# Catalyst 4500 Series Switch Cisco IOS Command Reference

Release 12.2(46)SG

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# CONTENTS

# Preface

This preface describes the audience, organization, and conventions of this publication, and provides information on how to obtain related documentation.

## Audience

This publication is for experienced network administrators who are responsible for configuring and maintaining Catalyst 4500 series switches.

## Organization

This publication is organized as follows:

| Chapter | Title | Description |
|---|---|---|
| Chapter 1 | Command-Line Interface | Describes the Catalyst 4500 series switch CLI. |
| Chapter 2 | Cisco IOS Commands for the Catalyst 4500 Series Switches | Lists all Catalyst 4500 series Cisco IOS commands alphabetically and provides detailed information on each command. |
| Appendix A | Abbreviations | Defines the acronyms used in this publication. |

## Related Documentation

The Catalyst 4500 series Cisco IOS documentation set includes these publications:

- *Catalyst 4500 Series Switch Installation Guide*
- *Catalyst 4500 Series Switch Supervisor Engine III Installation Note*
- *Catalyst 4500 Series Switch Supervisor Engine IV Installation Note*
- *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide*
- *Catalyst 4500 Series Switch Cisco IOS System Message Guide*
- *Release Notes for Catalyst 4500 Series Switch Software Release 12.1(13)EW*

Other documents in the Cisco IOS documentation set include:

- Cisco IOS Release 12.2 Configuration Guides
- Cisco IOS Release 12.2 Command References

For information about MIBs, refer to this URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

# Conventions

This document uses these conventions:

| Convention | Description |
|---|---|
| **boldface** font | Boldface text indicates commands and keywords that you enter literally as shown. |
| *italic* font | *Italic* text indicates arguments for which you supply values. |
| [**x**] | Square brackets enclose an optional element (keyword or argument). |
| \| | A vertical line indicates a choice within an optional or required set of keywords or arguments. |
| [**x** \| *y*] | Square brackets enclosing keywords or arguments separated by a vertical line indicate an optional choice. |
| {**x** \| *y*} | Braces enclosing keywords or arguments separated by a vertical line indicate a required choice. |
| [**x** {**y** \| **z**}] | Braces and a vertical line within square brackets indicate a required choice within an optional element. |
| string | A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks. |
| `screen` font | Terminal sessions and information the system displays are in `screen` font. |
| **`boldface screen`** font | Information you must enter is in **`boldface screen`** font. |
| *italic screen* font | Arguments for which you supply values are in *italic screen* font. |
| ^ | The symbol ^ represents the key labeled Control—for example, the key combination ^D in a screen display means hold down the Control key while you press the D key. |
| < > | Nonprinting characters, such as passwords, are in angle brackets. |
| [ ] | Default responses to system prompts are in square brackets. |
| !, # | An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line. |

Notes use this convention:

**Note** Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the publication.

Cautions use this convention:

**Caution** Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

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http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

CHAPTER 1

# Command-Line Interface

This chapter provides information for understanding and using the Cisco IOS command-line interface (CLI) on the Catalyst 4500 series switch. This chapter includes the following sections:



For an overview of the Catalyst 4500 series switch Cisco IOS configuration, refer to the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide*.

## Getting Help

To display a list of commands that you can use within a command mode, enter a question mark (**?**) at the system prompt. You also can display keywords and arguments for each command with this context-sensitive help feature.

Table 1-1 lists commands you can enter to get help that is specific to a command mode, a command, a keyword, or an argument.

***Table 1-1 Getting Help***

| Command | Purpose |
|---|---|
| *abbreviated-command-entry***?** | Displays a list of commands that begin with a particular character string. (Do not leave a space between the command and question mark.) |
| *abbreviated-command-entry*<**Tab**> | Completes a partial command name. |
| **?** | Lists all commands for the command mode. |
| *command* **?** | Lists all keywords for the command. Leave a space between the command and the question mark. |
| *command keyword* **?** | Lists all arguments for the keyword. Leave a space between the keyword and the question mark. |

# How to Find Command Options

This section provides an example of how to display syntax for a command. The syntax can consist of optional or required keywords. To display keywords for a command, enter a question mark (**?**) at the command prompt or after entering part of a command followed by a space. The Catalyst 4500 series switch software displays a list of available keywords along with a brief description of the keywords. For example, if you are in global configuration mode and want to see all the keywords for the **arap** command, you enter **arap ?**.

Table 1-2 shows examples of how you can use the question mark (**?**) to assist you in entering commands and also guides you through entering the following commands:

- **interface gigabitethernet 1/1**
- **channel-group 1 mode auto**

*Table 1-2 How to Find Command Options*

| Command | Purpose |
|---|---|
| `Switch> enable`<br>`Password: <password>`<br>`Switch#` | Enter the **enable** command and password to access privileged EXEC commands.<br>You are in privileged EXEC mode when the prompt changes to `Switch#`. |
| `Switch# configure terminal`<br>`Enter configuration commands, one per line. End with CNTL/Z.`<br>`Switch(config)#` | Enter global configuration mode.<br>You are in global configuration mode when the prompt changes to `Switch(config)#`. |
| `Switch(config)# interface gigabitethernet ?`<br>`  <1-9>  GigabitEthernet interface number`<br>`Switch(config)# interface gigabitethernet 1/1`<br>`Switch(config-if)#` | Enter interface configuration mode by specifying the Gigabit Ethernet interface that you want to configure using the **interface gigabitethernet** global configuration command.<br>Enter a **?** to display what you must enter next on the command line. In this example, you must enter an interface number from 1 to 9 in the format *module-number/port-number*.<br>You are in interface configuration mode when the prompt changes to `Switch(config-if)#`. |

*Table 1-2 How to Find Command Options (continued)*

| Command | Purpose |
|---|---|
| `Switch(config-if)#?`<br>`Interface configuration commands:`<br>`  access-expression  Build a bridge boolean access expression`<br>`  apollo  Apollo interface subcommands`<br>`  appletalk  Appletalk interface subcommands`<br>`  arp  Set arp type (arpa, probe, snap) or timeout`<br>`  backup  Modify backup parameters`<br>`  bandwidth  Set bandwidth informational parameter`<br>`  bgp-policy  Apply policy propogated by bgp community string`<br>`  bridge-group  Transparent bridging interface parameters`<br>`  carrier-delay  Specify delay for interface transitions`<br>`  cdp  CDP interface subcommands`<br>`  channel-group  Etherchannel/port bundling configuration`<br>`  clns  CLNS interface subcommands`<br>`  cmns  OSI CMNS`<br>`  custom-queue-list  Assign a custom queue list to an interface`<br>`  decnet  Interface DECnet config commands`<br>`  default  Set a command to its defaults`<br>`  delay  Specify interface throughput delay`<br>`  description  Interface specific description`<br>`  dlsw  DLSw interface subcommands`<br>`  dspu  Down Stream PU`<br>`  exit  Exit from interface configuration mode`<br>`  fair-queue  Enable Fair Queuing on an Interface`<br>`  flowcontrol  Configure flow operation.`<br>`  fras  DLC Switch Interface Command`<br>`  help  Description of the interactive help system`<br>`  hold-queue  Set hold queue depth`<br>`  ip  Interface Internet Protocol config commands`<br>`  ipx  Novell/IPX interface subcommands`<br>`  isis  IS-IS commands`<br>`  iso-igrp  ISO-IGRP interface subcommands`<br>`.`<br>`.`<br>`.`<br>`Switch(config-if)#` | Enter a **?** to display a list of all the interface configuration commands available for the Gigabit Ethernet interface. |
| `Switch(config-if)# channel-group ?`<br>`  group  channel-group of the interface`<br>`Switch(config-if)#channel-group` | Enter the command that you want to configure for the controller. In this example, the **channel-group** command is used.<br>Enter a **?** to display what you must enter next on the command line. In this example, you must enter the **group** keyword.<br>Because a <cr> is not displayed, it indicates that you must enter more information to complete the command. |

*Table 1-2 How to Find Command Options (continued)*

| Command | Purpose |
|---|---|
| `Switch(config-if)# channel-group ?`<br>`  <1-256>  Channel group number`<br><br>`Switch(config-if)#channel-group` | After you enter the **group** keyword, enter a **?** to display what you must enter next on the command line. In this example, you must enter a channel group number from 1 to 256.<br><br>Because a <cr> is not displayed, it indicates that you must enter more information to complete the command. |
| `Switch(config-if)# channel-group 1 ?`<br>`  mode  Etherchannel Mode of the interface`<br><br>`Switch(config-if)#` | After you enter the channel group number, enter a **?** to display what you must enter next on the command line. In this example, you must enter the **mode** keyword.<br><br>Because a <cr> is not displayed, it indicates that you must enter more information to complete the command. |
| `Switch(config-if)# channel-group 1 mode ?`<br>`  auto       Enable PAgP only if a PAgP device is detected`<br>`  desirable  Enable PAgP unconditionally`<br>`  on         Enable Etherchannel only`<br><br>`Switch(config-if)#` | After you enter the **mode** keyword, enter a **?** to display what you must enter next on the command line. In this example, you must enter the **auto**, **desirable**, or **on** keyword.<br><br>Because a <cr> is not displayed, it indicates that you must enter more information to complete the command. |
| `Switch(config-if)# channel-group 1 mode auto ?`<br>`  <cr>`<br><br>`Switch(config-if)#` | In this example, the **auto** keyword is entered. After you enter the **auto** keyword, enter a **?** to display what you must enter next on the command line.<br><br>Because a <cr> is displayed, it indicates that you can press Return to complete the command. If additional keywords are listed, you can enter more keywords or press Return to complete the command. |
| `Switch(config-if)# channel-group 1 mode auto`<br>`Switch(config-if)#` | In this example, press Return to complete the command. |

# Understanding Command Modes

The Cisco IOS user interface on the Catalyst 4500 series switch has many different modes. The commands that are available to you depend on which mode you are currently in. You can obtain a list of commands available for each command mode by entering a question mark (**?**) at the system prompt.

When you start a session on the Catalyst 4500 series switch, you begin in user mode, often called EXEC mode. Only a limited subset of the commands are available in EXEC mode. In order to have access to all commands, you must enter privileged EXEC mode. Normally, you must enter a password to enter privileged EXEC mode. From privileged EXEC mode, you can enter any EXEC command or enter global configuration mode. Most EXEC commands are one-time commands, such as **show** commands, which show the current status of a given item, and **clear** commands, which clear counters or interfaces. The EXEC commands are not saved across reboots of the Catalyst 4500 series switch.

The configuration modes provide a way for you to make changes to the running configuration. When you save changes to the configuration, the changes remain intact when the Catalyst 4500 series switch reboots. From global configuration mode, you can enter interface configuration mode, subinterface configuration mode, and other protocol-specific modes.

ROM-monitor mode is a separate mode used when the Catalyst 4500 series switch cannot boot properly. If your Catalyst 4500 series switch or access server does not find a valid system image when it is booting, or if its configuration file is corrupted at startup, the system might enter ROM-monitor mode.

Table 1-3 provides a summary of the main command modes.

*Table 1-3 Summary of Main Command Modes*

| Command Mode | Access Method | Prompt | Exit Method |
|---|---|---|---|
| User EXEC mode | Log in. | `Switch>` | Use the **logout** command. |
| Privileged EXEC mode | From user EXEC mode, enter the **enable** EXEC command. | `Switch#` | To exit to user EXEC mode, enter the **disable** command.<br>To enter global configuration mode, enter the **configure terminal** privileged EXEC command. |
| Global configuration mode | From privileged EXEC mode, enter the **configure terminal** privileged EXEC command. | `Switch(config)#` | To exit to privileged EXEC mode, enter the **exit** or **end** command or press **Ctrl-Z**.<br>To enter interface configuration mode, enter an **interface** configuration command. |
| Interface configuration mode | From global configuration mode, enter by specifying an interface with an **interface** command. | `Switch(config-if)#` | To exit to global configuration mode, enter the **exit** command.<br>To exit to privileged EXEC mode, enter the **exit** command or press **Ctrl-Z**.<br>To enter subinterface configuration mode, specify a subinterface with the **interface** command. |

*Table 1-3 Summary of Main Command Modes (continued)*

| Command Mode | Access Method | Prompt | Exit Method |
|---|---|---|---|
| Subinterface configuration | From interface configuration mode, specify a subinterface with an **interface** command. | `Switch(config-subif)#` | To exit to global configuration mode, enter the **exit** command.<br>To enter privileged EXEC mode, enter the **end** command or press **Ctrl-Z**. |
| ROM monitor | From privileged EXEC mode, enter the **reload** EXEC command. Press the Break key during the first 60 seconds while the system is booting. | `Rommon>` | To exit ROM-monitor mode, you must reload the image by entering the **boot** command. If you use the **boot** command without specifying a file or any other boot instructions, the system boots from the default Flash image (the first image in onboard Flash memory). Otherwise, you can instruct the system to boot from a specific Flash image (using the **boot system flash** *filename* command). |

For more information on command modes, refer to the "Using the Command Line Interface" chapter of the *Configuration Fundamentals Configuration Guide*.

# Using the No and Default Forms of Commands

Almost every configuration command has a **no** form. In general, enter the **no** form to disable a function. Use the command without the keyword **no** to reenable a disabled function or to enable a function that is disabled by default. For example, IP routing is enabled by default. To disable IP routing, specify the **no ip routing** command and specify **ip routing** to reenable it. This publication provides the complete syntax for the configuration commands and describes what the **no** form of a command does.

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

# Using the CLI String Search

The pattern in the command output is referred to as a string. The CLI string search feature allows you to search or filter any **show** or **more** command output and allows you to search and filter at --More-- prompts. This feature is useful when you need to sort though large amounts of output, or if you want to exclude output that you do not need to see.

With the search function, you can begin unfiltered output at the first line that contains a regular expression you specify. You can then specify a maximum of one filter per command or start a new search from the --More-- prompt.

A regular expression is a pattern (a phrase, number, or more complex pattern) software uses to match against **show** or **more** command output. Regular expressions are case sensitive and allow for complex matching requirements. Examples of simple regular expressions are Serial, misses, and 138. Examples of complex regular expressions are 00210..., ( is ), and [Oo]utput.

You can perform three types of filtering:

- Use the **begin** keyword to begin output with the line that contains a specified regular expression.
- Use the **include** keyword to include output lines that contain a specified regular expression.
- Use the **exclude** keyword to exclude output lines that contain a specified regular expression.

