002 to 1005 in the private VLAN configuration. Extended VLANs (VLAN IDs 1006 to 4094) can be configured in private VLANs.</p> <p>You can associate a secondary (isolated or community) VLAN with only one primary VLAN. A primary VLAN can have one isolated VLAN and multiple community VLANs associated with it.</p> <ul style="list-style-type: none"> <li>• A secondary VLAN cannot be configured as a primary VLAN.</li> <li>• The <i>secondary-vlan-list</i> cannot contain spaces. It can contain multiple comma-separated items. Each item can be a single private VLAN ID or a hyphenated range of private VLAN IDs. The list can contain one isolated VLAN and multiple community VLANs.</li> </ul>				

- If you delete either the primary or secondary VLANs, the ports associated with the VLAN become inactive.

A community VLAN carries traffic among community ports and from community ports to the promiscuous ports on the corresponding primary VLAN.

An isolated VLAN is used by isolated ports to communicate with promiscuous ports. It does not carry traffic to other community ports or isolated ports with the same primary VLAN domain.

A primary VLAN is the VLAN that carries traffic from a gateway to customer end stations on private ports.

Configure Layer 3 VLAN interfaces (SVIs) only for primary VLANs. You cannot configure Layer 3 VLAN interfaces for secondary VLANs. SVIs for secondary VLANs are inactive while the VLAN is configured as a secondary VLAN.

The **private-vlan** commands do not take effect until you exit from VLAN configuration mode.

Do not configure private VLAN ports as EtherChannels. While a port is part of the private VLAN configuration, any EtherChannel configuration for it is inactive.

Do not configure a private VLAN as a Remote Switched Port Analyzer (RSPAN) VLAN.

Do not configure a private VLAN as a voice VLAN.

Do not configure fallback bridging on switches with private VLANs.

Although a private VLAN contains more than one VLAN, only one STP instance runs for the entire private VLAN. When a secondary VLAN is associated with the primary VLAN, the STP parameters of the primary VLAN are propagated to the secondary VLAN.

For more information about private VLAN interaction with other features, see the software configuration guide for this release.

This example shows how to configure VLAN 20 as a primary VLAN, VLAN 501 as an isolated VLAN, and VLANs 502 and 503 as community VLANs, and to associate them in a private VLAN:

```
Device# configure terminal
Device(config)# vlan 20
Device(config-vlan)# private-vlan primary
Device(config-vlan)# exit
Device(config)# vlan 501
Device(config-vlan)# private-vlan isolated
Device(config-vlan)# exit
Device(config)# vlan 502
Device(config-vlan)# private-vlan community
Device(config-vlan)# exit
Device(config)# vlan 503
Device(config-vlan)# private-vlan community
Device(config-vlan)# exit
Device(config)# vlan 20
Device(config-vlan)# private-vlan association 501-503
Device(config-vlan)# end
```

You can verify your setting by entering the **show vlan private-vlan** or **show interfaces status privileged** EXEC command.

# private-vlan mapping

To create a mapping between the primary and the secondary VLANs so that both VLANs share the same primary VLAN switched virtual interface (SVI), use the **private-vlan mapping** interface configuration command on a switch virtual interface (SVI). Use the **no** form of this command to remove private VLAN mappings from the SVI.

```
private-vlan mapping [{add | remove}] secondary-vlan-list
no private-vlan mapping
```

<b>Syntax Description</b>	<b>add</b> (Optional) Maps the secondary VLAN to the primary VLAN SVI. <b>remove</b> (Optional) Removes the mapping between the secondary VLAN and the primary VLAN SVI. <i>secondary-vlan-list</i> One or more secondary VLANs to be mapped to the primary VLAN SVI.				
<b>Command Default</b>	No private VLAN SVI mapping is configured.				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>The device must be in VTP transparent mode when you configure private VLANs.</p> <p>The SVI of the primary VLAN is created at Layer 3.</p> <p>Configure Layer 3 VLAN interfaces (SVIs) only for primary VLANs. You cannot configure Layer 3 VLAN interfaces for secondary VLANs. SVIs for secondary VLANs are inactive while the VLAN is configured as a secondary VLAN.</p> <p>The <i>secondary-vlan-list</i> argument cannot contain spaces. It can contain multiple comma-separated items. Each item can be a single private VLAN ID or a hyphenated range of private VLAN IDs. The list can contain one isolated VLAN and multiple community VLANs.</p> <p>Traffic that is received on the secondary VLAN is routed by the SVI of the primary VLAN.</p> <p>A secondary VLAN can be mapped to only one primary SVI. If you configure the primary VLAN as a secondary VLAN, all SVIs specified in this command are brought down.</p> <p>If you configure a mapping between two VLANs that do not have a valid Layer 2 private VLAN association, the mapping configuration does not take effect.</p>				

This example shows how to map the interface of VLAN 20 to the SVI of VLAN 18:

```
Device# configure terminal
Device# interface vlan 18
Device(config-if)# private-vlan mapping 20
Device(config-vlan)# end
```

This example shows how to permit routing of secondary VLAN traffic from secondary VLANs 303 to 305 and 307 through VLAN 20 SVI:

```
Device# configure terminal
Device# interface vlan 20
Device(config-if)# private-vlan mapping 303-305, 307
Device(config-vlan)# end
```

You can verify your settings by entering the **show interfaces private-vlan mapping** privileged EXEC command.

show interfaces private-vlan mapping

## show interfaces private-vlan mapping

To display private VLAN mapping information for the VLAN switch virtual interfaces (SVIs), use the **show interfaces private-vlan mapping** command in user EXEC or privileged EXEC mode.

**show interfaces [interface-id] private-vlan mapping**

<b>Syntax Description</b>	<i>interface-id</i> (Optional) ID of the interface for which to display private VLAN mapping information.				
<b>Command Default</b>	None				
<b>Command Modes</b>	User EXEC Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

This example shows how to display the information about the private VLAN mapping:

```
Device#show interfaces private-vlan mapping
Interface Secondary VLAN Type
-----
vlan2    301      community
vlan3    302      community
```

# show platform vlan

To display platform-dependent VLAN information, use the **show platform vlan** privileged EXEC command.

**show platform vlan [vlan-id] [switch switch-number]**

<b>Syntax Description</b>	<i>vlan-id</i> (Optional) ID of the VLAN. The range is 1 to 4094. <i>switch</i> (Optional) Limits the display to VLANs on the specified stack member. <i>switch-number</i>				
<b>Command Default</b>	None				
<b>Command Modes</b>	Privileged EXEC				
<b>Command History</b>	<table border="1"><thead><tr><th>Release</th><th>Modification</th></tr></thead><tbody><tr><td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr></tbody></table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

**Usage Guidelines** Use this command only when you are working directly with your technical support representative while troubleshooting a problem. Do not use this command unless your technical support representative asks you to do so.

This example shows how to display platform-dependent VLAN information:

```
Device# show platform vlan
```

**show vlan**

# show vlan

To display the parameters for all configured VLANs or one VLAN (if the VLAN ID or name is specified) on the switch, use the **show vlan** command in user EXEC mode.

```
show vlan [{brief | group | id vlan-id | mtu | name vlan-name | private-vlan [{type}] | remote-span | summary}]
```

Syntax Description	
<b>brief</b>	(Optional) Displays one line for each VLAN with the VLAN name, status, and its ports.
<b>group</b>	(Optional) Displays information about VLAN groups.
<b>id <i>vlan-id</i></b>	(Optional) Displays information about a single VLAN identified by the VLAN ID number. For <i>vlan-id</i> , the range is 1 to 4094.
<b>mtu</b>	(Optional) Displays a list of VLANs and the minimum and maximum transmission unit (MTU) sizes configured on ports in the VLAN.
<b>name <i>vlan-name</i></b>	(Optional) Displays information about a single VLAN identified by the VLAN name. The VLAN name is an ASCII string from 1 to 32 characters.
<b>private-vlan</b>	(Optional) Displays information about configured private VLANs, including primary and secondary VLAN IDs, type (community, isolated, or primary) and ports belonging to the private VLAN. This keyword is only supported if your switch is running the IP services feature set.
<b>type</b>	(Optional) Displays only private VLAN ID and type.
<b>remote-span</b>	(Optional) Displays information about Remote SPAN (RSPAN) VLANs.
<b>summary</b>	(Optional) Displays VLAN summary information.