You can then search this filtered output at the --More-- prompts.

**Note** The CLI string search function does not allow you to search or filter backward through previous output; filtering cannot be specified using HTTP access to the CLI.

# Regular Expressions

A regular expression can be a single character that matches the same single character in the command output or multiple characters that match the same multiple characters in the command output. This section describes how to create both single-character patterns and multiple-character patterns and how to create more complex regular expressions using multipliers, alternation, anchoring, and parentheses.

## Single-Character Patterns

The simplest regular expression is a single character that matches the same single character in the command output. You can use any letter (A-Z, a-z) or digit (0-9) as a single-character pattern. You can also use other keyboard characters (such as ! or ~) as single-character patterns, but certain keyboard characters have special meaning when used in regular expressions. Table 1-4 lists the keyboard characters that have special meaning.

*Table 1-4 Characters with Special Meaning*

| Character | Special Meaning |
|---|---|
| . | Matches any single character, including white space. |
| * | Matches 0 or more sequences of the pattern. |
| + | Matches 1 or more sequences of the pattern. |
| ? | Matches 0 or 1 occurrences of the pattern. |
| ^ | Matches the beginning of the string. |
| $ | Matches the end of the string. |
| _ (underscore) | Matches a comma (,), left brace ({), right brace (}), left parenthesis ( ( ), right parenthesis ( ) ), the beginning of the string, the end of the string, or a space. |

To enter these special characters as single-character patterns, remove the special meaning by preceding each character with a backslash (\). These examples are single-character patterns matching a dollar sign, an underscore, and a plus sign, respectively.

**\$ _ \+**

You can specify a range of single-character patterns to match against command output. For example, you can create a regular expression that matches a string containing one of the following letters: a, e, i, o, or u. One and only one of these characters must exist in the string for pattern matching to succeed. To specify a range of single-character patterns, enclose the single-character patterns in square brackets ([ ]). For example,

**[aeiou]**

matches any one of the five vowels of the lowercase alphabet, while

**[abcdABCD]**

matches any one of the first four letters of the lower- or uppercase alphabet.

You can simplify ranges by entering only the end points of the range separated by a dash (-). Simplify the previous range as follows:

**[a-dA-D]**

To add a dash as a single-character pattern in your range, include another dash and precede it with a backslash:

**[a-dA-D\-]**

You can also include a right square bracket (]) as a single-character pattern in your range. To do so, enter the following:

**[a-dA-D\-\]]**

The previous example matches any one of the first four letters of the lower- or uppercase alphabet, a dash, or a right square bracket.

You can reverse the matching of the range by including a caret (^) at the start of the range. This example matches any letter except the ones listed:

**[^a-dqsv]**

This example matches anything except a right square bracket (]) or the letter d:

**[^\]d]**

## Multiple-Character Patterns

When creating regular expressions, you can also specify a pattern containing multiple characters. You create multiple-character regular expressions by joining letters, digits, or keyboard characters that do not have special meaning. For example, a4% is a multiple-character regular expression. Put a backslash in front of the keyboard characters that have special meaning when you want to remove their special meaning.

With multiple-character patterns, order is important. The regular expression a4% matches the character a followed by a 4 followed by a % sign. If the string does not have a4%, in that order, pattern matching fails. This multiple-character regular expression:

**a.**

uses the special meaning of the period character to match the letter a followed by any single character. With this example, the strings ab, a!, or a2 are all valid matches for the regular expression.

You can remove the special meaning of the period character by putting a backslash in front of it. In the following expression:

**a\.**

only the string a. matches this regular expression.

You can create a multiple-character regular expression containing all letters, all digits, all keyboard characters, or a combination of letters, digits, and other keyboard characters. These examples are all valid regular expressions:

**telebit 3107 v32bis**

## Multipliers

You can create more complex regular expressions to match multiple occurrences of a specified regular expression by using some special characters with your single- and multiple-character patterns. Table 1-5 lists the special characters that specify "multiples" of a regular expression.

*Table 1-5 Special Characters Used as Multipliers*

| Character | Description |
|---|---|
| * | Matches 0 or more single- or multiple-character patterns. |
| + | Matches 1 or more single- or multiple-character patterns. |
| ? | Matches 0 or 1 occurrences of the single- or multiple-character patterns. |

This example matches any number of occurrences of the letter a, including none:

**a***

This pattern requires that at least one letter a in the string is matched:

**a+**

This pattern matches the string bb or bab:

**ba?b**

This string matches any number of asterisks (*):

******

To use multipliers with multiple-character patterns, you enclose the pattern in parentheses. In the following example, the pattern matches any number of the multiple-character string ab:

**(ab)***

As a more complex example, this pattern matches one or more instances of alphanumeric pairs (but not none; that is, an empty string is not a match):

**([A-Za-z][0-9])+**

The order for matches using multipliers (*, +, or ?) is to put the longest construct first. Nested constructs are matched from outside to inside. Concatenated constructs are matched beginning at the left side of the construct. Thus, the regular expression matches A9b3, but not 9Ab3 because the letters are specified before the numbers.

# Alternation

Alternation allows you to specify alternative patterns to match against a string. You separate the alternative patterns with a vertical bar (|). Exactly one of the alternatives can match the string. For example, the regular expression

**codex | telebit**

matches the string codex or the string telebit, but not both codex and telebit.

# Anchoring

You can match a regular expression pattern against the beginning or the end of the string. That is, you can specify that the beginning or end of a string contains a specific pattern. You "anchor" these regular expressions to a portion of the string using the special characters shown in Table 1-6.

*Table 1-6 Special Characters Used for Anchoring*

| Character | Description |
|---|---|
| ^ | Matches the beginning of the string. |
| $ | Matches the end of the string. |

This regular expression matches a string only if the string starts with abcd:

**^abcd**

In contrast, this expression is in a range that matches any single letter, as long as it is not the letters a, b, c, or d:

**[^abcd]**

With this example, the regular expression matches a string that ends with .12:

**$\.12**

Contrast these anchoring characters with the special character underscore (_). The underscore matches the beginning of a string (^), the end of a string ($), parentheses ( ), space ( ), braces { }, comma (,), or underscore (_). With the underscore character, you can specify that a pattern exist anywhere in the string.

For example:

**_1300_**

matches any string that has 1300 somewhere in the string. The string's 1300 can be preceded by or end with a space, brace, comma, or underscore. For example:

**{1300_**

matches the regular expression, but 21300 and 13000 do not.

Using the underscore character, you can replace long regular expression lists, such as the following:

**^1300$ ^1300(space) (space)1300 {1300, ,1300, {1300} ,1300, (1300**

with

**_1300_**

## Parentheses for Recall

As shown in the "Multipliers" section on page 1-9, you use parentheses with multiple-character regular expressions to multiply the occurrence of a pattern. You can also use parentheses around a single- or multiple-character pattern to remember a pattern for use elsewhere in the regular expression.

To create a regular expression that recalls a previous pattern, you use parentheses to indicate a remembered specific pattern and a backslash (\) followed by an integer to reuse the remembered pattern. The integer specifies the occurrence of the parentheses in the regular expression pattern. If you have more than one remembered pattern in your regular expression, then \1 indicates the first remembered pattern, \2 indicates the second remembered pattern, and so on.

This regular expression uses parentheses for recall:

**a(.)bc(.)\1\2**

This regular expression matches an a followed by any character (call it character 1), followed by bc followed by any character (character 2), followed by character 1 again, followed by character 2 again. So, the regular expression can match aZbcTZT. The software remembers that character 1 is Z and character 2 is T and then uses Z and T again later in the regular expression.

# Saving Configuration Changes

To save your configuration changes to your startup configuration so that they will not be lost if there is a system reload or power outage, enter the following command:

```
Switch# copy system:running-config nvram:startup-config
Building configuration...
```

It might take a minute or two to save the configuration. After the configuration has been saved, the following output appears:

```
[OK]
Switch#
```

On most platforms, this step saves the configuration to NVRAM. On the Class A Flash file system platforms, this step saves the configuration to the location specified by the CONFIG_FILE environment variable. The CONFIG_FILE environment variable defaults to NVRAM.

# show platform Commands

You should use these commands only when you are working directly with your technical support representative, while troubleshooting a problem. Do not use these commands unless your technical support representative asks you to do so.

**Note** The **show platform** commands are not described in this document.

CHAPTER 2

# Cisco IOS Commands for the Catalyst 4500 Series Switches

This chapter contains an alphabetical listing of Cisco IOS commands for the Catalyst 4500 series switches. For information about Cisco IOS commands that are not included in this publication, refer to Cisco IOS Release 12.2 configuration guides and command references at this URL:

http://www.cisco.com/en/US/products/sw/iosswrel/ps1835/products_product_indices_list.html

# #macro keywords

To specify the help string for the macro keywords, use the **#macro keywords** command.

**#macro keywords** [**keyword1**] [**keyword2**] [**keyword3**]

## Syntax Description

| | |
|---|---|
| **keyword 1** | (Optional) Specifies a keyword that is needed while applying a macro to an interface. |
| **keyword 2** | (Optional) Specifies a keyword that is needed while applying a macro to an interface. |
| **keyword 3** | (Optional) Specifies a keyword that is needed while applying a macro to an interface. |

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If you do not specify the mandatory keywords for a macro, the macro is to be considered invalid and fails when you attempt to apply it. By enteringthe **#macro keywords** command, you will receive a message indicating what you need to include to make the syntax valid.

## Examples

This example shows how to specify the help string for keywords associated with a macro named test:

```
Switch(config)# macro name test
macro name test
Enter macro commands one per line. End with the character '@'.
#macro keywords $VLAN $MAX
swichport
@

Switch(config)# int gi1/1
Switch(config-if)# macro apply test ?
  WORD  Keyword to replace with a value e.g $VLAN, $MAX   << It is shown as help
  <cr>
```

## Related Commands

| Command | Description |
|---|---|
| **macro apply cisco-desktop** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop. |
| **macro apply cisco-phone** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop and a Cisco IP phone. |
| **macro apply cisco-router** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a router. |
| **macro apply cisco-switch** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to another switch. |

# aaa accounting dot1x default start-stop group radius

To enable accounting for 802.1X authentication sessions, use the **aaa accounting dot1x default start-stop group radius** command. To disable accounting, use the **no** form of this command.

**aaa accounting dot1x default start-stop group radius**

**no aaa accounting dot1x default start-stop group radius**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Accounting is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

802.1X accounting requires a RADIUS server.

This command enables the Authentication, Authorization, and Accounting (AAA) client's accounting feature to forward 802.1X update and watchdog packets from the 802.1X supplicant (workstation client) to the authentication (RADIUS) server. (Watchdog packets are defined as EAPOL-LOGON, EAPOL-LOGOFF, and EAPOL-INTERIM messages.) Successful authentication and authorization of the supplicant by the authentication server is required before these packets are considered valid and are forwarded. When the client is reauthenticated, an interim-update accounting notice is sent to the accounting server.

## Examples

This example shows how to configure 802.1X accounting:

```
Switch(config)# aaa accounting dot1x default start-stop group radius
```

**Note** The RADIUS authentication server must be properly configured to accept and log update or watchdog packets from the AAA client.

## Related Commands

| Command | Description |
|---|---|
| aaa accounting system default start-stop group radius | Receives the session termination messages after the switch reboots. |

# aaa accounting system default start-stop group radius

To receive the session termination messages after the switch reboots, use the **aaa accounting system default start-stop group radius** command. To disable accounting, use the **no** form of this command.

**aaa accounting system default start-stop group radius**

**no aaa accounting system default start-stop group radius**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Accounting is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

802.1X accounting requires the RADIUS server.

This command enables the AAA client's accounting feature to forward 802.1X update and watchdog packets from the 802.1X supplicant (workstation client) to the authentication (RADIUS) server. (Watchdog packets are defined as EAPOL-LOGON, EAPOL-LOGOFF, and EAPOL-INTERIM messages.) Successful authentication and authorization of the supplicant by the authentication server is required before these packets are considered valid and are forwarded. When the client is reauthenticated, an interim-update accounting notice is sent to the accounting server.

## Examples

This example shows how to generate a logoff after a switch reboots:

```
Switch(config)# aaa accounting system default start-stop group radius
```

**Note** The RADIUS authentication server must be properly configured to accept and log update or watchdog packets from the AAA client.

## Related Commands

| Command | Description |
|---|---|
| aaa accounting dot1x default start-stop group radius | Enables accounting for 802.1X authentication sessions. |

# access-group mode

To specify the override modes (for example, VACL overrides PACL) and the non-override modes (for example, merge or strict mode), use the **access-group mode** command. To return to preferred port mode, use the **no** form of this command.

**access-group mode** {**prefer** {**port** | **vlan**} | **merge**}

**no access-group mode** {**prefer** {**port** | **vlan**} | **merge**}

## Syntax Description

| | |
|---|---|
| **prefer port** | Specifies that the PACL mode take precedence if PACLs are configured. If no PACL features are configured on the port, other features applicable to the interface are merged and applied on the interface. |
| **prefer vlan** | Specifies that the VLAN-based ACL mode take precedence. If no VLAN-based ACL features are configured on the port's VLAN, the PACL features on the port are applied. |
| **merge** | Merges applicable ACL features before they are programmed into the hardware. |

## Defaults

PACL override mode

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

On the Layer 2 interface, prefer port, prefer VLAN, and merge modes are supported. A Layer 2 interface can have one IP ACL applied in either direction (one inbound and one outbound).

## Examples

This example shows how to make the PACL mode on the switch take effect:

```
(config-if)# access-group mode prefer port
```

This example shows how to merge applicable ACL features:

```
(config-if)# access-group mode merge
```

## Related Commands

| Command | Description |
|---|---|
| **show access-group mode interface** | Displays the ACL configuration on a Layer 2 interface. |
| **show ip interface** (refer to Cisco IOS documentation) | Displays the IP interface configuration. |
| **show mac access-group interface** | Displays the ACL configuration on a Layer 2 interface. |

# access-list hardware capture mode

To select the mode of capturing control packets, use the **access-list hardware capture mode** command.

**access-list hardware capture mode** {**global** | **vlan**}

## Syntax Description

| | |
|---|---|
| **global** | Specifies the capture of control packets globally on all VLANs. |
| **vlan** | Specifies the capture of control packets on a specific VLAN. |

## Defaults

The control packets are globally captured.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

Before configuring the capture mode, it is best to examine and modify your configuration to globally disable features such as DHCP snooping or IGMP snooping, and instead enable them on specific VLANs.

When changing to path managed mode, be aware that control traffic may be bridged in hardware or dropped initially until the per-vlan CAM entries are programmed in hardware.

You must ensure that any access control configuration on a member port or VLAN does not deny or drop the control packets from being forwarded to the CPU for the features which are enabled on the VLAN. If control packets are not permitted then the specific feature does not function.

## Examples

This example shows how to configure the switch to capture control packets on VLANs that are configured to enable capturing control packets.

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# access-list hardware capture mode vlan
Switch(config)# end
Switch#
```

This example shows how to configure the switch to capture control packets globally across all VLANs (using a static ACL).

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# access-list hardware capture mode global
Switch(config)# end
Switch#
```

This example shows another way to configure the switch to capture control packets globally across all VLANs.

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# no access-list hardware capture mode vlan
Switch(config)# end
Switch#
```

# access-list hardware entries

To designate how ACLs are programmed into the switch hardware, use the **access-list hardware entries** command.

**access-list hardware entries** {**packed** | **scattered**}

## Syntax Description

| | |
|---|---|
| **packed** | Directs the software to use the first entry with a matching mask when selecting an entry from the ACL TCAM for programming the ACEs in an ACL. |
| **scattered** | Directs the software to use the first entry with a free mask when selecting an entry from the ACL TCAM for programming the ACEs in an ACL. |

## Defaults

The ACLs are programmed as packed.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(20)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Two types of hardware resources are used when ACLs are programmed: entries and masks. If one of these resources is consumed, no additional ACLs can be programmed into the hardware. If the masks are consumed, but the entries are available, change the programming algorithm from **packed** to **scattered** to make the masks available. This action allows additional ACLs to be programmed into the hardware.

The goal is to use TCAM resources more efficiently; that is, to minimize the number of masks per ACL entries. To compare TCAM utilization when using the **scattered** or **packed** algorithms, use the **show platform hardware acl statistics utilization brief** command. To change the algorithm from **packed** to **scattered**, use the **access-list hardware entries** command.

## Examples

This example shows how to program ACLs into the hardware as packed. After they are programmed, you will need 89 percent of the masks to program only 49 percent of the ACL entries.

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# access-list hardware entries packed
Switch(config)# end
Switch#
01:15:34: %SYS-5-CONFIG_I: Configured from console by console
Switch#
Switch# show platform hardware acl statistics utilization brief
Entries/Total(%)  Masks/Total(%)
                                      -----------------  ---------------
           Input  Acl(PortAndVlan)  2016 / 4096 ( 49)   460 /  512 ( 89)
           Input  Acl(PortOrVlan)      6 / 4096 (  0)     4 /  512 (  0)
           Input  Qos(PortAndVlan)     0 / 4096 (  0)     0 /  512 (  0)
           Input  Qos(PortOrVlan)      0 / 4096 (  0)     0 /  512 (  0)
```

```
            Output Acl(PortAndVlan)      0 / 4096 (  0)      0 /  512 (  0)
            Output Acl(PortOrVlan)       0 / 4096 (  0)      0 /  512 (  0)
            Output Qos(PortAndVlan)      0 / 4096 (  0)      0 /  512 (  0)
            Output Qos(PortOrVlan)       0 / 4096 (  0)      0 /  512 (  0)

            L4Ops: used 2 out of 64
Switch#
```

This example shows how to reserve space (scatter) between ACL entries in the hardware. The number of masks required to program 49 percent of the entries has decreased to 49 percent.

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# access-list hardware entries scattered
Switch(config)# end
Switch#
01:39:37: %SYS-5-CONFIG_I: Configured from console by console
Switch#
Switch# show platform hardware acl statistics utilization brief
Entries/Total(%)  Masks/Total(%)
                                    -----------------  ---------------
            Input  Acl(PortAndVlan)  2016 / 4096 ( 49)   252 /  512 ( 49)
            Input  Acl(PortOrVlan)      6 / 4096 (  0)     5 /  512 (  0)
            Input  Qos(PortAndVlan)     0 / 4096 (  0)     0 /  512 (  0)
            Input  Qos(PortOrVlan)      0 / 4096 (  0)     0 /  512 (  0)
            Output Acl(PortAndVlan)     0 / 4096 (  0)     0 /  512 (  0)
            Output Acl(PortOrVlan)      0 / 4096 (  0)     0 /  512 (  0)
            Output Qos(PortAndVlan)     0 / 4096 (  0)     0 /  512 (  0)
            Output Qos(PortOrVlan)      0 / 4096 (  0)     0 /  512 (  0)

            L4Ops: used 2 out of 64
Switch#
```

# access-list hardware region

To modify the balance between TCAM regions in hardware, use the **access-list hardware region** command.

**access-list hardware region** {**feature** | **qos**} {**input** | **output**} **balance** {*bal-num*}

## Syntax Description

| | |
|---|---|
| **feature** | Specifies adjustment of region balance for ACLs. |
| **qos** | Specifies adjustment of region balance for QoS. |
| **input** | Specifies adjustment of region balance for input ACL and QoS. |
| **output** | Specifies adjustment of region balance for output ACL and QoS. |
| **balance** *bal-num* | Specifies relative sizes of the PandV and PorV regions in the TCAM; valid values are between 1 and 99. |

## Defaults

The default region balance for each TCAM is 50.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

PandV is a TCAM region containing entries which mask in both the port and VLAN tag portions of the flow label.

PorV is a TCAM region containing entries which mask in either the port or VLAN tag portion of the flow label, but not both.

A balance of 1 allocates the minimum number of PandV region entries and the maximum number of PorV region entries. A balance of 99 allocates the maximum number of PandV region entries and the minimum number of PorV region entries. A balance of 50 allocates equal numbers of PandV and PorV region entries in the specified TCAM.

Balances for the four TCAMs can be modified independently.

## Examples

This example shows how to enable the MAC notification trap when a MAC address is added to a port:

```
Switch# configure terminal
Switch(config)# access-list hardware region feature input balance 75
Switch(config)#
```

# action

To specify an action to be taken when a match occurs in a VACL, use the **action** command. To remove an action clause, use the **no** form of this command.

**action** {**drop** | **forward**}

**no action** {**drop** | **forward**}

## Syntax Description

| | |
|---|---|
| **drop** | Sets the action to drop packets. |
| **forward** | Sets the action to forward packets to their destination. |

## Defaults

This command has no default settings.

## Command Modes

VLAN access-map

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

In a VLAN access map, if at least one ACL is configured for a packet type (IP or MAC), the default action for the packet type is **drop** (deny).

If an ACL is not configured for a packet type, the default action for the packet type is **forward** (permit).

If an ACL for a packet type is configured and the ACL is empty or undefined, the configured action will be applied to the packet type.

## Examples

This example shows how to define a drop action:

```
Switch(config-access-map)# action drop
Switch(config-access-map)#
```

This example shows how to define a forward action:

```
Switch(config-access-map)# action forward
Switch(config-access-map)#
```

## Syntax Description

| Command | Description |
|---|---|
| **match** | Specifies a match clause by selecting one or more ACLs for a VLAN access-map sequence. |
| **show vlan access-map** | Displays the contents of a VLAN access map. |
| **vlan access-map** | Enters VLAN access-map command mode to create a VLAN access map. |

# apply

To implement a new VLAN database, increment the configuration number, save the configuration number in NVRAM, and propagate the configuration number throughout the administrative domain, use the **apply** command.

**apply**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **apply** command implements the configuration changes that you made after you entered VLAN database mode and uses them for the running configuration. This command keeps you in VLAN database mode.

You cannot use this command when the switch is in the VTP client mode.

You can verify that the VLAN database changes occurred by entering the **show vlan** command from privileged EXEC mode.

## Examples

This example shows how to implement the proposed new VLAN database and to recognize it as the current database:

```
Switch(config-vlan)# apply
Switch(config-vlan)#
```

## Related Commands

| Command | Description |
|---|---|
| **exit** (refer to Cisco IOS documentation) | Closes an active terminal session by logging off the switch. |
| **reset** | Leaves the proposed new VLAN database but remains in VLAN configuration mode and resets the proposed new database to be identical to the VLAN database currently implemented. |
| **show vlan** | Displays VLAN information. |

| Command | Description |
|---|---|
| **shutdown vlan** (refer to Cisco IOS documentation) | Shutsdown VLAN switching. |
| **vtp (global configuration mode)** | Modifies the name of a VTP configuration storage file. |

# arp access-list

To define an ARP access list or add clauses at the end of a predefined list, use the **arp access-list** command.

**arp access-list** *name*

## Syntax Description

| | |
|---|---|
| *name* | Specifies the access control list name. |

## Defaults

None

## Command Modes

Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to define an ARP access list named static-hosts:

```
Switch(config)# arp access-list static-hosts
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **deny** | Denies an ARP packet based on matches against the DHCP bindings. |
| **ip arp inspection filter vlan** | Permits ARPs from hosts that are configured for static IP when DAI is enabled and to define an ARP access list and applies it to a VLAN. |
| **permit** | Permits an ARP packet based on matches against the DHCP bindings. |

# attach module

To remotely connect to a specific module, use the **attach module** configuration command.

**attach module** *mod*

## Syntax Description

| | |
|---|---|
| *mod* | Target module for the command. |

## Defaults

This command has no default settings.

## Command Modes

Privileged

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command applies only to the Access Gateway Module on Catalyst 4500 series switches.

The valid values for *mod* depend on the chassis that are used. For example, if you have a Catalyst 4506 chassis, valid values for the module are from 2 to 6. If you have a 4507R chassis, valid values are from 3 to 7.

When you execute the **attach module** *mod* command, the prompt changes to Gateway#.

This command is identical in the resulting action to the **session module** *mod* and the **remote login module** *mod* commands.

## Examples

This example shows how to remotely log in to an Access Gateway Module:

```
Switch# attach module 5
Attaching console to module 5
Type 'exit' at the remote prompt to end the session

Gateway>
```

## Related Commands

| Command | Description |
|---|---|
| remote login module | Remotely connects to a specific module. |
| session module | Logs in to the standby supervisor engine using a virtual console. |

# auto qos voip

To automatically configure quality of service (auto-QoS) for Voice over IP (VoIP) within a QoS domain, use the **auto qos voip** interface configuration command. To change the auto-QoS configuration settings to the standard QoS defaults, use the **no** form of this command.

**auto qos voip** {**cisco-phone** | **trust**}

**no auto qos voip** {**cisco-phone** | **trust**}

## Syntax Description

| | |
|---|---|
| **cisco-phone** | Connects the interface to a Cisco IP phone and automatically configures QoS for VoIP. The CoS labels of incoming packets are trusted only when the telephone is detected. |
| **trust** | Connects the interface to a trusted switch or router and automatically configures QoS for VoIP. The CoS and DSCP labels of incoming packets are trusted. |

## Defaults

Auto-QoS is disabled on all interfaces.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Use this command to configure the QoS that is appropriate for VoIP traffic within the QoS domain. The QoS domain includes the switch, the interior of the network, and the edge devices that can classify incoming traffic for QoS.

Use the **cisco-phone** keyword on the ports at the edge of the network that are connected to Cisco IP phones. The switch detects the telephone through the Cisco Discovery Protocol (CDP) and trusts the CoS labels in packets that are received from the telephone.

Use the **trust** keyword on the ports that are connected to the interior of the network. Because it is assumed that the traffic has already been classified by the other edge devices, the CoS/DSCP labels in these packets are trusted.

When you enable the auto-QoS feature on the specified interface, these actions automatically occur:

- QoS is globally enabled (**qos** global configuration command).
- DBL is enabled globally (**qos dbl** global configuration command).
- When you enter the **auto qos voip cisco-phone** interface configuration command, the trusted boundary feature is enabled. It uses the Cisco Discovery Protocol (CDP) to detect the presence or absence of a Cisco IP phone. When a Cisco IP phone is detected, the ingress classification on the specific interface is set to trust the CoS label that is received in the packet because some old phones do not mark DSCP. When a Cisco IP phone is absent, the ingress classification is set to not trust the CoS label in the packet.

- When you enter the **auto qos voip trust** interface configuration command, the ingress classification on the specified interface is set to trust the CoS label that is received in the packet if the specified interface is configured as Layer 2 (and is set to trust DSCP if the interface is configured as Layer 3).

You can enable auto-QoS on static, dynamic-access, voice VLAN access, and trunk ports.

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.

To disable auto-QoS on an interface, use the **no auto qos voip** interface configuration command. When you enter this command, the switch enables standard QoS and changes the auto-QoS settings to the standard QoS default settings for that interface. This action will not change any global configuration performed by auto-QoS; the global configuration remains the same.