**Note** The **ifindex** keyword is not supported, even though it is visible in the command-line help string.

<b>Command Default</b>	None				
<b>Command Modes</b>	User EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				

## Usage Guidelines

In the **show vlan mtu** command output, the MTU\_Mismatch column shows whether all the ports in the VLAN have the same MTU. When yes appears in the column, it means that the VLAN has ports with different MTUs, and packets that are switched from a port with a larger MTU to a port with a smaller MTU might be dropped. If the VLAN does not have an SVI, the hyphen (-) symbol appears in the SVI\_MTU column. If the MTU-Mismatch column displays yes, the names of the ports with the MinMTU and the MaxMTU appear.

If you try to associate a private VLAN secondary VLAN with a primary VLAN before you define the secondary VLAN, the secondary VLAN is not included in the **show vlan private-vlan** command output.

In the **show vlan private-vlan type** command output, a type displayed as normal means a VLAN that has a private VLAN association but is not part of the private VLAN. For example, if you define and associate two VLANs as primary and secondary VLANs and then delete the secondary VLAN configuration without removing the association from the primary VLAN, the VLAN that was the secondary VLAN is shown as normal in the display. In the **show vlan private-vlan** output, the primary and secondary VLAN pair is shown as nonoperational.

This is an example of output from the **show vlan** command. See the table that follows for descriptions of the fields in the display.

Device> show vlan		Status	Ports							
VLAN Name										
1 default		active	Gi1/0/2, Gi1/0/3, Gi1/0/4 Gi1/0/5, Gi1/0/6, Gi1/0/7 Gi1/0/8, Gi1/0/9, Gi1/0/10 Gi1/0/11, Gi1/0/12, Gi1/0/13 Gi1/0/14, Gi1/0/15, Gi1/0/16 Gi1/0/17, Gi1/0/18, Gi1/0/19 Gi1/0/20, Gi1/0/21, Gi1/0/22 Gi1/0/23, Gi1/0/24, Gi1/0/25 Gi1/0/26, Gi1/0/27, Gi1/0/28 Gi1/0/29, Gi1/0/30, Gi1/0/31 Gi1/0/32, Gi1/0/33, Gi1/0/34 Gi1/0/35, Gi1/0/36, Gi1/0/37 Gi1/0/38, Gi1/0/39, Gi1/0/40 Gi1/0/41, Gi1/0/42, Gi1/0/43 Gi1/0/44, Gi1/0/45, Gi1/0/46 Gi1/0/47, Gi1/0/48							
2 VLAN0002		active								
40 vlan-40		active								
300 VLAN0300		active								
1002 fddi-default		act/unsup								
1003 token-ring-default		act/unsup								
1004 fddinet-default		act/unsup								
1005 trnet-default		act/unsup								
VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1 enet	100001	1500	-	-	-	-	-	0	0	
2 enet	100002	1500	-	-	-	-	-	0	0	
40 enet	100040	1500	-	-	-	-	-	0	0	
300 enet	100300	1500	-	-	-	-	-	0	0	
1002 fddi	101002	1500	-	-	-	-	-	0	0	
1003 tr	101003	1500	-	-	-	-	-	0	0	
1004 fdnet	101004	1500	-	-	-	ieee	-	0	0	
1005 trnet	101005	1500	-	-	-	ibm	-	0	0	
2000 enet	102000	1500	-	-	-	-	-	0	0	
3000 enet	103000	1500	-	-	-	-	-	0	0	
Remote SPAN VLANs										

show vlan

2000,3000

Primary	Secondary	Type	Ports
---------	-----------	------	-------

**Table 75: show vlan Command Output Fields**

Field	Description
VLAN	VLAN number.
Name	Name, if configured, of the VLAN.
Status	Status of the VLAN (active or suspend).
Ports	Ports that belong to the VLAN.
Type	Media type of the VLAN.
SAID	Security association ID value for the VLAN.
MTU	Maximum transmission unit size for the VLAN.
Parent	Parent VLAN, if one exists.
RingNo	Ring number for the VLAN, if applicable.
BrdgNo	Bridge number for the VLAN, if applicable.
Stp	Spanning Tree Protocol type used on the VLAN.
BrdgMode	Bridging mode for this VLAN—possible values are source-route bridging (SRB) and source-route transparent (SRT); the default is SRB.
Trans1	Translation bridge 1.
Trans2	Translation bridge 2.
Remote SPAN VLANs	Identifies any RSPAN VLANs that have been configured.
Primary/Secondary/Type/Ports	Includes any private VLANs that have been configured, including the primary VLAN ID, the secondary VLAN ID, the type of secondary VLAN (community or isolated), and the ports that belong to it.

This is an example of output from the **show vlan private-vlan** command:

```
Device> show vlan private-vlan
Primary Secondary Type Ports
----- -----
10      501    isolated   Gi3/0/3
10      502    community  Gi2/0/11
10      503    non-operational3 -
20      25     isolated   Gi1/0/13, Gi1/0/20, Gi1/0/22, Gi1/0/1, Gi2/0/13, Gi2/0/22,
              Gi3/0/13, Gi3/0/14, Gi3/0/20, Gi3/0/1
20      30     community  Gi1/0/13, Gi1/0/20, Gi1/0/21, Gi1/0/1, Gi2/0/13, Gi2/0/20,
              Gi3/0/14, Gi3/0/20, Gi3/0/21, Gi3/0/1
20      35     community  Gi1/0/13, Gi1/0/20, Gi1/0/23, Gi1/0/33. Gi1/0/1, Gi2/0/13,
              Gi3/0/14, Gi3/0/20. Gi3/0/23, Gi3/0/33, Gi3/0/1
```

```

20      55      non-operational
2000    2500    isolated          Gi1/0/5, Gi1/0/10, Gi2/0/5, Gi2/0/10, Gi2/0/15

```

This is an example of output from the **show vlan private-vlan type** command:

```

Device> show vlan private-vlan type
Vlan Type
-----
10   primary
501  isolated
502  community
503  normal

```

This is an example of output from the **show vlan summary** command:

```

Device> show vlan summary
Number of existing VLANs : 45
Number of existing VTP VLANs : 45
Number of existing extended VLANs : 0

```

This is an example of output from the **show vlan id** command:

```

Device# show vlan id 2
VLAN Name                      Status     Ports
----- -----
2     VLAN0200                  active    Gi1/0/7, Gi1/0/8
2     VLAN0200                  active    Gi2/0/1, Gi2/0/2

VLAN Type   SAID      MTU      Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
----- -----  -----  -----  -----  -----  -----  -----  -----  -----  -----
2     enet    100002    1500     -       -       -       -       -       0       0

Remote SPAN VLANs
-----
Disabled

```

show vtp

# show vtp

To display general information about the VLAN Trunking Protocol (VTP) management domain, status, and counters, use the **show vtp** command in EXEC mode.