## Examples

This example shows how to enable auto-QoS and to trust the CoS and DSCP labels that are received in the incoming packets when the switch or router that is connected to Gigabit Ethernet interface 1/1 is a trusted device:

```
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# auto qos voip trust
```

This example shows how to enable auto-QoS and to trust the CoS labels that are received in incoming packets when the device connected to Fast Ethernet interface 2/1 is detected as a Cisco IP phone:

```
Switch(config)# interface fastethernet2/1
Switch(config-if)# auto qos voip cisco-phone
```

This example shows how to display the QoS configuration that is automatically generated when auto-QoS is enabled on an interface on Supervisor Engines other than a Supervisor Engine 6-E:

```
Switch# debug auto qos
AutoQoS debugging is on
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# auto qos voip trust
Switch(config-if)#
00:00:56:qos
00:00:57:qos map cos 3 to dscp 26
00:00:57:qos map cos 5 to dscp 46
00:00:58:qos map dscp 32 to tx-queue 1
00:00:58:qos dbl
00:01:00:policy-map autoqos-voip-policy
00:01:00:  class class-default
00:01:00:   dbl
00:01:00:interface GigabitEthernet1/1
00:01:00: qos trust cos
00:01:00: tx-queue 3
00:01:00:  priority high
00:01:00:  shape percent 33
00:01:00:  service-policy output autoqos-voip-policy
Switchconfig-if)# interface gigabitethernet1/1
Switch(config-if)# auto qos voip cisco-phone
Switch(config-if)#
00:00:55:qos
00:00:56:qos map cos 3 to dscp 26
00:00:57:qos map cos 5 to dscp 46
00:00:58:qos map dscp 32 to tx-queue 1
00:00:58:qos dbl
00:00:59:policy-map autoqos-voip-policy
```

```
00:00:59:  class class-default
00:00:59:   dbl
00:00:59:interface GigabitEthernet1/1
00:00:59: qos trust device cisco-phone
00:00:59: qos trust cos
00:00:59: tx-queue 3
00:00:59:  priority high
00:00:59:  shape percent 33
00:00:59:  bandwidth percent 33
00:00:59:  service-policy output autoqos-voip-policy
```

This example shows how to display the QoS configuration that is automatically generated when auto-QoS is enabled on an interface on a Supervisor Engine 6-E:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#interface gigabitethernet3/10
Switch(config-if)#auto qos voip trust
Switch(config-if)#
1d03h:  service-policy input AutoQos-VoIP-Input-Cos-Policy
1d03h:  service-policy output AutoQos-VoIP-Output-Policy
Switch(config-if)#intface gigabitethernet3/11
Switch(config-if)#auto qos voip
cisco-phone
Switch(config-if)#
1d03h:  qos trust device cisco-phone
1d03h:  service-policy input AutoQos-VoIP-Input-Cos-Policy
1d03h:  service-policy output AutoQos-VoIP-Output-Policy
Switch(config-if)#end
Switch#
```

You can verify your settings by entering the **show auto qos interface** command.

## Related Commands

| Command | Description |
|---|---|
| **debug auto qos** (refer to Cisco IOS documentation) | Debugs Auto QoS. |
| **qos map cos** | Defines the ingress CoS-to-DSCP mapping for the trusted interfaces. |
| **qos trust** | Sets the trusted state of an interface. |
| **show auto qos** | Displays the automatic quality of service (auto-QoS) configuration that is applied. |
| **show qos** | Displays QoS information. |
| **show qos interface** | Displays queueing information. |
| **show qos maps** | Displays QoS map information. |

# auto-sync

To enable automatic synchronization of the configuration files in NVRAM, use the **auto-sync** command. To disable automatic synchronization, use the **no** form of this command.

**auto-sync** {**startup-config** | **config-register** | **bootvar** | **standard**}

**no auto-sync** {**startup-config** | **config-register** | **bootvar** | **standard**}

## Syntax Description

| | |
|---|---|
| **startup-config** | Specifies automatic synchronization of the startup configuration. |
| **config-register** | Specifies automatic synchronization of the configuration register configuration. |
| **bootvar** | Specifies automatic synchronization of the BOOTVAR configuration. |
| **standard** | Specifies automatic synchronization of the startup configuration, BOOTVAR, and configuration registers. |

## Defaults

Standard automatic synchronization of all configuration files

## Command Modes

Redundancy main-cpu

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch (Catalyst 4507R only). |

## Usage Guidelines

If you enter the **no auto-sync standard** command, no automatic synchronizations occur.

## Examples

This example shows how (from the default configuration) to enable automatic synchronization of the configuration register in the main CPU:

```
Switch# config terminal
Switch (config)# redundancy
Switch (config-r)# main-cpu
Switch (config-r-mc)# no auto-sync standard
Switch (config-r-mc)# auto-sync configure-register
Switch (config-r-mc)#
```

## Related Commands

| Command | Description |
|---|---|
| redundancy | Enters the redundancy configuration mode. |

# bandwidth

To specify or modify the minimum bandwidth provided to a class belonging to a policy map attached to a physical port, use the **bandwidth** policy-map class command. To return to the default setting, use the **no** form of this command.

**bandwidth** {*bandwidth-kbps* | **percent** *percent* | **remaining percent** *percent*}

**no bandwidth**

## Syntax Description

| | |
|---|---|
| *bandwidth-kbps* | Amount of bandwidth in kbps assigned to the class. The range is 32 to 16000000. |
| **percent** *percent* | Percentage of available bandwidth assigned to the parent class. The range is 1 to 100. |
| **remaining percent** *percent* | Percentage of remaining bandwidth assigned to parent class. The range is 1 to 100. This command is supported only when priority queuing class is configured, and the prioity queuing class is not rate-limited. |

## Defaults

No bandwidth is specified.

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6E. |

## Usage Guidelines

Use the **bandwidth** command only in a policy map attached to a physical port.

The **bandwidth** command specifies the minimum bandwidth for traffic in that class when there is traffic congestion in the switch. If the switch is not congested, the class receives more bandwidth than you specify with this command.

When queuing class is configured without any explicit bandwidth configuration, since the queue is not guaranteed any minimum bandwidth, this queue will get a share of any unallocated bandwidth on the port.

If there is no unallocated bandwidth for the new queue or if the unallocated bandwidth is not sufficient to meet the minimum configurable rate for all queues which do not have any explicit bandwidth configuration, then the policy association is rejected.

These restrictions apply to the **bandwidth** command:

- If the **percent** keyword is used, the sum of the class bandwidth percentages within a single policy map cannot exceed 100 percent. Percentage calculations are based on the bandwidth available on the port.
- The amount of bandwidth configured should be large enough to accommodate Layer 2 overhead.
- A policy map can have all the class bandwidths specified in either kbps or in percentages, but not a mix of both.

## Examples

This example shows how to set the minimum bandwidth to 2000 kbps for a class called *silver-class*. The class already exists in the switch configuration.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# policy-map polmap6
Switch(config-pmap)# class silver-class
Switch(config-pmap-c)# bandwidth 2000
Switch(config-pmap-c)# end
```

This example shows how to guarantee 30 percent of the bandwidth for *class1* and 25 percent of the bandwidth for *class2* when CBWFQ is configured. A policy map with two classes is created and is then attached to a physical port.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# policy-map policy1
Switch(config-pmap)# class class1
Switch(config-pmap-c)# bandwidth percent 50
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class2
Switch(config-pmap-c)# bandwidth percent 25
Switch(config-pmap-c)# exit
Switch(config-pmap)# end
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# service-policy input policy1
Switch(config-if)# end
```

This example shows how bandwidth is guaranteed if low-latency queueing (LLQ) and bandwidth are configured. In this example, LLQ is enabled in a class called *voice1*.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# policy-map policy1
Switch(config-pmap)# class class1
Switch(config-pmap-c)# bandwidth remaining percent 50
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class2
Switch(config-pmap-c)# bandwidth remaining percent 25
Switch(config-pmap-c)# exit
Switch(config-pmap)# class voice1
Switch(config-pmap-c)# priority
Switch(config-pmap-c)# exit
Switch(config-pmap)# end
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# service-policy output policy1
Switch(config-if)# end
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| class | Specifies the name of the class whose traffic policy you want to create or change. |
| dbl | Enables active queue management on a transmit queue used by a class of traffic. |
| policy-map | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| priority | Enables the strict priority queue (low-latency queueing [LLQ]) and to give priority to a class of traffic belonging to a policy map attached to a physical port. |
| service-policy (policy-map class) | Creates a service policy that is a quality of service (QoS) policy within a policy map. |
| shape (class-based queueing) | Enables traffic shaping a class of traffic in a policy map attached to a physical port. |
| show policy-map | Displays information about the policy map. |

# channel-group

To assign and configure an EtherChannel interface to an EtherChannel group, use the **channel-group** command. To remove a channel group configuration from an interface, use the **no** form of this command.

**channel-group** *number* **mode** {**active** | **on** | **auto** [**non-silent**]} | {**passive** | **desirable** [**non-silent**]}

**no channel-group**

## Syntax Description

| | |
|---|---|
| *number* | Specifies the channel-group number; valid values are from 1 to 64. |
| **mode** | Specifies the EtherChannel mode of the interface. |
| **active** | Enables LACP unconditionally. |
| **on** | Forces the port to channel without PAgP. |
| **auto** | Places a port into a passive negotiating state, in which the port responds to PAgP packets it receives but does not initiate PAgP packet negotiation. |
| **non-silent** | (Optional) Used with the auto or desirable mode when traffic is expected from the other device. |
| **passive** | Enables LACP only if an LACP device is detected. |
| **desirable** | Places a port into an active negotiating state, in which the port initiates negotiations with other ports by sending PAgP packets. |

## Defaults

No channel groups are assigned.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(13)EW | Support for LACP was added. |

## Usage Guidelines

You do not have to create a port-channel interface before assigning a physical interface to a channel group. If a port-channel interface has not been created, it is automatically created when the first physical interface for the channel group is created.

If a specific channel number is used for the PAgP-enabled interfaces of a channel group, that same channel number cannot be used for configuring a channel that has LACP-enabled interfaces or vice versa.

You can also create port channels by entering the **interface port-channel** command. This will create a Layer 3 port channel. To change the Layer 3 port channel into a Layer 2 port channel, use the **switchport** command before you assign physical interfaces to the channel group. A port channel cannot be changed from Layer 3 to Layer 2 or vice versa when it contains member ports.

You do not have to disable the IP address that is assigned to a physical interface that is part of a channel group, but we recommend that you do so.

Any configuration or attribute changes that you make to the port-channel interface are propagated to all interfaces within the same channel group as the port channel (for example, configuration changes are also propagated to the physical interfaces that are not part of the port channel, but are part of the channel group).

You can create in **on** mode a usable EtherChannel by connecting two port groups together.

**Caution** Do not enable Layer 3 addresses on the physical EtherChannel interfaces. Do not assign bridge groups on the physical EtherChannel interfaces because it creates loops.

## Examples

This example shows how to add Gigabit Ethernet interface 1/1 to the EtherChannel group that is specified by port-channel 45:

```
Switch(config-if)# channel-group 45 mode on
Creating a port-channel interface Port-channel45
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **interface port-channel** | Accesses or creates a port-channel interface. |
| **show interfaces port-channel** (refer to Cisco IOS documentation) | Displays the information about the Fast EtherChannel. |

# channel-protocol

To enable LACP or PAgP on an interface, use the **channel-protocol** command. To disable the protocols, use the **no** form of this command.

**channel-protocol** {**lacp** | **pagp**}

**no channel-protocol** {**lacp** | **pagp**}

## Syntax Description

| | |
|---|---|
| **lacp** | Enables LACP to manage channeling. |
| **pagp** | Enables PAgP to manage channeling. |

## Defaults

PAgP

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

This command is not supported on systems that are configured with a Supervisor Engine I.

You can also select the protocol using the **channel-group** command.

If the interface belongs to a channel, the **no** form of this command is rejected.

All ports in an EtherChannel must use the same protocol; you cannot run two protocols on one module.

PAgP and LACP are not compatible; both ends of a channel must use the same protocol.

You can manually configure a switch with PAgP on one side and LACP on the other side in the **on** mode.

You can change the protocol at any time, but this change causes all existing EtherChannels to reset to the default channel mode for the new protocol. You can use the **channel-protocol** command to restrict anyone from selecting a mode that is not applicable to the selected protocol.

Configure all ports in an EtherChannel to operate at the same speed and duplex mode (full duplex only for LACP mode).

For a complete list of guidelines, refer to the "Configuring EtherChannel" section of the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide*.

## Examples

This example shows how to select LACP to manage channeling on the interface:

```
Switch(config-if)# channel-protocol lacp
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| channel-group | Assigns and configures an EtherChannel interface to an EtherChannel group. |
| show etherchannel | Displays EtherChannel information for a channel. |

# class

To specify the name of the class whose traffic policy you want to create or change, use the **class** policy-map configuration command. To delete an existing class from a policy map, use the **no** form of this command.

**class** *class-name*

**no class** *class-name*

## Syntax Description

| | |
|---|---|
| *class-name* | Name of the predefined traffic class for which you want to configure or modify a traffic policy. The class was previously created through the **class-map** *class-map-name* global configuration command. |

## Defaults

No classes are defined; except for the class-default.

## Command Modes

Policy-map configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

Before using the **class** command, you must create a class map for matching packets to the class by using the **class-map** global configuration command. You also must use the **policy-map** global configuration command to identify the policy map and to enter policy-map configuration mode. After specifying a policy map, you can configure a traffic policy for new classes or modify a traffic policy for any existing classes in that policy map. The class name that you specify with the **class** command in the policy map ties the characteristics for that class—that is, its policy—to the class map and its match criteria, as configured through the **class-map** global configuration command. You attach the policy map to a port by using the **service-policy (interface configuration)** configuration command.

After you enter the **class** command, the switch enters policy-map class configuration mode, and these configuration commands are available:

- **bandwidth**: specifies or modifies the minimum bandwidth provided to a class belonging to a policy map. For more information, see the **bandwidth** command. This command is only available on the Supervisor Engine 6-E and Catalyst 4900M chassis.
- **dbl**: enables dynamic buffer limiting for traffic hitting this class. For details on dbl parameters refer to the **show qos dbl** command.
- **exit**: exits policy-map class configuration mode and returns to policy-map configuration mode.
- **no**: returns a command to its default setting.
- **police**: configures a single-rate policer, an aggregate policer, or a two-rate traffic policer that uses the committed information rate (CIR) and the peak information rate (PIR) for a class of traffic. The policer specifies the bandwidth limitations and the action to take when the limits are exceeded. For

more information, see the police command. For more information about the two-rate policer, see the **police (two rates)** and the **police (percent)** command. The two rate traffic policer is supported on a Supervisor Engine 6-E and Catalyst 4900M chassis.

- **priority**: enables the strict priority queue for a class of traffic. For more information, see the **priority** command. This command is effective on a Supervisor Engine 6-E and Catalyst 4900M chassis.
- **service-policy (policy-map class)**: creates a service policy as a quality of service (QoS) policy within a policy map (called a hierarchical service policy). For more information, see the **service-policy (policy-map class)** command. This command is effective only in a hierarchical policy map attached to an interface.
- **set**: classifies IP traffic by setting a class of service (CoS), a Differentiated Services Code Point (DSCP) or IP-precedence in the packet. For more information, see the **set** command.
- **shape (class-based queueing)**: sets the token bucket committed information rate (CIR) in a policy map. For more information, see the **shape (class-based queueing)** command. This command is effective on a Supervisor Engine 6-E and Catalyst 4900M chassis.
- **trust**: defines a trust state for a traffic class. For more information, see the **trust** command. This command is not supported on a Supervisor Engine 6-E and Catalyst 4900M chassis.

The switch supports up to 256 classes, including the default class, in a policy map. Packets that fail to meet any of the matching criteria are classified as members of the default traffic class. You configure the default traffic class by specifying **class-default** as the class name in the **class** policy-map class configuration command. You can manipulate the default traffic class (for example, set policies to police or to shape it) just like any other traffic class, but you cannot delete it.

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 create a policy map called *policy1*. When attached to an ingress port, the policy matches all the inbound traffic defined in *class1*, sets the IP DSCP to 10, and polices the traffic at an average rate of 1 Mbps and bursts of 20 KB. Traffic exceeding the profile is marked down to a Traffic exceeding the profile is marked down to a DSCP value obtained from the policed-DSCP map and then sent.