**show vtp {counters | devices [conflicts] | interface [interface-id] | password | status}**

<b>Syntax Description</b>	<b>counters</b> Displays the VTP statistics for the device. <b>devices</b> Displays information about all VTP version 3 devices in the domain. This keyword applies only if the device is not running VTP version 3. <b>conflicts</b> (Optional) Displays information about VTP version 3 devices that have conflicting primary servers. This command is ignored when the device is in VTP transparent or VTP off mode. <b>interface</b> Displays VTP status and configuration for all interfaces or the specified interface. <i>interface-id</i> (Optional) Interface for which to display VTP status and configuration. This can be a physical interface or a port channel. <b>password</b> Displays the configured VTP password (available in privileged EXEC mode only). <b>status</b> Displays general information about the VTP management domain status.				
<b>Command Default</b>	None				
<b>Command Modes</b>	User EXEC Privileged EXEC				
<b>Command History</b>	<table border="1"> <thead> <tr> <th>Release</th> <th>Modification</th> </tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td> <td>This command was introduced.</td> </tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	When you enter the <b>show vtp password</b> command when the device is running VTP version 3, the display follows these rules: <ul style="list-style-type: none"> <li>If the <b>password password</b> global configuration command did not specify the <b>hidden</b> keyword and encryption is not enabled on the device, the password appears in clear text.</li> <li>If the <b>password password</b> command did not specify the <b>hidden</b> keyword and encryption is enabled on the device, the encrypted password appears.</li> <li>If the <b>password password</b> command is included the <b>hidden</b> keyword, the hexadecimal secret key is displayed.</li> </ul>				

This is an example of output from the **show vtp devices** command. A **Yes** in the **Conflict** column indicates that the responding server is in conflict with the local server for the feature; that is, when two devices in the same domain do not have the same primary server for a database.

```
Device# show vtp devices
Retrieving information from the VTP domain. Waiting for 5 seconds.
VTP Database Conf device ID      Primary Server Revision   System Name
          lict
-----
VLAN      Yes  00b0.8e50.d000 000c.0412.6300 12354    main.cisco.com
MST       No   00b0.8e50.d000 0004.AB45.6000 24        main.cisco.com
VLAN      Yes  000c.0412.6300=000c.0412.6300 67        qwerty.cisco.com
```

This is an example of output from the **show vtp counters** command. The table that follows describes each field in the display.

```
Device> show vtp counters
VTP statistics:
Summary advertisements received      : 0
Subset advertisements received       : 0
Request advertisements received     : 0
Summary advertisements transmitted  : 0
Subset advertisements transmitted  : 0
Request advertisements transmitted  : 0
Number of config revision errors   : 0
Number of config digest errors    : 0
Number of V1 summary errors        : 0

VTP pruning statistics:
Trunk      Join Transmitted Join Received   Summary advts received from
                           non-pruning-capable device
-----
Gi1/0/47      0            0            0
Gi1/0/48      0            0            0
Gi2/0/1      0            0            0
Gi3/0/2      0            0            0
```

**Table 76: show vtp counters Field Descriptions**

Field	Description
Summary advertisements received	Number of summary advertisements received by this device on its trunk ports. Summary advertisements contain the management domain name, the configuration revision number, the update timestamp and identity, the authentication checksum, and the number of subset advertisements to follow.
Subset advertisements received	Number of subset advertisements received by this device on its trunk ports. Subset advertisements contain all the information for one or more VLANs.
Request advertisements received	Number of advertisement requests received by this device on its trunk ports. Advertisement requests normally request information on all VLANs. They can also request information on a subset of VLANs.

show vtp

Field	Description
Summary advertisements transmitted	Number of summary advertisements sent by this device on its trunk ports. Summary advertisements contain the management domain name, the configuration revision number, the update timestamp and identity, the authentication checksum, and the number of subset advertisements to follow.
Subset advertisements transmitted	Number of subset advertisements sent by this device on its trunk ports. Subset advertisements contain all the information for one or more VLANs.
Request advertisements transmitted	Number of advertisement requests sent by this device on its trunk ports. Advertisement requests normally request information on all VLANs. They can also request information on a subset of VLANs.
Number of configuration revision errors	<p>Number of revision errors.</p> <p>Whenever you define a new VLAN, delete an existing one, suspend or resume an existing VLAN, or modify the parameters on an existing VLAN, the configuration revision number of the device increments.</p> <p>Revision errors increment whenever the device receives an advertisement whose revision number matches the revision number of the device, but the MD5 digest values do not match. This error means that the VTP password in the two devices is different or that the devices have different configurations.</p> <p>These errors indicate that the device is filtering incoming advertisements, which causes the VTP database to become unsynchronized across the network.</p>
Number of configuration digest errors	<p>Number of MD5 digest errors.</p> <p>Digest errors increment whenever the MD5 digest in the summary packet and the MD5 digest of the received advertisement calculated by the device do not match. This error usually means that the VTP password in the two devices is different. To solve this problem, make sure the VTP password on all devices is the same.</p> <p>These errors indicate that the device is filtering incoming advertisements, which causes the VTP database to become unsynchronized across the network.</p>

Field	Description
Number of V1 summary errors	Number of Version 1 errors. Version 1 summary errors increment whenever a device in VTP V2 mode receives a VTP Version 1 frame. These errors indicate that at least one neighboring device is either running VTP Version 1 or VTP Version 2 with V2-mode disabled. To solve this problem, change the configuration of the devices in VTP V2-mode to disabled.
Join Transmitted	Number of VTP pruning messages sent on the trunk.
Join Received	Number of VTP pruning messages received on the trunk.
Summary Advts Received from non-pruning-capable device	Number of VTP summary messages received on the trunk from devices that do not support pruning.

This is an example of output from the **show vtp status** command. The table that follows describes each field in the display.

```
Device> show vtp status
VTP Version capable          : 1 to 3
VTP version running          : 1
VTP Domain Name              :
VTP Pruning Mode             : Disabled
VTP Traps Generation         : Disabled
Device ID                    : 2037.06ce.3580
Configuration last modified by 192.168.1.1 at 10-10-12 04:34:02
Local updater ID is 192.168.1.1 on interface LI1N0 (first layer3 interface found
)

Feature VLAN:
-----
VTP Operating Mode           : Server
Maximum VLANs supported locally : 1005
Number of existing VLANs      : 7
Configuration Revision        : 2
MD5 digest                   : 0xA0 0xA1 0xFE 0x4E 0x7E 0x5D 0x97 0x41
                                0x89 0xB9 0x9B 0x70 0x03 0x61 0xE9 0x27
```

**Table 77: show vtp status Field Descriptions**

Field	Description
VTP Version capable	Displays the VTP versions that are capable of operating on the device.
VTP Version running	Displays the VTP version operating on the device. By default, the device implements Version 1 but can be set to Version 2.
VTP Domain Name	Name that identifies the administrative domain for the device.

show vtp

Field	Description
VTP Pruning Mode	Displays whether pruning is enabled or disabled. Enabling pruning on a VTP server enables pruning for the entire management domain. Pruning restricts flooded traffic to those trunk links that the traffic must use to access the appropriate network devices.
VTP Traps Generation	Displays whether VTP traps are sent to a network management station.
Device ID	Displays the MAC address of the local device.
Configuration last modified	Displays the date and time of the last configuration modification. Displays the IP address of the device that caused the configuration change to the database.
VTP Operating Mode	<p>Displays the VTP operating mode, which can be server, client, or transparent.</p> <p><b>Server</b>—A device in VTP server mode is enabled for VTP and sends advertisements. You can configure VLANs on it. The device guarantees that it can recover all the VLAN information in the current VTP database from NVRAM after reboot. By default, every device is a VTP server.</p> <p><b>Note</b> The device automatically changes from VTP server mode to VTP client mode if it detects a failure while writing the configuration to NVRAM and cannot return to server mode until the NVRAM is functioning.</p> <p><b>Client</b>—A device in VTP client mode is enabled for VTP, can send advertisements, but does not have enough nonvolatile storage to store VLAN configurations. You cannot configure VLANs on it. When a VTP client starts up, it does not send VTP advertisements until it receives advertisements to initialize its VLAN database.</p> <p><b>Transparent</b>—A device in VTP transparent mode is disabled for VTP, does not send or learn from advertisements sent by other devices, and cannot affect VLAN configurations on other devices in the network. The device receives VTP advertisements and forwards them on all trunk ports except the one on which the advertisement was received.</p>
Maximum VLANs Supported Locally	Maximum number of VLANs supported locally.
Number of Existing VLANs	Number of existing VLANs.