```
Switch# configure terminal
Switch(config)# class-map class1
Switch(config-cmap)# exit
Switch(config)# policy-map policy1
Switch(config-pmap)# class class1
Switch(config-pmap-c)# set ip dscp 10
Switch(config-pmap-c)# police 1000000 20000 exceed-action policed-dscp-transmit
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface fastethernet1/0/4
Switch(config-if)# service-policy input policy1
Switch#
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **bandwidth** | Specifies or modifies the minimum bandwidth provided to a class belonging to a policy map attached to a physical port. |
| **class-map** | Creates a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode. |
| **dbl** | Enables active queue management on a transmit queue used by a class of traffic. |
| **police** | Configures the Traffic Policing feature. |
| **police (percent)** | Configures traffic policing on the basis of a percentage of bandwidth available on an interface. |
| **police rate** | Configures single- or dual-rate policer. |
| **policy-map** | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **priority** | Enables the strict priority queue (low-latency queueing [LLQ]) and to give priority to a class of traffic belonging to a policy map attached to a physical port. |
| **service-policy (interface configuration)** | Attaches a policy map to an interface. |
| **service-policy (policy-map class)** | Creates a service policy that is a quality of service (QoS) policy within a policy map. |
| **set** | Marks IP traffic by setting a class of service (CoS), a Differentiated Services Code Point (DSCP), or IP-precedence in the packet. |
| **shape (class-based queueing)** | Enables traffic shaping a class of traffic in a policy map attached to a physical port. |
| **show policy-map** | Displays information about the policy map. |
| **trust** | Defines a trust state for traffic classified through the **class** policy-map configuration command. |

# 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** global configuration command. To delete an existing class map and to return to global configuration mode, use the **no** form of this command.

**class-map** [**match-all** | **match-any**] *class-map-name*

**no class-map** [**match-all** | **match-any**] *class-map-name*

## Syntax Description

| | |
|---|---|
| **match-all** | (Optional) Perform a logical-AND of all matching under this class map. All criteria in the class map must be matched. |
| **match-any** | (Optional) Perform a logical-OR of the matching statements under this class map. One or more criteria in the class map must be matched. |
| *class-map-name* | Name of the class map. |

## Defaults

No class maps are defined.

If neither the **match-all** nor the **match-any** keyword is specified, the default is **match-all**.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## 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. Packets are checked against the match criteria configured for a class map to decide if the packet belongs to that class. If a packet matches the specified criteria, the packet is considered a member of the class and is forwarded according to the quality of service (QoS) specifications set in the traffic policy.

After you enter the **class-map** command, the switch enters class-map configuration mode, and 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. For more information, see the **match (class-map configuration)** command.
- **no**: removes a match statement from a class map.

## Examples

This example shows how to configure the class map called *class1* with one match criterion, which is an access list called *103*:

```
Switch# configure terminal
Switch(config)# access-list 103 permit any any dscp 10
Switch(config)# class-map class1
Switch(config-cmap)# match access-group 103
Switch(config-cmap)# exit
Switch#
```

This example shows how to delete the `class1` class map:

```
Switch# configure terminal
Switch(config)# no class-map class1
Switch#
```

You can verify your settings by entering the **show class-map** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **class** | Specifies the name of the class whose traffic policy you want to create or change. |
| **match (class-map configuration)** | Defines the match criteria for a class map. |
| **policy-map** | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **show class-map** | Displays class map information. |

# clear counters

To clear the interface counters, use the **clear counters** command.

**clear counters** [{**FastEthernet** *interface_number*} | {**GigabitEthernet** *interface_number*} | {**null** *interface_number*} | {**port-channel** *number*} | {**vlan** *vlan_id*}]

## Syntax Description

| | |
|---|---|
| **FastEthernet** *interface_number* | (Optional) Specifies the Fast Ethernet interface; valid values are from 1 to 9. |
| **GigabitEthernet** *interface_number* | (Optional) Specifies the Gigabit Ethernet interface; valid values are from 1 to 9. |
| **null** *interface_number* | (Optional) Specifies the null interface; the valid value is 0. |
| **port-channel** *number* | (Optional) Specifies the channel interface; valid values are from 1 to 64. |
| **vlan** *vlan_id* | (Optional) Specifies the VLAN; valid values are from 1 to 4096. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended VLAN addresses was added. |

## Usage Guidelines

This command clears all the current interface counters from all the interfaces unless you specify an interface.

**Note** This command does not clear the counters that are retrieved using SNMP, but only those seen when you enter the **show interface counters** command.

## Examples

This example shows how to clear all the interface counters:

```
Switch# clear counters
Clear "show interface" counters on all interfaces [confirm] y
Switch#
```

This example shows how to clear the counters on a specific interface:

```
Switch# clear counters vlan 200
Clear "show interface" counters on this interface [confirm]y
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| **show interface counters** (refer to Cisco IOS documentation) | Displays interface counter information. |

# clear hw-module slot password

To clear the password on an intelligent line module, use the **clear hw-module slot password** command.

**clear hw-module slot** *slot_num* **password**

## Syntax Description

| | |
|---|---|
| *slot_num* | Slot on a line module. |

## Defaults

The password is not cleared.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You only need to change the password once unless the password is reset.

## Examples

This example shows how to clear the password from slot 5 on a line module:

```
Switch# clear hw-module slot 5 password
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **hw-module power** | Turns the power off on a slot or line module. |

# clear interface gigabitethernet

To clear the hardware logic from a Gigabit Ethernet IEEE 802.3z interface, use the **clear interface gigabitethernet** command.

**clear interface gigabitethernet** *mod/port*

## Syntax Description

| | |
|---|---|
| *mod/port* | Number of the module and port. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to clear the hardware logic from a Gigabit Ethernet IEEE 802.3z interface:

```
Switch# clear interface gigabitethernet 1/1
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces status | Displays the interface status. |

# clear interface vlan

To clear the hardware logic from a VLAN, use the **clear interface vlan** command.

**clear interface vlan** *number*

## Syntax Description

| | |
|---|---|
| *number* | Number of the VLAN interface; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended VLAN addresses added. |

## Examples

This example shows how to clear the hardware logic from a specific VLAN:

```
Switch# clear interface vlan 5
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces status | Displays the interface status. |

# clear ip access-template

To clear the statistical information in access lists, use the **clear ip access-template** command.

**clear ip access-template** *access-list*

## Syntax Description

| | |
|---|---|
| *access-list* | Number of the access list; valid values are from 100 to 199 for an IP extended access list, and from 2000 to 2699 for an expanded range IP extended access list. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to clear the statistical information for an access list:

```
Switch# clear ip access-template 201
Switch#
```

# clear ip arp inspection log

To clear the status of the log buffer, use the **clear ip arp inspection log** command.

**clear ip arp inspection log**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to clear the contents of the log buffer:

```
Switch# clear ip arp inspection log
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| show ip arp inspection log | Displays the status of the log buffer. |

# clear ip arp inspection statistics

To clear the dynamic ARP inspection statistics, use the **clear ip arp inspection statistics** command.

**clear ip arp inspection statistics** [**vlan** *vlan-range*]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-range* | (Optional) Specifies the VLAN range. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to clear the DAI statistics from VLAN 1 and how to verify the removal:

```
Switch# clear ip arp inspection statistics vlan 1
Switch# show ip arp inspection statistics vlan 1

 Vlan      Forwarded        Dropped     DHCP Drops     ACL Drops
 ----      ---------        -------     ----------     ----------
    1              0              0              0              0

 Vlan   DHCP Permits    ACL Permits   Source MAC Failures
 ----   ------------    -----------   -------------------
    1              0              0                     0

 Vlan   Dest MAC Failures   IP Validation Failures
 ----   -----------------   ----------------------
    1                  0                        0
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **arp access-list** | Defines an ARP access list or adds clauses at the end of a predefined list. |
| **clear ip arp inspection log** | Clears the status of the log buffer. |
| **show ip arp inspection log** | Displays the status of the log buffer. |

# clear ip dhcp snooping binding

To clear the DHCP snooping binding, use the **clear ip dhcp snooping binding** command.

**clear ip dhcp snooping binding** [*] [*ip-address*] [**vlan** *vlan_num*] [**interface** *interface_num*]

## Syntax Description

| | |
|---|---|
| * | (Optional) clearing all DHCP snooping binding entries. |
| *ip-address* | (Optional) IP address for the DHCP snooping binding entries |
| **vlan** *vlan_num* | (Optional) Specifies a VLAN. |
| **interface** *interface_num* | (Optional) Specifies an interface. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(44)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

These commands are mainly used to clear DHCP snooping binding entries.

DHCP snooping is enabled on a VLAN only if both the global snooping and the VLAN snooping are enabled.

## Examples

This example shows how to clear all the DHCP snoop binding entries:

```
Switch#clear ip dhcp snooping binding *
Switch#
```

This example shows how to clear a specific DHCP snoop binding entry:

```
Switch#clear ip dhcp snooping binding 1.2.3.4
Switch#
```

This example shows how to clear all the DHCP snoop binding entries on the GigabitEthernet interface 1/1:

```
Switch#clear ip dhcp snooping binding interface gigabitEthernet 1/1
Switch#
```

This example shows how to clear all the DHCP snoop binding entries on VLAN 40:

```
Switch#clear ip dhcp snooping binding vlan 40
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping binding | Sets up and generates a DHCP binding configuration to restore bindings across reboots. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# clear ip dhcp snooping database

To clear the DHCP binding database, use the **clear ip dhcp snooping database** command.

**clear ip dhcp snooping database**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to clear the DHCP binding database:

```
Switch# clear ip dhcp snooping database
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping binding | Sets up and generates a DHCP binding configuration to restore bindings across reboots. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# clear ip dhcp snooping database statistics

To clear the DHCP binding database statistics, use the **clear ip dhcp snooping database statistics** command.

**clear ip dhcp snooping database statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to clear the DHCP binding database:

```
Switch# clear ip dhcp snooping database statistics
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping binding | Sets up and generates a DHCP binding configuration to restore bindings across reboots. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# clear ip igmp group

To delete the IGMP group cache entries, use the **clear ip igmp group** command.

**clear ip igmp group** [{**fastethernet** *mod/port*} | {**GigabitEthernet** *mod/port*} | {*host_name* | *group_address*} {**Loopback** *interface_number*} | {**null** *interface_number*} | {**port-channel** *number*} | {**vlan** *vlan_id*}]

## Syntax Description

| | |
|---|---|
| **fastethernet** | (Optional) Specifies the Fast Ethernet interface. |
| *mod/port* | (Optional) Number of the module and port. |
| **GigabitEthernet** | (Optional) Specifies the Gigabit Ethernet interface. |
| *host_name* | (Optional) Hostname, as defined in the DNS hosts table or with the **ip host** command. |
| *group_address* | (Optional) Address of the multicast group in four-part, dotted notation. |
| **Loopback** *interface_number* | (Optional) Specifies the loopback interface; valid values are from 0 to 2,147,483,647. |
| **null** *interface_number* | (Optional) Specifies the null interface; the valid value is 0. |
| **port-channel** *number* | (Optional) Specifies the channel interface; valid values are from 1 to 64. |
| **vlan** *vlan_id* | (Optional) Specifies the VLAN; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The IGMP cache contains a list of the multicast groups of which hosts on the directly connected LAN are members.

To delete all the entries from the IGMP cache, enter the **clear ip igmp group** command with no arguments.

## Examples

This example shows how to clear the entries for a specific group from the IGMP cache:

```
Switch# clear ip igmp group 224.0.255.1
Switch#
```

This example shows how to clear the IGMP group cache entries from a specific interface:

```
Switch# clear ip igmp group gigabitethernet 2/2
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **ip host** (refer to Cisco IOS documentation) | Defines a static host name-to-address mapping in the host cache. |
| **show ip igmp groups** (refer to Cisco IOS documentation) | Displays the multicast groups with receivers that are directly connected to the router and that were learned through Internet Group Management Protocol (IGMP), use the **show ip igmp groups** command in EXEC mode. |
| **show ip igmp interface** | Displays the information about the IGMP-interface status and configuration. |

# clear ip igmp snooping membership

To clear the explicit host tracking database, use the **clear ip igmp snooping membership** command.

**clear ip igmp snooping** membership [vlan *vlan_id*]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan_id* | (Optional) Specifies a VLAN; valid values are from 1 to 1001 and from 1006 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(20)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

By default, the explicit host tracking database maintains a maximum of 1-KB entries. After you reach this limit, no additional entries can be created in the database. To create more entries, you will need to delete the database with the **clear ip igmp snooping statistics vlan** command.

## Examples

This example shows how to display the IGMP snooping statistics for VLAN 25:

```
Switch# clear ip igmp snooping membership vlan 25
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip igmp snooping vlan explicit-tracking | Enables per-VLAN explicit host tracking. |
| show ip igmp snooping membership | Displays host membership information. |

# clear ip mfib counters

To clear the global MFIB counters and the counters for all active MFIB routes, use the **clear ip mfib counters** command.

**clear ip mfib counters**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to clear all the active MFIB routes and global counters:

```
Switch# clear ip mfib counters
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show ip mfib | Displays all active Multicast Forwarding Information Base (MFIB) routes. |

# clear ip mfib fastdrop

To clear all the MFIB fast-drop entries, use the **clear ip mfib fastdrop** command.

**clear ip mfib fastdrop**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If new fast-dropped packets arrive, the new fast-drop entries are created.

## Examples

This example shows how to clear all the fast-drop entries:

```
Switch# clear ip mfib fastdrop
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip mfib fastdrop | Enables MFIB fast drop. |
| show ip mfib fastdrop | Displays all currently active fast-drop entries and shows whether fast drop is enabled. |

# clear lacp counters

To clear the statistics for all the interfaces belonging to a specific channel group, use the **clear lacp counters** command.

**clear lacp** [*channel-group*] **counters**

## Syntax Description

| | |
|---|---|
| *channel-group* | (Optional) Channel-group number; valid values are from 1 to 64. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

This command is not supported on systems that are configured with a Supervisor Engine I.

If you do not specify a channel group, all channel groups are cleared.

If you enter this command for a channel group that contains members in PAgP mode, the command is ignored.

## Examples

This example shows how to clear the statistics for a specific group:

```
Switch# clear lacp 1 counters
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show lacp** | Displays LACP information. |

# clear mac-address-table

To clear the global counter entries from the Layer 2 MAC address table, use the **clear mac-address-table** command.