Field	Description
Configuration Revision	Current configuration revision number on this device.
MD5 Digest	A 16-byte checksum of the VTP configuration.

This is an example of output from the **show vtp status** command for a device running VTP version 3:

```

Device> show vtp status
VTP Version capable : 1 to 3
VTP version running : 3
VTP Domain Name : Cisco
VTP Pruning Mode : Disabled
VTP Traps Generation : Disabled
Device ID : 0021.1bcd.c700

Feature VLAN:
-----
VTP Operating Mode : Server
Number of existing VLANs : 7
Number of existing extended VLANs : 0
Configuration Revision : 0
Primary ID : 0000.0000.0000
Primary Description :
MD5 digest : 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Feature MST:
-----
VTP Operating Mode : Client
Configuration Revision : 0
Primary ID : 0000.0000.0000
Primary Description :
MD5 digest : 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Feature UNKNOWN:
-----
```

**switchport mode private-vlan**

# switchport mode private-vlan

To configure an interface as either a host private-VLAN port or a promiscuous private-VLAN port, use the **switchport mode private-vlan** command in interface configuration mode. To reset the mode to the appropriate default for the device, use the **no** form of this command.

```
switchport mode private-vlan{host | promiscuous}
no switchport mode private-vlan
```

<b>Syntax Description</b>	<b>host</b> Configures the interface as a private-VLAN host port. Host ports belong to private-VLAN secondary VLANs and are either community ports or isolated ports, depending on the VLAN to which they belong. <b>promiscuous</b> Configures the interface as a private-VLAN promiscuous port. Promiscuous ports are members of private-VLAN primary VLANs.				
<b>Command Default</b>	None				
<b>Command Modes</b>	Interface configuration				
<b>Command History</b>	<table border="1"> <thead> <tr> <th><b>Release</b></th><th><b>Modification</b></th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	<b>Release</b>	<b>Modification</b>	Cisco IOS XE 3.2SE	This command was introduced.
<b>Release</b>	<b>Modification</b>				
Cisco IOS XE 3.2SE	This command was introduced.				
<b>Usage Guidelines</b>	<p>A private-VLAN host or promiscuous port cannot be a Switched Port Analyzer (SPAN) destination port. If you configure a SPAN destination port as a private-VLAN host or promiscuous port, the port becomes inactive.</p> <p>Do not configure private VLAN on ports with these other features:</p> <ul style="list-style-type: none"> <li>• Dynamic-access port VLAN membership</li> <li>• Dynamic Trunking Protocol (DTP)</li> <li>• Port Aggregation Protocol (PAgP)</li> <li>• Link Aggregation Control Protocol (LACP)</li> <li>• Multicast VLAN Registration (MVR)</li> <li>• Voice VLAN</li> </ul> <p>While a port is part of the private-VLAN configuration, any EtherChannel configuration for it is inactive.</p> <p>A private-VLAN port cannot be a secure port and should not be configured as a protected port.</p> <p>For more information about private-VLAN interaction with other features, see the software configuration guide for this release.</p> <p>We strongly recommend that you enable spanning tree Port Fast and bridge-protocol-data-unit (BPDU) guard on isolated and community host ports to prevent STP loops due to misconfigurations and to speed up STP convergence.</p>				

If you configure a port as a private-VLAN host port and you do not configure a valid private-VLAN association by using the **switchport private-vlan host-association** command, the interface becomes inactive.

If you configure a port as a private-VLAN promiscuous port and you do not configure a valid private VLAN mapping by using the **switchport private-vlan mapping** command, the interface becomes inactive.

## Examples

This example shows how to configure an interface as a private-VLAN host port and associate it to primary VLAN 20. The interface is a member of secondary isolated VLAN 501 and primary VLAN 20.

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport mode private-vlan host
Device (config-if)# switchport private-vlan host-association 20 501
Device (config-if)# end
```

This example shows how to configure an interface as a private-VLAN promiscuous port and map it to a private VLAN. The interface is a member of primary VLAN 20 and secondary VLANs 501 to 503 are mapped to it.

```
Device(config)# interface gigabitethernet2/0/1
Device(config-if)# switchport mode private-vlan promiscuous
Device (config-if)# switchport private-vlan mapping 20 501-503
Device (config-if)# end
```

**switchport priority extend**

# switchport priority extend

To set a port priority for the incoming untagged frames or the priority of frames received by the IP phone connected to the specified port, use the **switchport priority extend** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

```
switchport priority extend {cos value | trust}
no switchport priority extend
```

Syntax Description	<b>cos</b> Sets the IP phone port to override the IEEE 802.1p priority received from the PC or the attached device with the specified class of service (CoS) value. The range is 0 to 7. Seven is the highest priority. The default is 0. <b>trust</b> Sets the IP phone port to trust the IEEE 802.1p priority received from the PC or the attached device.				
Command Default	The default port priority is set to a CoS value of 0 for untagged frames received on the port.				
Command Modes	Interface configuration				
Command History	<table border="1"> <thead> <tr> <th>Release</th><th>Modification</th></tr> </thead> <tbody> <tr> <td>Cisco IOS XE 3.2SE</td><td>This command was introduced.</td></tr> </tbody> </table>	Release	Modification	Cisco IOS XE 3.2SE	This command was introduced.
Release	Modification				
Cisco IOS XE 3.2SE	This command was introduced.				
Usage Guidelines	<p>When voice VLAN is enabled, you can configure the device to send the Cisco Discovery Protocol (CDP) packets to instruct the IP phone how to send data packets from the device attached to the access port on the Cisco IP Phone. You must enable CDP on the device port connected to the Cisco IP Phone to send the configuration to the Cisco IP Phone. (CDP is enabled by default globally and on all device interfaces.)</p> <p>You should configure voice VLAN on device access ports. You can configure a voice VLAN only on Layer 2 ports.</p> <p>Before you enable voice VLAN, we recommend that you enable quality of service (QoS) on the interface by entering the <b>trust device cisco-phone</b> interface configuration command. If you use the auto QoS feature, these settings are automatically configured.</p>				

This example shows how to configure the IP phone connected to the specified port to trust the received IEEE 802.1p priority:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# switchport priority extend trust
```

You can verify your settings by entering the **show interfaces interface-id switchport** privileged EXEC command.

# switchport trunk

To set the trunk characteristics when the interface is in trunking mode, use the **switchport trunk** command in interface configuration mode. To reset a trunking characteristic to the default, use the **no** form of this command.

```
switchport trunk {allowed vlan vlan-list | native vlan vlan-id | pruning vlan vlan-list}
no switchport trunk {allowed vlan | native vlan | pruning vlan}
```

<b>Syntax Description</b>	<b>allowed vlan <i>vlan-list</i></b> Sets the list of allowed VLANs that can receive and send traffic on this interface in tagged format when in trunking mode. See the Usage Guidelines for the <i>vlan-list</i> choices. <b>native vlan <i>vlan-id</i></b> Sets the native VLAN for sending and receiving untagged traffic when the interface is in IEEE 802.1Q trunking mode. The range is 1 to 4094. <b>pruning vlan <i>vlan-list</i></b> Sets the list of VLANs that are eligible for VTP pruning when in trunking mode. See the Usage Guidelines for the <i>vlan-list</i> choices.
---------------------------	--

**Command Default** VLAN 1 is the default native VLAN ID on the port.

The default for all VLAN lists is to include all VLANs.

**Command Modes** Interface configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
Cisco IOS XE 3.2SE		This command was introduced.

**Usage Guidelines** The *vlan-list* format is **all | none | [add | remove | except] *vlan-atom* [,*vlan-atom*...]**:

- **all** specifies all VLANs from 1 to 4094. This is the default. This keyword is not allowed on commands that do not permit all VLANs in the list to be set at the same time.
- **none** specifies an empty list. This keyword is not allowed on commands that require certain VLANs to be set or at least one VLAN to be set.
- **add** adds the defined list of VLANs to those currently set instead of replacing the list. Valid IDs are from 1 to 1005; extended-range VLANs (VLAN IDs greater than 1005) are valid in some cases.



**Note** You can add extended-range VLANs to the allowed VLAN list, but not to the pruning-eligible VLAN list.

Separate nonconsecutive VLAN IDs with a comma; use a hyphen to designate a range of IDs.

- **remove** removes the defined list of VLANs from those currently set instead of replacing the list. Valid IDs are from 1 to 1005; extended-range VLAN IDs are valid in some cases.



**Note** You can remove extended-range VLANs from the allowed VLAN list, but you cannot remove them from the pruning-eligible list.

- **except** lists the VLANs that should be calculated by inverting the defined list of VLANs. (VLANs are added except the ones specified.) Valid IDs are from 1 to 1005. Separate nonconsecutive VLAN IDs with a comma; use a hyphen to designate a range of IDs.
- *vlan-atom* is either a single VLAN number from 1 to 4094 or a continuous range of VLANs described by two VLAN numbers, the lesser one first, separated by a hyphen.

Native VLANs:

- All untagged traffic received on an IEEE 802.1Q trunk port is forwarded with the native VLAN configured for the port.
- If a packet has a VLAN ID that is the same as the sending-port native VLAN ID, the packet is sent without a tag; otherwise, the switch sends the packet with a tag.
- The **no** form of the **native vlan** command resets the native mode VLAN to the appropriate default VLAN for the device.

Allowed VLAN:

- To reduce the risk of spanning-tree loops or storms, you can disable VLAN 1 on any individual VLAN trunk port by removing VLAN 1 from the allowed list. When you remove VLAN 1 from a trunk port, the interface continues to send and receive management traffic, for example, Cisco Discovery Protocol (CDP), Port Aggregation Protocol (PAgP), Link Aggregation Control Protocol (LACP), Dynamic Trunking Protocol (DTP), and VLAN Trunking Protocol (VTP) in VLAN 1.
- The **no** form of the **allowed vlan** command resets the list to the default list, which allows all VLANs.

Trunk pruning:

- The pruning-eligible list applies only to trunk ports.
- Each trunk port has its own eligibility list.
- If you do not want a VLAN to be pruned, remove it from the pruning-eligible list. VLANs that are pruning-ineligible receive flooded traffic.
- VLAN 1, VLANs 1002 to 1005, and extended-range VLANs (VLANs 1006 to 4094) cannot be pruned.

This example shows how to configure VLAN 3 as the default for the port to send all untagged traffic:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# switchport trunk native vlan 3
```

This example shows how to add VLANs 1, 2, 5, and 6 to the allowed list:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# switchport trunk allowed vlan add 1,2,5,6
```

This example shows how to remove VLANs 3 and 10 to 15 from the pruning-eligible list:

```
Device(config)# interface gigabitethernet1/0/2
Device(config-if)# switchport trunk pruning vlan remove 3,10-15
```

You can verify your settings by entering the **show interfaces *interface-id* switchport** privileged EXEC command.

# vlan

To add a VLAN and to enter the VLAN configuration mode, use the **vlan** command in global configuration mode. To delete the VLAN, use the **no** form of this command.

```
vlan vlan-id
no vlan vlan-id
```

## Syntax Description

*vlan-id* ID of the VLAN to be added and configured. The range is 1 to 4094. You can enter a single VLAN ID, a series of VLAN IDs separated by commas, or a range of VLAN IDs separated by hyphens.

## Command Default

None

## Command Modes

Global configuration

## Command History

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

## Usage Guidelines

You can use the **vlan** *vlan-id* global configuration command to add normal-range VLANs (VLAN IDs 1 to 1005) or extended-range VLANs (VLAN IDs 1006 to 4094). Configuration information for normal-range VLANs is always saved in the VLAN database, and you can display this information by entering the **show vlan** privileged EXEC command. If the VTP mode is transparent, VLAN configuration information for normal-range VLANs is also saved in the device running configuration file. VLAN IDs in the extended range are not saved in the VLAN database, but they are stored in the switch running configuration file, and you can save the configuration in the startup configuration file.

VTP version 3 supports propagation of extended-range VLANs. VTP versions 1 and 2 propagate only VLANs 1 to 1005.

When you save the VLAN and VTP configurations in the startup configuration file and reboot the device, the configuration is selected as follows:

- If the VTP mode is transparent in the startup configuration and the VLAN database and the VTP domain name from the VLAN database matches that in the startup configuration file, the VLAN database is ignored (cleared), and the VTP and VLAN configurations in the startup configuration file are used. The VLAN database revision number remains unchanged in the VLAN database.
- If the VTP mode or domain name in the startup configuration do not match the VLAN database, the domain name and VTP mode and configuration for VLAN IDs 1 to 1005 use the VLAN database information.

If you enter an invalid VLAN ID, you receive an error message and do not enter VLAN configuration mode.

Entering the **vlan** command with a VLAN ID enables VLAN configuration mode. When you enter the VLAN ID of an existing VLAN, you do not create a new VLAN, but you can modify VLAN parameters for that VLAN. The specified VLANs are added or modified when you exit the VLAN configuration mode. Only the **shutdown** command (for VLANs 1 to 1005) takes effect immediately.



**Note** Although all commands are visible, the only VLAN configuration command that is supported on extended-range VLANs is **remote-span**. For extended-range VLANs, all other characteristics must remain at the default state.

These configuration commands are available in VLAN configuration mode. The **no** form of each command returns the characteristic to its default state:

- **are are-number**—Defines the maximum number of all-routes explorer (ARE) hops for this VLAN. This keyword applies only to TrCRF VLANs. The range is 0 to 13. The default is 7. If no value is entered, 0 is assumed to be the maximum.
- **backupcrf**—Specifies the backup CRF mode. This keyword applies only to TrCRF VLANs.
  - **enable**—Backup CRF mode for this VLAN.
  - **disable**—Backup CRF mode for this VLAN (the default).
- **bridge {bridge-number | type}**—Specifies the logical distributed source-routing bridge, the bridge that interconnects all logical rings that have this VLAN as a parent VLAN in FDDI-NET, Token Ring-NET, and TrBRF VLANs. The range is 0 to 15. The default bridge number is 0 (no source-routing bridge) for FDDI-NET, TrBRF, and Token Ring-NET VLANs. The **type** keyword applies only to TrCRF VLANs and is one of these:
  - **srb**—Source-route bridging
  - **srt**—Source-route transparent) bridging VLAN
- **exit**—Applies changes, increments the VLAN database revision number (VLANs 1 to 1005 only), and exits VLAN configuration mode.
- **media**—Defines the VLAN media type and is one of these:



**Note** The device supports only Ethernet ports. You configure only FDDI and Token Ring media-specific characteristics for VLAN Trunking Protocol (VTP) global advertisements to other devices. These VLANs are locally suspended.