**clear mac-address-table {dynamic** [{**address** *mac_addr*} | {**interface** *interface*}] [**vlan** *vlan_id*] | **notification**}

## Syntax Description

| | |
|---|---|
| **dynamic** | Specifies dynamic entry types. |
| **address** *mac_addr* | (Optional) Specifies the MAC address. |
| **interface** *interface* | (Optional) Specifies the interface and clears the entries associated with it; valid values are **FastEthernet** and **GigabitEthernet**. |
| **vlan** *vlan_id* | (Optional) Specifies the VLANs; valid values are from 1 to 4094. |
| **notification** | Specifies MAC change notification global counters. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended VLAN addresses added. |
| 12.2(31)SG | Support for MAC address notification global counters added. |

## Usage Guidelines

Enter the **clear mac-address-table dynamic** command with no arguments to remove all dynamic entries from the table.

The **clear mac-address-table notification** command only clears the global counters which are displayed with **show mac-address-table notification** command. It does not clear the global counters and the history table of the CISCO-MAC-NATIFICATION-MIB.

## Examples

This example shows how to clear all the dynamic Layer 2 entries for a specific interface (gi1/1):

```
Switch# clear mac-address-table dynamic interface gi1/1
Switch#
```

This example shows how to clear the MAC address notification counters:

```
Switch# clear mac-address-table notification
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| clear mac-address-table dynamic | Clears the dynamic address entries from the Layer 2 MAC address table. |
| mac-address-table aging-time | Configures the aging time for entries in the Layer 2 table. |
| mac-address-table notification | Enables MAC address notification on a switch. |
| main-cpu | Enters the main CPU submode and manually synchronize the configurations on the two supervisor engines. |
| show mac-address-table address | Displays the information about the MAC-address table. |
| snmp-server enable traps | Enables SNMP notifications. |

# clear mac-address-table dynamic

To clear the dynamic address entries from the Layer 2 MAC address table, use the **clear mac-address-table dynamic** command.

**clear mac-address-table dynamic** [{**address** *mac_addr*} | {**interface** *interface*}] [**vlan** *vlan_id*]

## Syntax Description

| | |
|---|---|
| **address** *mac_addr* | (Optional) Specifies the MAC address. |
| **interface** *interface* | (Optional) Specifies the interface and clears the entries associated with it; valid values are **FastEthernet** and **GigabitEthernet**. |
| **vlan** *vlan_id* | (Optional) Specifies the VLANs; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended VLAN addresses added. |

## Usage Guidelines

Enter the **clear mac-address-table dynamic** command with no arguments to remove all dynamic entries from the table.

## Examples

This example shows how to clear all the dynamic Layer 2 entries for a specific interface (gi1/1):

```
Switch# clear mac-address-table dynamic interface gi1/1
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| mac-address-table aging-time | Configures the aging time for entries in the Layer 2 table. |
| main-cpu | Enters the main CPU submode and manually synchronize the configurations on the two supervisor engines. |
| show mac-address-table address | Displays the information about the MAC-address table. |

# clear pagp

To clear the port-channel information, use the **clear pagp** command.

**clear pagp** {*group-number* | **counters**}

## Syntax Description

| | |
|---|---|
| *group-number* | Channel-group number; valid values are from 1 to 64. |
| **counters** | Clears traffic filters. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to clear the port-channel information for a specific group:

```
Switch# clear pagp 32
Switch#
```

This example shows how to clear all the port-channel traffic filters:

```
Switch# clear pagp counters
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show pagp** | Displays information about the port channel. |

# clear port-security

To delete all configured secure addresses or a specific dynamic or sticky secure address on an interface from the MAC address table, use the **clear port-security** command.

**clear port-security dynamic** [**address** *mac-addr* [**vlan** *vlan-id*]] | [**interface** *interface-id*] [**vlan access** | **voice**]

## Syntax Description

| | |
|---|---|
| **dynamic** | Deletes all the dynamic secure MAC addresses. |
| **address** *mac-addr* | (Optional) Deletes the specified secure MAC address. |
| **vlan** *vlan-id* | (Optional) Deletes the specified secure MAC address from the specified VLAN. |
| **interface** *interface-id* | (Optional) Deletes the secure MAC addresses on the specified physical port or port channel. |
| **vlan access** | (Optional) Deletes the secure MAC addresses from access VLANs. |
| **vlan voice** | (Optional) Deletes the secure MAC addresses from voice VLANs. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Usage Guidelines

If you enter the **clear port-security all** command, the switch removes all the dynamic secure MAC addresses from the MAC address table.

**Note** You can clear sticky and static secure MAC addresses one at a time with the **no switchport port-security mac-address** command.

If you enter the **clear port-security dynamic interface** *interface-id* command, the switch removes all the dynamic secure MAC addresses on an interface from the MAC address table.

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | This command was first introduced on the Catalyst 4500 series switch. |
| 12.2(31)SG | Add support for sticky port security. |

## Examples

This example shows how to remove all the dynamic secure addresses from the MAC address table:

```
Switch# clear port-security dynamic
```

This example shows how to remove a dynamic secure address from the MAC address table:

```
Switch# clear port-security dynamic address 0008.0070.0007
```

This example shows how to remove all the dynamic secure addresses learned on a specific interface:

```
Switch# clear port-security dynamic interface gigabitethernet0/1
```

You can verify that the information was deleted by entering the **show port-security** command.

## Related Commands

| Command | Description |
|---|---|
| **show port-security** | Displays information about the port-security setting. |
| **switchport port-security** | Enables port security on an interface. |

# clear qos

To clear the global and per-interface aggregate QoS counters, use the **clear qos** command.

**clear qos** [**aggregate-policer** [*name*] | **interface** {{**fastethernet** | **GigabitEthernet**} {*mod/interface*}} | **vlan** {*vlan_num*} | **port-channel** {*number*}]

## Syntax Description

| | |
|---|---|
| **aggregate-policer** *name* | (Optional) Specifies an aggregate policer. |
| **interface** | (Optional) Specifies an interface. |
| **fastethernet** | (Optional) Specifies the Fast Ethernet 802.3 interface. |
| **GigabitEthernet** | (Optional) Specifies the Gigabit Ethernet 802.3z interface. |
| *mod/interface* | (Optional) Number of the module and interface. |
| **vlan** *vlan_num* | (Optional) Specifies a VLAN. |
| **port-channel** *number* | (Optional) Specifies the channel interface; valid values are from 1 to 64. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

**Note** When you enter the **clear qos** command, the way that the counters work is affected and the traffic that is normally restricted could be forwarded for a short period of time.

The **clear qos** command resets the interface QoS policy counters. If no interface is specified, the **clear qos** command resets the QoS policy counters for all interfaces.

## Examples

This example shows how to clear the global and per-interface aggregate QoS counters for all the protocols:

```
Switch# clear qos
Switch#
```

This example shows how to clear the specific protocol aggregate QoS counters for all the interfaces:

```
Switch# clear qos aggregate-policer
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| show qos | Displays QoS information. |

# clear vlan counters

To clear the software-cached counter values to start from zero again for a specified VLAN or all existing VLANs, use the **clear vlan counters** command.

**clear vlan** [*vlan-id*] **counters**

## Syntax Description

| | |
|---|---|
| *vlan-id* | (Optional) VLAN number; see the "Usage Guidelines" section for valid values. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

If you do not specify a *vlan-id* value; the software-cached counter values for all the existing VLANs are cleared.

## Examples

This example shows how to clear the software-cached counter values for a specific VLAN:

```
Switch# clear vlan 10 counters
Clear "show vlan" counters on this vlan [confirm]y
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show vlan counters | Displays VLAN counter information. |

# clear vmps statistics

To clear the VMPS statistics, use the **clear vmps statistics** command.

**clear vmps statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Examples

This example shows how to clear the VMPS statistics:

```
Switch# clear vmps statistics
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show vmps | Displays VMPS information. |
| vmps reconfirm (privileged EXEC) | Changes the reconfirmation interval for the VLAN Query Protocol (VQP) client. |

# control-plane

To enter control-plane configuration mode, which allows users to associate or modify attributes or parameters (such as a service policy) that are associated with the control plane of the device, use the **control-plane** command.

**control-plane**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Default service police named “system-cpp-policy” is attached.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

**Note** You must set a policy action for every class. If you do not set a policy action for every class, the traffic skips the class that does not have a policy action and matches against the subsequent classes.

After you enter the **control-plane** command, you can define control plane services for your route processor. For example, you can associate a service policy with the control plane to police all traffic that is destined to the control plane.

## Examples

These examples show how to configure trusted hosts with source addresses 10.1.1.1 and 10.1.1.2 to forward Telnet packets to the control plane without constraint, while allowing all remaining Telnet packets to be policed at the specified rate:

```
Switch(config)# access-list 140 deny tcp host 10.1.1.1 any eq telnet
! Allow 10.1.1.2 trusted host traffic.
Switch(config)# access-list 140 deny tcp host 10.1.1.2 any eq telnet
! Rate limit all other Telnet traffic.
Switch(config)# access-list 140 permit tcp any any eq telnet
! Define class-map “telnet-class.”
Switch(config)# class-map telnet-class
Switch(config-cmap)# match access-group 140
Switch(config-cmap)# exit
Switch(config)# policy-map control-plane
Switch(config-pmap)# class telnet-class
Switch(config-pmap-c)# police 32000 1000 conform transmit exceed drop
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
! Define aggregate control plane service for the active Route Processor.
```

```
Switch(config)# macro global apply system-cpp
Switch(config)# control-plane
Switch(config-cp)# service-police input system-cpp-policy
Switch(config-cp)# exit
```

## Related Commands

| Command | Description |
|---|---|
| **class** | Specifies the name of the class whose traffic policy you want to create or change. |
| **class-map** | Creates a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode. |
| **match access-group** (refer to the *Cisco IOS Release 12.2 Command Reference*) | Configures the match criteria for a class map on the basis of the specified access control list (ACL). |
| **policy-map** | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **service-policy (interface configuration)** | Attaches a policy map to an interface. |
| **show policy-map control-plane** | Displays the configuration either of a class or of all classes for the policy map of a control plane. |

# counter

To assign a counter set to a switch port, use the **counter** command. To remove a counter assignment, use the no form of this command.

**counter**

**no counter**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default setting.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | Support for this command was introduced. |

## Usage Guidelines

This command is supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

The total number of switch ports that can have transmit and receive counters is 4096.

When a Layer 3 port with counter assigned is changed to a Layer 2 port or removed, the hardware counters are freed. This action is similar to issuing the **no counter** command.

## Examples

This example shows how to assign a counter set to a switch port:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#interface vlan 20
Switch(config-if)#counter
Switch(config-if)#end
Switch#
```

# dbl

To enable active queue management on a transmit queue used by a class of traffic, use the **dbl** command. Use the **no** form of this command to return to the default setting.

**dbl**

**no dbl**

## Syntax Description

This command has no keywords or arguments.

## Defaults

Active queue management is disabled.

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | This command was introduced on the Catalyst 4500 series switch. |
| 12.2(40)SG | Added support for the Supervisor Engine 6E. |

## Usage Guidelines

The semantics of the DBL configuration is similar to (W)RED algorithm. That means ‘dbl’ is allowed standalone on “class-default”, but otherwise requires that bandwidth or shape command also be configured on the class.

## Examples

This example shows how to enable dbl action in a class:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# policy-map policy1
Switch(config-pmap)# class class1
Switch(config-pmap-c)# dbl
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface gigabitethernet 1/1
Switch(config-if)# service-policy output policy1
Switch(config-if)# end
```

## Related Commands

| Command | Description |
|---|---|
| bandwidth | Creates a signaling class structure that can be referred to by its name. |
| class | Creates a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode. |

| Command | Description |
|---|---|
| policy-map | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| service-policy (policy-map class) | Creates a service policy that is a quality of service (QoS) policy within a policy map. |
| show policy-map | Displays information about the policy map. |

# debug adjacency

To display information about the adjacency debugging, use the **debug adjacency** command. To disable debugging output, use the **no** form of this command.

**debug adjacency** [**ipc**]

**no debug adjacency**

## Syntax Description

| | |
|---|---|
| **ipc** | (Optional) Displays the IPC entries in the adjacency database. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the information in the adjacency database:

```
Switch# debug adjacency
4d02h: ADJ: add 172.20.52.36 (GigabitEthernet1/1) via ARP will expire: 04:00:00
4d02h: ADJ: add 172.20.52.36 (GigabitEthernet1/1) via ARP will expire: 04:00:00
4d02h: ADJ: add 172.20.52.36 (GigabitEthernet1/1) via ARP will expire: 04:00:00
4d02h: ADJ: add 172.20.52.36 (GigabitEthernet1/1) via ARP will expire: 04:00:00
4d02h: ADJ: add 172.20.52.36 (GigabitEthernet1/1) via ARP will expire: 04:00:00
4d02h: ADJ: add 172.20.52.36 (GigabitEthernet1/1) via ARP will expire: 04:00:00
4d02h: ADJ: add 172.20.52.36 (GigabitEthernet1/1) via ARP will expire: 04:00:00
4d02h: ADJ: add 172.20.52.36 (GigabitEthernet1/1) via ARP will expire: 04:00:00
<... output truncated...>
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug adjacency** (same as no debug adjacency) | Disables debugging output. |

# debug backup

To debug the backup events, use the **debug backup** command. To disable the debugging output, use the **no** form of this command.

**debug backup**

**no debug backup**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to debug the backup events:

```
Switch# debug backup
Backup events debugging is on
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug backup** (same as no debug backup) | Disables debugging output. |

# debug condition interface

To limit the debugging output of interface-related activities, use the **debug condition interface** command. To disable the debugging output, use the **no** form of this command.