- **ethernet**—Ethernet media type (the default).
- **fd-net**—FDDI network entity title (NET) media type.
- **fddi**—FDDI media type.
- **tokenring**—Token Ring media type if the VTP v2 mode is disabled, or TrCRF if the VTP Version 2 (v) mode is enabled.
- **tr-net**—Token Ring network entity title (NET) media type if the VTP v2 mode is disabled or TrBRF media type if the VTP v2 mode is enabled.

See the table that follows for valid commands and syntax for different media types.

- **name vlan-name**—Names the VLAN with an ASCII string from 1 to 32 characters that must be unique within the administrative domain. The default is VLANxxxx where xxxx represents four numeric digits (including leading zeros) equal to the VLAN ID number.

- **no**—Negates a command or returns it to the default setting.
- **parent *parent-vlan-id***—Specifies the parent VLAN of an existing FDDI, Token Ring, or TrCRF VLAN. This parameter identifies the TrBRF to which a TrCRF belongs and is required when defining a TrCRF. The range is 0 to 1005. The default parent VLAN ID is 0 (no parent VLAN) for FDDI and Token Ring VLANs. For both Token Ring and TrCRF VLANs, the parent VLAN ID must already exist in the database and be associated with a Token Ring-NET or TrBRF VLAN.
- **private-vlan**—Configures the VLAN as a private VLAN community, isolated, or primary VLAN or configures the association between private VLAN primary and secondary VLANs. For more information, see the **private-vlan** command.
- **remote-span**—Configures the VLAN as a Remote SPAN (RSPAN) VLAN. When the RSPAN feature is added to an existing VLAN, the VLAN is first deleted and is then recreated with the RSPAN feature. Any access ports are deactivated until the RSPAN feature is removed. If VTP is enabled, the new RSPAN VLAN is propagated by VTP for VLAN IDs that are lower than 1024. Learning is disabled on the VLAN.
- **ring *ring-number***—Defines the logical ring for an FDDI, Token Ring, or TrCRF VLAN. The range is 1 to 4095. The default for Token Ring VLANs is 0. For FDDI VLANs, there is no default.
- **said *said-value***—Specifies the security association identifier (SAID) as documented in IEEE 802.10. The range is 1 to 4294967294, and the number must be unique within the administrative domain. The default value is 100000 plus the VLAN ID number.
- **shutdown**—Shuts down VLAN switching on the VLAN. This command takes effect immediately. Other commands take effect when you exit VLAN configuration mode.
- **state**—Specifies the VLAN state:
  - **active** means the VLAN is operational (the default).
  - **suspend** means the VLAN is suspended. Suspended VLANs do not pass packets.
- **ste *ste-number***—Defines the maximum number of spanning-tree explorer (STE) hops. This keyword applies only to TrCRF VLANs. The range is 0 to 13. The default is 7.
- **stp type**—Defines the spanning-tree type for FDDI-NET, Token Ring-NET, or TrBRF VLANs. For FDDI-NET VLANs, the default STP type is ieee. For Token Ring-NET VLANs, the default STP type is ibm. For FDDI and Token Ring VLANs, the default is no type specified.
  - **ieee**—IEEE Ethernet STP running source-route transparent (SRT) bridging.
  - **ibm**—IBM STP running source-route bridging (SRB).
  - **auto**—STP running a combination of source-route transparent bridging (IEEE) and source-route bridging (IBM).
- **tb-vlan1 *tb-vlan1-id* and tb-vlan2 *tb-vlan2-id***—Specifies the first and second VLAN to which this VLAN is translationally bridged. Translational VLANs translate FDDI or Token Ring to Ethernet, for example. The range is 0 to 1005. If no value is specified, 0 (no transitional bridging) is assumed.

Table 78: Valid Commands and Syntax for Different Media Types

Media Type	Valid Syntax
Ethernet	<b>name</b> <i>vlan-name</i> , <b>media</b> <b>ethernet</b> , <b>state</b> { <b>suspend</b>   <b>active</b> }, <b>said</b> <i>said-value</i> , <b>remote-span</b> , <b>tb-vlan1</b> <i>tb-vlan1-id</i> , <b>tb-vlan2</b> <i>tb-vlan2-id</i>
FDDI	<b>name</b> <i>vlan-name</i> , <b>media</b> <b>fddi</b> , <b>state</b> { <b>suspend</b>   <b>active</b> }, <b>said</b> <i>said-value</i> , <b>ring</b> <i>ring-number</i> , <b>parent</b> <i>parent-vlan-id</i> , <b>tb-vlan1</b> <i>tb-vlan1-id</i> , <b>tb-vlan2</b> <i>tb-vlan2-id</i>
FDDI-NET	<b>name</b> <i>vlan-name</i> , <b>media</b> <b>fd-net</b> , <b>state</b> { <b>suspend</b>   <b>active</b> }, <b>said</b> <i>said-value</i> , <b>bridge</b> <i>bridge-number</i> , <b>stp type</b> { <b>ieee</b>   <b>ibm</b>   <b>auto</b> }, <b>tb-vlan1</b> <i>tb-vlan1-id</i> , <b>tb-vlan2</b> <i>tb-vlan2-id</i> If VTP v2 mode is disabled, do not set the <b>stp type</b> to <b>auto</b> .
Token Ring	VTP v1 mode is enabled. <b>name</b> <i>vlan-name</i> , <b>media</b> <b>tokenring</b> , <b>state</b> { <b>suspend</b>   <b>active</b> }, <b>said</b> <i>said-value</i> , <b>ring</b> <i>ring-number</i> , <b>parent</b> <i>parent-vlan-id</i> , <b>tb-vlan1</b> <i>tb-vlan1-id</i> , <b>tb-vlan2</b> <i>tb-vlan2-id</i>
Token Ring concentrator relay function (TrCRF)	VTP v2 mode is enabled. <b>name</b> <i>vlan-name</i> , <b>media</b> <b>tokenring</b> , <b>state</b> { <b>suspend</b>   <b>active</b> }, <b>said</b> <i>said-value</i> , <b>ring</b> <i>ring-number</i> , <b>parent</b> <i>parent-vlan-id</i> , <b>bridge type</b> { <b>srp</b>   <b>srt</b> }, <b>are</b> <i>are-number</i> , <b>ste</b> <i>ste-number</i> , <b>backuprf</b> { <b>enable</b>   <b>disable</b> }, <b>tb-vlan1</b> <i>tb-vlan1-id</i> , <b>tb-vlan2</b> <i>tb-vlan2-id</i>
Token Ring-NET	VTP v1 mode is enabled. <b>name</b> <i>vlan-name</i> , <b>media</b> <b>tr-net</b> , <b>state</b> { <b>suspend</b>   <b>active</b> }, <b>said</b> <i>said-value</i> , <b>bridge</b> <i>bridge-number</i> , <b>stp type</b> { <b>ieee</b>   <b>ibm</b> }, <b>tb-vlan1</b> <i>tb-vlan1-id</i> , <b>tb-vlan2</b> <i>tb-vlan2-id</i>
Token Ring bridge relay function (TrBRF)	VTP v2 mode is enabled. <b>name</b> <i>vlan-name</i> , <b>media</b> <b>tr-net</b> , <b>state</b> { <b>suspend</b>   <b>active</b> }, <b>said</b> <i>said-value</i> , <b>bridge</b> <i>bridge-number</i> , <b>stp type</b> { <b>ieee</b>   <b>ibm</b>   <b>auto</b> }, <b>tb-vlan1</b> <i>tb-vlan1-id</i> , <b>tb-vlan2</b> <i>tb-vlan2-id</i>

The following table describes the rules for configuring VLANs:

**Table 79: VLAN Configuration Rules**

Configuration	Rule
VTP v2 mode is enabled, and you are configuring a TrCRF VLAN media type.	Specify a parent VLAN ID of a TrBRF that already exists in the database. Specify a ring number. Do not leave this field blank. Specify unique ring numbers when TrCRF VLANs have the same parent VLAN ID. Only one backup concentrator relay function (CRF) can be enabled.
VTP v2 mode is enabled, and you are configuring VLANs other than TrCRF media type.	Do not specify a backup CRF.
VTP v2 mode is enabled, and you are configuring a TrBRF VLAN media type.	Specify a bridge number. Do not leave this field blank.
VTP v1 mode is enabled.	No VLAN can have an STP type set to auto. This rule applies to Ethernet, FDDI, FDDI-NET, Token Ring, and Token Ring-NET VLANs.
Add a VLAN that requires translational bridging (values are not set to zero).	The translational bridging VLAN IDs that are used must already exist in the database. The translational bridging VLAN IDs that a configuration points to must also contain a pointer to the original VLAN in one of the translational bridging parameters (for example, Ethernet points to FDDI, and FDDI points to Ethernet). The translational bridging VLAN IDs that a configuration points to must be different media types than the original VLAN (for example, Ethernet can point to Token Ring). If both translational bridging VLAN IDs are configured, these VLANs must be different media types (for example, Ethernet can point to FDDI and Token Ring).

This example shows how to add an Ethernet VLAN with default media characteristics. The default includes a *vlan-name* of VLAN xxxx, where xxxx represents four numeric digits (including leading zeros) equal to the VLAN ID number. The default media is ethernet; the state is active. The default said-value is 100000 plus the VLAN ID; the mtu-size variable is 1500; the stp-type is ieee. When you enter the **exit** VLAN configuration command, the VLAN is added if it did not already exist; otherwise, this command does nothing.

This example shows how to create a new VLAN with all default characteristics and enter VLAN configuration mode:

```
Device(config)# vlan 200
Device(config-vlan)# exit
Device(config)#

```

This example shows how to create a new extended-range VLAN with all the default characteristics, to enter VLAN configuration mode, and to save the new VLAN in the device startup configuration file:

```
Device(config)# vlan 2000
Device(config-vlan)# end
Device# copy running-config startup config
```

You can verify your setting by entering the **show vlan** privileged EXEC command.

# vtp (global configuration)

To set or modify the VLAN Trunking Protocol (VTP) configuration characteristics, use the **vtp** command in global configuration mode. To remove the settings or to return to the default settings, use the **no** form of this command.

```
vtp {domain domain-name | file filename | interface interface-name [only] | mode {client | off | server | transparent} [{mst | unknown | vlan}] | password password [{hidden | secret}] | pruning | version number}
no vtp {file | interface | mode [{client | off | server | transparent}] [{mst | unknown | vlan}] | password | pruning | version}
```

Syntax Description	
<b>domain</b> <i>domain-name</i>	Specifies the VTP domain name, an ASCII string from 1 to 32 characters that identifies the VTP administrative domain for the device. The domain name is case sensitive.
<b>file</b> <i>filename</i>	Specifies the Cisco IOS file system file where the VTP VLAN configuration is stored.
<b>interface</b> <i>interface-name</i>	Specifies the name of the interface providing the VTP ID updated for this device.
<b>only</b>	(Optional) Uses only the IP address of this interface as the VTP IP updater.
<b>mode</b>	Specifies the VTP device mode as client, server, or transparent.
<b>client</b>	Places the device in VTP client mode. A device in VTP client mode is enabled for VTP, and can send advertisements, but does not have enough nonvolatile storage to store VLAN configurations. You cannot configure VLANs on a VTP client. VLANs are configured on another device in the domain that is in server mode. When a VTP client starts up, it does not send VTP advertisements until it receives advertisements to initialize its VLAN database.
<b>off</b>	Places the device in VTP off mode. A device in VTP off mode functions the same as a VTP transparent device except that it does not forward VTP advertisements on trunk ports.
<b>server</b>	Places the device in VTP server mode. A device in VTP server mode is enabled for VTP and sends advertisements. You can configure VLANs on the device. The device can recover all the VLAN information in the current VTP database from nonvolatile storage after reboot.
<b>transparent</b>	Places the device in VTP transparent mode. A device in VTP transparent mode is disabled for VTP, does not send advertisements or learn from advertisements sent by other devices, and cannot affect VLAN configurations on other devices in the network. The device receives VTP advertisements and forwards them on all trunk ports except the one on which the advertisement was received.  When VTP mode is transparent, the mode and domain name are saved in the device running configuration file, and you can save them in the device startup configuration file by entering the <b>copy running-config startup config</b> privileged EXEC command.
<b>mst</b>	(Optional) Sets the mode for the multiple spanning tree (MST) VTP database (only VTP Version 3).

<b>unknown</b>	(Optional) Sets the mode for unknown VTP databases (only VTP Version 3).
<b>vlan</b>	(Optional) Sets the mode for VLAN VTP databases. This is the default (only VTP Version 3).
<b>password</b> <i>password</i>	Sets the administrative domain password for the generation of the 16-byte secret value used in MD5 digest calculation to be sent in VTP advertisements and to validate received VTP advertisements. The password can be an ASCII string from 1 to 32 characters. The password is case sensitive.
<b>hidden</b>	(Optional) Specifies that the key generated from the password string is saved in the VLAN database file. When the <b>hidden</b> keyword is not specified, the password string is saved in clear text. When the hidden password is entered, you need to reenter the password to issue a command in the domain. This keyword is supported only in VTP Version 3.
<b>secret</b>	(Optional) Allows the user to directly configure the password secret key (only VTP Version 3).
<b>pruning</b>	Enables VTP pruning on the device.
<b>version</b> <i>number</i>	Sets the VTP Version to Version 1, Version 2, or Version 3.

**Command Default**

The default filename is *flash:vlan.dat*.

The default mode is server mode and the default database is VLAN.

In VTP Version 3, for the MST database, the default mode is transparent.

No domain name or password is defined.

No password is configured.

Pruning is disabled.

The default version is Version 1.

**Command Modes**

Global configuration

**Command History****Release**      **Modification**

Cisco IOS XE 3.2SE This command was introduced.

**Usage Guidelines**

When you save VTP mode, domain name, and VLAN configurations in the device startup configuration file and reboot the device, the VTP and VLAN configurations are selected by these conditions:

- If the VTP mode is transparent in the startup configuration and the VLAN database and the VTP domain name from the VLAN database matches that in the startup configuration file, the VLAN database is ignored (cleared), and the VTP and VLAN configurations in the startup configuration file are used. The VLAN database revision number remains unchanged in the VLAN database.
- If the VTP mode or domain name in the startup configuration do not match the VLAN database, the domain name and VTP mode and configuration for VLAN IDs 1 to 1005 use the VLAN database information.

**vtp (global configuration)**

The **vtp file** *filename* cannot be used to load a new database; it renames only the file in which the existing database is stored.

Follow these guidelines when configuring a VTP domain name:

- The device is in the no-management-domain state until you configure a domain name. While in the no-management-domain state, the device does not send any VTP advertisements even if changes occur to the local VLAN configuration. The device leaves the no-management-domain state after it receives the first VTP summary packet on any port that is trunking or after you configure a domain name by using the **vtp domain** command. If the device receives its domain from a summary packet, it resets its configuration revision number to 0. After the device leaves the no-management-domain state, it cannot be configured to reenter it until you clear the NVRAM and reload the software.
- Domain names are case-sensitive.
- After you configure a domain name, it cannot be removed. You can only reassign it to a different domain.