**debug condition interface** {**fastethernet** *mod/port* | **GigabitEthernet** *mod/port* | **null** *interface_num* | **port-channel** *interface-num* | **vlan** *vlan_id*}

**no debug condition interface** {**fastethernet** *mod/port* | **GigabitEthernet** *mod/port* | **null** *interface_num* | **port-channel** *interface-num* | **vlan** *vlan_id*}

## Syntax Description

| | |
|---|---|
| **fastethernet** | Limits the debugging to Fast Ethernet interfaces. |
| *mod/port* | Number of the module and port. |
| **GigabitEthernet** | Limits the debugging to Gigabit Ethernet interfaces. |
| **null** *interface-num* | Limits the debugging to null interfaces; the valid value is 0. |
| **port-channel** *interface-num* | Limits the debugging to port-channel interfaces; valid values are from 1 to 64. |
| **vlan** *vlan_id* | Specifies the VLAN interface number; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended VLAN addresses added. |

## Examples

This example shows how to limit the debugging output to VLAN interface 1:

```
Switch# debug condition interface vlan 1
Condition 2 set
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **debug interface** | Abbreviates the entry of the **debug condition interface** command. |
| **undebug condition interface** (same as no debug condition interface) | Disables interface related activities. |

# debug condition standby

To limit the debugging output for the standby state changes, use the **debug condition standby** command. To disable the debugging output, use the **no** form of this command.

**debug condition standby** {**fastethernet** *mod/port* | **GigabitEthernet** *mod/port* | **port-channel** *interface-num* | **vlan** *vlan_id group-number*}

**no debug condition standby** {**fastethernet** *mod/port* | **GigabitEthernet** *mod/port* | **port-channel** *interface-num* | **vlan** *vlan_id group-number*}

## Syntax Description

| | |
|---|---|
| **fastethernet** | Limits the debugging to Fast Ethernet interfaces. |
| *mod/port* | Number of the module and port. |
| **GigabitEthernet** | Limits the debugging to Gigabit Ethernet interfaces. |
| **port-channel** *interface_num* | Limits the debugging output to port-channel interfaces; valid values are from 1 to 64. |
| **vlan** *vlan_id* | Limits the debugging of a condition on a VLAN interface; valid values are from 1 to 4094. |
| *group-number* | VLAN group number; valid values are from 0 to 255. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended VLAN addresses added. |

## Usage Guidelines

If you attempt to remove the only condition set, you will be prompted with a message asking if you want to abort the removal operation. You can enter **n** to abort the removal or **y** to proceed with the removal. If you remove the only condition set, an excessive number of debugging messages might occur.

## Examples

This example shows how to limit the debugging output to group 0 in VLAN 1:

```
Switch# debug condition standby vlan 1 0
Condition 3 set
Switch#
```

This example shows the display if you try to turn off the last standby debug condition:

```
Switch# no debug condition standby vlan 1 0
This condition is the last standby condition set.
Removing all conditions may cause a flood of debugging
messages to result, unless specific debugging flags
are first removed.

Proceed with removal? [yes/no]: n
% Operation aborted
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug condition standby** (same as no debug condition standby) | Disables debugging output. |

# debug condition vlan

To limit the VLAN debugging output for a specific VLAN, use the **debug condition vlan** command. To disable the debugging output, use the **no** form of this command.

**debug condition vlan** {*vlan_id*}

**no debug condition vlan** {*vlan_id*}

## Syntax Description

| | |
|---|---|
| *vlan_id* | Number of the VLAN; valid values are from 1 to 4096. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended VLAN addresses added. |

## Usage Guidelines

If you attempt to remove the only VLAN condition set, you will be prompted with a message asking if you want to abort the removal operation. You can enter **n** to abort the removal or **y** to proceed with the removal. If you remove the only condition set, it could result in the display of an excessive number of messages.

## Examples

This example shows how to limit the debugging output to VLAN 1:

```
Switch# debug condition vlan 1
Condition 4 set
Switch#
```

This example shows the message that is displayed when you attempt to disable the last VLAN debug condition:

```
Switch# no debug condition vlan 1
This condition is the last vlan condition set.
Removing all conditions may cause a flood of debugging
messages to result, unless specific debugging flags
are first removed.

Proceed with removal? [yes/no]: n
% Operation aborted
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| **undebug condition vlan** (same as no debug condition vlan) | Disables debugging output. |

# debug dot1x

To enable the debugging for the 802.1X feature, use the **debug dot1x** command. To disable the debugging output, use the **no** form of this command.

**debug dot1x** {**all** | **errors** | **events** | **packets** | **registry** | **state-machine**}

**no debug dot1x** {**all** | **errors** | **events** | **packets** | **registry** | **state-machine**}

## Syntax Description

| | |
|---|---|
| **all** | Enables the debugging of all conditions. |
| **errors** | Enables the debugging of print statements guarded by the dot1x error flag. |
| **events** | Enables the debugging of print statements guarded by the dot1x events flag. |
| **packets** | All incoming dot1x packets are printed with packet and interface information. |
| **registry** | Enables the debugging of print statements guarded by the dot1x registry flag. |
| **state-machine** | Enables the debugging of print statements guarded by the dot1x registry flag. |

## Defaults

Debugging is disabled.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable the 802.1X debugging for all conditions:

```
Switch# debug dot1x all
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show dot1x** | Displays dot1x information. |
| **undebug dot1x** (same as no debug dot1x) | Disables debugging output. |

# debug etherchnl

To debug EtherChannel, use the **debug etherchnl** command. To disable the debugging output, use the **no** form of this command.

**debug etherchnl** [**all** | **detail** | **error** | **event** | **idb** | **linecard**]

**no debug etherchnl**

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Displays all EtherChannel debug messages. |
| **detail** | (Optional) Displays the detailed EtherChannel debug messages. |
| **error** | (Optional) Displays the EtherChannel error messages. |
| **event** | (Optional) Debugs the major EtherChannel event messages. |
| **idb** | (Optional) Debugs the PAgP IDB messages. |
| **linecard** | (Optional) Debugs the SCP messages to the module. |

## Defaults

The default settings are as follows:

- Debug is disabled.
- All messages are displayed.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

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

## Examples

This example shows how to display all the EtherChannel debug messages:

```
Switch# debug etherchnl
PAgP Shim/FEC debugging is on
22:46:30:FEC:returning agport Po15 for port (Fa2/1)
22:46:31:FEC:returning agport Po15 for port (Fa4/14)
22:46:33:FEC:comparing GC values of Fa2/25 Fa2/15 flag = 1 1
22:46:33:FEC:port_attrib:Fa2/25 Fa2/15 same
22:46:33:FEC:EC - attrib incompatable for Fa2/25; duplex of Fa2/25 is half, Fa2/15 is full
22:46:33:FEC:pagp_switch_choose_unique:Fa2/25, port Fa2/15 in agport Po3 is incompatable
Switch#
```

This example shows how to display the EtherChannel IDB debug messages:

```
Switch# debug etherchnl idb
Agport idb related debugging is on
Switch#
```

This example shows how to disable the debugging:

```
Switch# no debug etherchnl
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug etherchnl** (same as no debug etherchnl) | Disables debugging output. |

# debug interface

To abbreviate the entry of the **debug condition interface** command, use the **debug interface** command. To disable debugging output, use the **no** form of this command.

**debug interface** {**FastEthernet** *mod/port* | **GigabitEthernet** *mod/port* | **null** | **port-channel** *interface-num* | **vlan** *vlan_id*}

**no debug interface** {**FastEthernet** *mod/port* | **GigabitEthernet** *mod/port* | **null** | **port-channel** *interface-num* | **vlan** *vlan_id*}

## Syntax Description

| | |
|---|---|
| **FastEthernet** | Limits the debugging to Fast Ethernet interfaces. |
| *mod/port* | Number of the module and port. |
| **GigabitEthernet** | Limits the debugging to Gigabit Ethernet interfaces. |
| **null** | Limits the debugging to null interfaces; the only valid value is 0. |
| **port-channel** *interface-num* | Limits the debugging to port-channel interfaces; valid values are from 1 to 64. |
| **vlan** *vlan_id* | Specifies the VLAN interface number; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended VLAN addresses added. |

## Examples

This example shows how to limit the debugging to interface VLAN 1:

```
Switch# debug interface vlan 1
Condition 1 set
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **debug condition interface** | Limits the debugging output of interface-related activities. |
| **undebug etherchnl** (same as no debug etherchnl) | Disables debugging output. |

# debug ipc

To debug the IPC activity, use the **debug ipc** command. To disable the debugging output, use the **no** form of this command.

**debug ipc** {**all** | **errors** | **events** | **headers** | **packets** | **ports** | **seats**}

**no debug ipc** {**all** | **errors** | **events** | **headers** | **packets** | **ports** | **seats**}

## Syntax Description

| | |
|---|---|
| **all** | Enables all IPC debugging. |
| **errors** | Enables the IPC error debugging. |
| **events** | Enables the IPC event debugging. |
| **headers** | Enables the IPC header debugging. |
| **packets** | Enables the IPC packet debugging. |
| **ports** | Enables the debugging of the creation and deletion of ports. |
| **seats** | Enables the debugging of the creation and deletion of nodes. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable the debugging of the IPC events:

```
Switch# debug ipc events
Special Events debugging is on
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug ipc** (same as no debug ipc) | Disables debugging output. |

# debug ip dhcp snooping event

To debug the DHCP snooping events, use the **debug ip dhcp snooping event** command. To disable debugging output, use the **no** form of this command.

**debug ip dhcp snooping event**

**no debug ip dhcp snooping event**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Debugging of snooping event is disabled.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable the debugging for the DHCP snooping events:

```
Switch# debug ip dhcp snooping event
Switch#
```

This example shows how to disable the debugging for the DHCP snooping events:

```
Switch# no debug ip dhcp snooping event
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| debug ip dhcp snooping packet | Debugs the DHCP snooping messages. |

# debug ip dhcp snooping packet

To debug the DHCP snooping messages, use the **debug ip dhcp snooping packet** command. To disable the debugging output, use the **no** form of this command.

**debug ip dhcp snooping packet**

**no debug ip dhcp snooping packet**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Debugging of snooping packet is disabled.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable the debugging for the DHCP snooping packets:

```
Switch# debug ip dhcp snooping packet
Switch#
```

This example shows how to disable the debugging for the DHCP snooping packets:

```
Switch# no debug ip dhcp snooping packet
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| debug ip dhcp snooping event | Debugs the DHCP snooping events. |

# debug ip verify source packet

To debug the IP source guard messages, use the **debug ip verify source packet** command. To disable the debugging output, use the **no** form of this command.

**debug ip verify source packet**

**no debug ip verify source packet**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Debugging of snooping security packets is disabled.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable debugging for the IP source guard:

```
Switch# debug ip verify source packet
Switch#
```

This example shows how to disable debugging for the IP source guard:

```
Switch# no debug ip verify source packet
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping limit rate | Enables DHCP option 82 data insertion. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# debug lacp

To debug the LACP activity, use the **debug lacp** command. To disable the debugging output, use the **no** form of this command.

**debug lacp** [**all** | **event** | **fsm** | **misc** | **packet**]

**no debug lacp**

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Enables all LACP debugging. |
| **event** | (Optional) Enables the debugging of the LACP events. |
| **fsm** | (Optional) Enables the debugging of the LACP finite state machine. |
| **misc** | (Optional) Enables the miscellaneous LACP debugging. |
| **packet** | (Optional) Enables the LACP packet debugging. |

## Defaults

Debugging of LACP activity is disabled.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is supported only by the supervisor engine and can be entered only from the Catalyst 4500 series switch console.

## Examples

This example shows how to enable the LACP miscellaneous debugging:

```
Switch# debug lacp
Port Aggregation Protocol Miscellaneous debugging is on
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug pagp** (same as no debug pagp) | Disables debugging output. |

# debug monitor

To display the monitoring activity, use the **debug monitor** command. To disable the debugging output, use the **no** form of this command.

**debug monitor** {**all** | **errors** | **idb-update** | **list** | **notifications** | **platform** | **requests**}

**no debug monitor** {**all** | **errors** | **idb-update** | **list** | **notifications** | **platform** | **requests**}

## Syntax Description

| | |
|---|---|
| **all** | Displays all the SPAN debugging messages. |
| **errors** | Displays the SPAN error details. |
| **idb-update** | Displays the SPAN IDB update traces. |
| **list** | Displays the SPAN list tracing and the VLAN list tracing. |
| **notifications** | Displays the SPAN notifications. |
| **platform** | Displays the SPAN platform tracing. |
| **requests** | Displays the SPAN requests. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to debug the monitoring errors:

```
Switch# debug monitor errors
SPAN error detail debugging is on
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug monitor** (same as no debug monitor) | Disables debugging output. |

# debug nvram

To debug the NVRAM activity, use the **debug nvram** command. To disable the debugging output, use the **no** form of this command.

**debug nvram**

**no debug nvram**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to debug NVRAM:

```
Switch# debug nvram
NVRAM behavior debugging is on
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug nvram** (same as no debug nvram) | Disables debugging output. |

# debug pagp

To debug the PAgP activity, use the **debug pagp** command. To disable the debugging output, use the **no** form of this command.

**debug pagp** [**all** | **dual-active** | **event** | **fsm** | **misc** | **packet**]

**no debug pagp**

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Enables all PAgP debugging. |
| **dual-active** | (Optional) Enables the PAgP dual-active debugging. |
| **event** | (Optional) Enables the debugging of the PAgP events. |
| **fsm** | (Optional) Enables the debugging of the PAgP finite state machine. |
| **misc** | (Optional) Enables the miscellaneous PAgP debugging. |
| **packet** | (Optional) Enables the PAgP packet debugging. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is supported only by the supervisor engine and can be entered only from the Catalyst 4500 series switch console.

## Examples

This example shows how to enable the PAgP miscellaneous debugging:

```
Switch# debug pagp misc
Port Aggregation Protocol Miscellaneous debugging is on
Switch#
*Sep 30 10:13:03: SP: PAgP: pagp_h(Fa5/6) expired
*Sep 30 10:13:03: SP: PAgP: 135 bytes out Fa5/6
*Sep 30 10:13:03: SP: PAgP: Fa5/6 Transmitting information packet
*Sep 30 10:13:03: SP: PAgP: timer pagp_h(Fa5/6) started with interval 30000
<... output truncated...>
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug pagp** (same as no debug pagp) | Disables debugging output. |

# debug platform packet protocol lacp

To debug the LACP protocol packets, use the **debug platform packet protocol lacp** command. To disable the debugging output, use the **no** form of this command.