Follow these guidelines when setting VTP mode:

- The **no vtp mode** command returns the device to VTP server mode.
- The **vtp mode server** command is the same as **no vtp mode** except that it does not return an error if the device is not in client or transparent mode.
- If the receiving device is in client mode, the client device changes its configuration to duplicate the configuration of the server. If you have devices in client mode, be sure to make all VTP or VLAN configuration changes on a device in server mode, as it has a higher VTP configuration revision number. If the receiving device is in transparent mode, the device configuration is not changed.
- A device in transparent mode does not participate in VTP. If you make VTP or VLAN configuration changes on a device in transparent mode, the changes are not propagated to other devices in the network.
- If you change the VTP or VLAN configuration on a device that is in server mode, that change is propagated to all the devices in the same VTP domain.
- The **vtp mode transparent** command disables VTP from the domain but does not remove the domain from the device.
- In VTP Versions 1 and 2, the VTP mode must be transparent for VTP and VLAN information to be saved in the running configuration file.
- With VTP Versions 1 and 2, you cannot change the VTP mode to client or server if extended-range VLANs are configured on the switch. Changing the VTP mode is allowed with extended VLANs in VTP Version 3.
- The VTP mode must be transparent for you to add extended-range VLANs or for VTP and VLAN information to be saved in the running configuration file.
- VTP can be set to either server or client mode only when dynamic VLAN creation is disabled.
- The **vtp mode off** command sets the device to off. The **no vtp mode off** command resets the device to the VTP server mode.

Follow these guidelines when setting a VTP password:

- Passwords are case sensitive. Passwords should match on all devices in the same domain.
- When you use the **no vtp password** form of the command, the device returns to the no-password state.

- The **hidden** and **secret** keywords are supported only in VTP Version 3. If you convert from VTP Version 2 to VTP Version 3, you must remove the hidden or secret keyword before the conversion.

Follow these guidelines when setting VTP pruning:

- VTP pruning removes information about each pruning-eligible VLAN from VTP updates if there are no stations belonging to that VLAN.
- If you enable pruning on the VTP server, it is enabled for the entire management domain for VLAN IDs 1 to 1005.
- Only VLANs in the pruning-eligible list can be pruned.
- Pruning is supported with VTP Version 1 and Version 2.

Follow these guidelines when setting the VTP version:

- Toggling the Version 2 (v2) mode state modifies parameters of certain default VLANs.
- Each VTP device automatically detects the capabilities of all the other VTP devices. To use Version 2, all VTP devices in the network must support Version 2; otherwise, you must configure them to operate in VTP Version 1 mode.
- If all devices in a domain are VTP Version 2-capable, you only need to configure Version 2 on one device; the version number is then propagated to the other Version-2 capable devices in the VTP domain.
- If you are using VTP in a Token Ring environment, VTP Version 2 must be enabled.
- If you are configuring a Token Ring bridge relay function (TrBRF) or Token Ring concentrator relay function (TrCRF) VLAN media type, you must use Version 2.
- If you are configuring a Token Ring or Token Ring-NET VLAN media type, you must use Version 1.
- In VTP Version 3, all database VTP information is propagated across the VTP domain, not only VLAN database information.
- Two VTP Version 3 regions can only communicate over a VTP Version 1 or VTP Version 2 region in transparent mode.

You cannot save password, pruning, and version configurations in the device configuration file.

This example shows how to rename the filename for VTP configuration storage to vtpfilename:

```
Device(config)# vtp file vtpfilename
```

This example shows how to clear the device storage filename:

```
Device(config)# no vtp file vtpconfig
Clearing device storage filename.
```

This example shows how to specify the name of the interface providing the VTP updater ID for this device:

```
Device(config)# vtp interface gigabitethernet
```

This example shows how to set the administrative domain for the device:

**vtp (global configuration)**

```
Device(config)# vtp domain OurDomainName
```

This example shows how to place the device in VTP transparent mode:

```
Device(config)# vtp mode transparent
```

This example shows how to configure the VTP domain password:

```
Device(config)# vtp password ThisIsOurDomainsPassword
```

This example shows how to enable pruning in the VLAN database:

```
Device(config)# vtp pruning  
Pruning switched ON
```

This example shows how to enable Version 2 mode in the VLAN database:

```
Device(config)# vtp version 2
```

You can verify your settings by entering the **show vtp status** privileged EXEC command.

# vtp (interface configuration)

To enable the VLAN Trunking Protocol (VTP) on a per-port basis, use the **vtp** command in interface configuration mode. To disable VTP on the interface, use the **no** form of this command.

```
vtp  
no vtp
```

**Syntax Description** This command has no arguments or keywords.

**Command Default** None

**Command Modes** Interface configuration

Command History	Release	Modification
Cisco IOS XE 3.2SE		This command was introduced.

**Usage Guidelines** Enter this command only on interfaces that are in trunking mode.

This command is supported only when the device is running VTP Version 3.

This example shows how to enable VTP on an interface:

```
Device(config-if)# vtp
```

This example shows how to disable VTP on an interface:

```
Device(config-if)# no vtp
```

**vtp primary**

# vtp primary

To configure a device as the VLAN Trunking Protocol (VTP) primary server, use the **vtp primary** command in privileged EXEC mode.

**vtp primary [{mst | vlan}] [force]**

---

<b>Syntax Description</b>	<b>mst</b> (Optional) Configures the device as the primary VTP server for the multiple spanning tree (MST) feature. <b>vlan</b> (Optional) Configures the device as the primary VTP server for VLANs. <b>force</b> (Optional) Configures the device to not check for conflicting devices when configuring the primary server.
---------------------------	---

---

**Command Default** The device is a VTP secondary server.

**Command Modes** Privileged EXEC

**Command History**

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** A VTP primary server updates the database information and sends updates that are honored by all devices in the system. A VTP secondary server can only back up the updated VTP configurations received from the primary server to NVRAM.

By default, all devices come up as secondary servers. Primary server status is needed only for database updates when the administrator issues a takeover message in the domain. You can have a working VTP domain without any primary servers.

Primary server status is lost if the device reloads or domain parameters change.

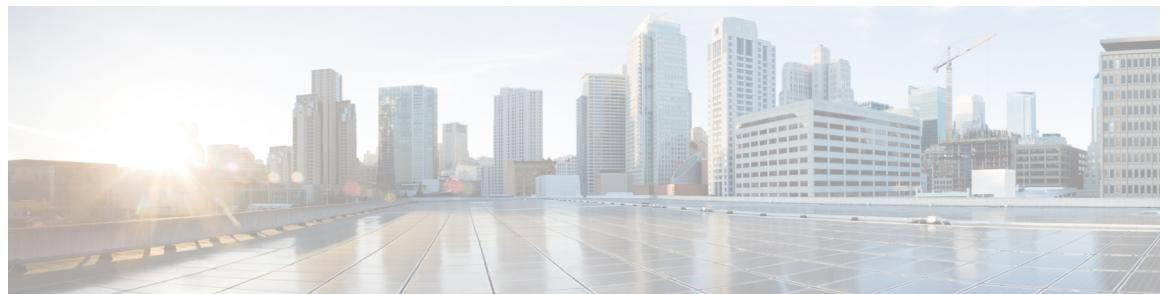


**Note** This command is supported only when the device is running VTP Version 3.

This example shows how to configure the device as the primary VTP server for VLANs:

```
Device# vtp primary vlan
Setting device to VTP TRANSPARENT mode.
```

You can verify your settings by entering the **show vtp status** privileged EXEC command.



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