**debug platform packet protocol lacp** [**receive** | **transmit** | **vlan**]

**no debug platform packet protocol lacp** [**receive** | **transmit** | **vlan**]

## Syntax Description

| | |
|---|---|
| **receive** | (Optional) Enables the platform packet reception debugging functions. |
| **transmit** | (Optional) Enables the platform packet transmission debugging functions. |
| **vlan** | (Optional) Enables the platform packet VLAN debugging functions. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable all PM debugging:

```
Switch# debug platform packet protocol lacp
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug platform packet protocol lacp** (same as no debug platform packet protocol lacp) | Disables debugging output. |

# debug platform packet protocol pagp

To debug the PAgP protocol packets, use the **debug platform packet protocol pagp** command. To disable the debugging output, use the **no** form of this command.

**debug platform packet protocol pagp** [**receive** | **transmit** | **vlan**]

**no debug platform packet protocol pagp** [**receive** | **transmit** | **vlan**]

## Syntax Description

| | |
|---|---|
| **receive** | (Optional) Enables the platform packet reception debugging functions. |
| **transmit** | (Optional) Enables the platform packet transmission debugging functions. |
| **vlan** | (Optional) Enables the platform packet VLAN debugging functions. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable all PM debugging:

```
Switch# debug platform packet protocol pagp
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug platform packet protocol pagp** (same as no debug platform packet protocol pagp) | Disables debugging output. |

# debug pm

To debug the port manager (PM) activity, use the **debug pm** command. To disable the debugging output, use the **no** form of this command.

**debug pm** {**all** | **card** | **cookies** | **etherchnl** | **messages** | **port** | **registry** | **scp** | **sm** | **span** | **split** | **vlan** | **vp**}

**no debug pm** {**all** | **card** | **cookies** | **etherchnl** | **messages** | **port** | **registry** | **scp** | **sm** | **span** | **split** | **vlan** | **vp**}

## Syntax Description

| | |
|---|---|
| **all** | Displays all PM debugging messages. |
| **card** | Debugs the module-related events. |
| **cookies** | Enables the internal PM cookie validation. |
| **etherchnl** | Debugs the EtherChannel-related events. |
| **messages** | Debugs the PM messages. |
| **port** | Debugs the port-related events. |
| **registry** | Debugs the PM registry invocations. |
| **scp** | Debugs the SCP module messaging. |
| **sm** | Debugs the state machine-related events. |
| **span** | Debugs the spanning-tree-related events. |
| **split** | Debugs the split-processor. |
| **vlan** | Debugs the VLAN-related events. |
| **vp** | Debugs the virtual port-related events. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable all PM debugging:

```
Switch# debug pm all
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug pm** (same as no debug pm) | Disables debugging output. |

# debug port-security

To debug port security, use the **debug port-security** command. To disable the debugging output, use the **no** form of this command.

**debug port-security**

**no debug port-security**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable all PM debugging:

```
Switch# debug port-security
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| switchport port-security | Enables port security on an interface. |

# debug redundancy

To debug the supervisor engine redundancy, use the **debug redundancy** command. To disable the debugging output, use the **no** form of this command.

**debug redundancy** {**errors** | **fsm** | **kpa** | **msg** | **progression** | **status** | **timer**}

**no debug redundancy**

## Syntax Description

| | |
|---|---|
| **errors** | Enables the redundancy facility for error debugging. |
| **fsm** | Enables the redundancy facility for FSM event debugging. |
| **kpa** | Enables the redundancy facility for keepalive debugging. |
| **msg** | Enables the redundancy facility for messaging event debugging. |
| **progression** | Enables the redundancy facility for progression event debugging. |
| **status** | Enables the redundancy facility for status event debugging. |
| **timer** | Enables the redundancy facility for timer event debugging. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch (Catalyst 4507R only). |

## Examples

This example shows how to debug the redundancy facility timer event debugging:

```
Switch# debug redundancy timer
Redundancy timer debugging is on
Switch#
```

# debug spanning-tree

To debug the spanning-tree activities, use the **debug spanning-tree** command. To disable the debugging output, use the **no** form of this command.

**debug spanning-tree** {**all** | **backbonefast** | **bpdu** | **bpdu-opt** | **etherchannel** | **config** | **events** | **exceptions** | **general** | **ha** | **mstp** | **pvst+** | **root** | **snmp** | **switch** | **synchronization** | **uplinkfast**}

**no debug spanning-tree** {**all** | **bpdu** | **bpdu-opt** | **etherchannel** | **config** | **events** | **exceptions** | **general** | **mst** | **pvst+** | **root** | **snmp**}

## Syntax Description

| | |
|---|---|
| **all** | Displays all the spanning-tree debugging messages. |
| **backbonefast** | Debugs the backbonefast events. |
| **bpdu** | Debugs the spanning-tree BPDU. |
| **bpdu-opt** | Debugs the optimized BPDU handling. |
| **etherchannel** | Debugs the spanning-tree EtherChannel support. |
| **config** | Debugs the spanning-tree configuration changes. |
| **events** | Debugs the TCAM events. |
| **exceptions** | Debugs the spanning-tree exceptions. |
| **general** | Debugs the general spanning-tree activity. |
| **ha** | Debugs the HA events |
| **mstp** | Debugs the multiple spanning-tree events. |
| **pvst+** | Debugs the PVST+ events. |
| **root** | Debugs the spanning-tree root events. |
| **snmp** | Debugs the spanning-tree SNMP events. |
| **switch** | Debugs the switch debug events. |
| **synchronization** | Debugs the STP state synchronization events. |
| **uplinkfast** | Debugs the uplinkfast events. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to debug the spanning-tree PVST+:

```
Switch# debug spanning-tree pvst+
Spanning Tree PVST+ debugging is on
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| **undebug spanning-tree** (same as no debug spanning-tree) | Disables debugging output. |

# debug spanning-tree backbonefast

To enable debugging of the spanning-tree BackboneFast events, use the **debug spanning-tree backbonefast** command. To disable the debugging output, use the **no** form of this command.

**debug spanning-tree backbonefast** [**detail** | **exceptions**]

**no debug spanning-tree backbonefast**

## Syntax Description

| | |
|---|---|
| **detail** | (Optional) Displays the detailed BackboneFast debugging messages. |
| **exceptions** | (Optional) Enables the debugging of spanning-tree BackboneFast exceptions. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is supported only by the supervisor engine and can be entered only from the Catalyst 4500 series switch console.

## Examples

This example shows how to enable the debugging and to display the detailed spanning-tree BackboneFast debugging information:

```
Switch# debug spanning-tree backbonefast detail
Spanning Tree backbonefast detail debugging is on
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug spanning-tree backbonefast** (same as no debug spanning-tree backbonefast) | Disables debugging output. |

# debug spanning-tree switch

To enable the switch shim debugging, use the **debug spanning-tree switch** command. To disable the debugging output, use the **no** form of this command.

**debug spanning-tree switch** {**all** | **errors** | **general** | **pm** | **rx** {**decode** | **errors** | **interrupt** | **process**} | **state** | **tx** [**decode**]}

**no debug spanning-tree switch** {**all** | **errors** | **general** | **pm** | **rx** {**decode** | **errors** | **interrupt** | **process**} | **state** | **tx** [**decode**]}

## Syntax Description

| | |
|---|---|
| **all** | Displays all the spanning-tree switch shim debugging messages. |
| **errors** | Enables the debugging of switch shim errors or exceptions. |
| **general** | Enables the debugging of general events. |
| **pm** | Enables the debugging of port manager events. |
| **rx** | Displays the received BPDU-handling debugging messages. |
| **decode** | Enables the debugging of the decode-received packets of the spanning-tree switch shim. |
| **errors** | Enables the debugging of the receive errors of the spanning-tree switch shim. |
| **interrupt** | Enables the shim ISR receive BPDU debugging on the spanning-tree switch. |
| **process** | Enables the process receive BPDU debugging on the spanning-tree switch. |
| **state** | Enables the debugging of the state changes on the spanning-tree port. |
| **tx** | Enables the transmit BPDU debugging on the spanning-tree switch shim. |
| **decode** | (Optional) Enables the decode-transmitted packets debugging on the spanning-tree switch shim. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is supported only by the supervisor engine and can be entered only from the switch console.

## Examples

This example shows how to enable the transmit BPDU debugging on the spanning-tree switch shim:

```
Switch# debug spanning-tree switch tx
Spanning Tree Switch Shim transmit bpdu debugging is on
*Sep 30 08:47:33: SP: STP SW: TX: bpdu of type ieee-st size 92 on FastEthernet5/9 303
*Sep 30 08:47:33: SP: STP SW: TX: bpdu of type ieee-st size 92 on FastEthernet5/9 304
*Sep 30 08:47:33: SP: STP SW: TX: bpdu of type ieee-st size 92 on FastEthernet5/9 305
*Sep 30 08:47:33: SP: STP SW: TX: bpdu of type ieee-st size 92 on FastEthernet5/9 349
*Sep 30 08:47:33: SP: STP SW: TX: bpdu of type ieee-st size 92 on FastEthernet5/9 350
*Sep 30 08:47:33: SP: STP SW: TX: bpdu of type ieee-st size 92 on FastEthernet5/9 351
*Sep 30 08:47:33: SP: STP SW: TX: bpdu of type ieee-st size 92 on FastEthernet5/9 801
<... output truncated...>
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug spanning-tree switch** (same as no debug spanning-tree switch) | Disables debugging output. |

# debug spanning-tree uplinkfast

To enable the debugging of the spanning-tree UplinkFast events, use the **debug spanning-tree uplinkfast** command. To disable the debugging output, use the **no** form of this command.

**debug spanning-tree uplinkfast** [**exceptions**]

**no debug spanning-tree uplinkfast**

## Syntax Description

| | |
|---|---|
| **exceptions** | (Optional) Enables the debugging of the spanning-tree UplinkFast exceptions. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is supported only by the supervisor engine and can be entered only from the switch console.

## Examples

This example shows how to debug the spanning-tree UplinkFast exceptions:

```
Switch# debug spanning-tree uplinkfast exceptions
Spanning Tree uplinkfast exceptions debugging is on
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug spanning-tree uplinkfast** (same as no debug spanning-tree uplinkfast) | Disables debugging output. |

# debug sw-vlan

To debug the VLAN manager activities, use the **debug sw-vlan** command. To disable the debugging output, use the **no** form of this command.

**debug sw-vlan** {**badpmcookies** | **events** | **management** | **packets** | **registries**}

**no debug sw-vlan** {**badpmcookies** | **events** | **management** | **packets** | **registries**}

## Syntax Description

| | |
|---|---|
| **badpmcookies** | Displays the VLAN manager incidents of bad port-manager cookies. |
| **events** | Debugs the VLAN manager events. |
| **management** | Debugs the VLAN manager management of internal VLANs. |
| **packets** | Debugs the packet handling and encapsulation processes. |
| **registries** | Debugs the VLAN manager registries. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to debug the software VLAN events:

```
Switch# debug sw-vlan events
vlan manager events debugging is on
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug sw-vlan** (same as no debug sw-vlan) | Disables debugging output. |

# debug sw-vlan ifs

To enable the VLAN manager Cisco IOS file system (IFS) error tests, use the **debug sw-vlan ifs** command. To disable the debugging output, 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

| | |
|---|---|
| **open** | Enables the VLAN manager IFS debugging of errors in an IFS file-open operation. |
| **read** | Debugs the errors that occurred when the IFS VLAN configuration file was open for reading. |
| **write** | Debugs the errors that occurred when the IFS VLAN configuration file was open for writing. |
| {**1** \| **2** \| **3** \| **4**} | Determines the file-read operation. See the "Usage Guidelines" section for information about operation levels. |
| **write** | Debugs the errors that occurred during an IFS file-write operation. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The following are four types of file read operations:

- 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 TLV descriptor structures.
- Operation **4**—Reads TLV data.

## Examples

This example shows how to debug the TLV data errors during a file-read operation:

```
Switch# debug sw-vlan ifs read 4
vlan manager ifs read # 4 errors debugging is on
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| **undebug sw-vlan ifs** (same as no debug sw-vlan ifs) | Disables debugging output. |

# debug sw-vlan notification

To enable the debugging of the messages that trace the activation and deactivation of the ISL VLAN IDs, use the **debug sw-vlan notification** command. To disable the debugging output, 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**}

## Syntax Description

| | |
|---|---|
| **accfwdchange** | Enables the VLAN manager notification of aggregated access interface STP forward changes. |
| **allowedvlancfgchange** | Enables the VLAN manager notification of changes to allowed VLAN configuration. |
| **fwdchange** | Enables the VLAN manager notification of STP forwarding changes. |
| **linkchange** | Enables the VLAN manager notification of interface link state changes. |
| **modechange** | Enables the VLAN manager notification of interface mode changes. |
| **pruningcfgchange** | Enables the VLAN manager notification of changes to pruning configuration. |
| **statechange** | Enables the VLAN manager notification of interface state changes. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to debug the software VLAN interface mode change notifications:

```
Switch# debug sw-vlan notification modechange
vlan manager port mode change notification debugging is on
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug sw-vlan notification** (same as no debug sw-vlan notification) | Disables debugging output. |

# debug sw-vlan vtp

To enable the debugging of messages to be generated by the VTP protocol code, use the **debug sw-vlan vtp** command. To disable the debugging output, use the **no** form of this command.

**debug sw-vlan vtp** {**events** | **packets** | **pruning** [**packets** | **xmit**] | **xmit**}

**no debug sw-vlan vtp** {**events** | **packets** | **pruning** [**packets** | **xmit**] | **xmit**}

## Syntax Description

| | |
|---|---|
| **events** | Displays the general-purpose logic flow and detailed VTP debugging messages generated by the VTP_LOG_RUNTIME macro in the VTP code. |
| **packets** | Displays 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. |
| **pruning** | Enables the debugging message to be generated by the pruning segment of the VTP protocol code. |
| **packets** | (Optional) Displays the contents of all incoming VTP pruning packets that have been passed into the VTP code from the Cisco IOS VTP platform-dependent layer. |
| **xmit** | (Optional) Displays the contents of all outgoing VTP packets that the VTP code will request that the Cisco IOS VTP platform-dependent layer to send. |
| **xmit** | Displays the contents of all outgoing VTP packets that the VTP code will request that the Cisco IOS VTP platform-dependent layer to send; does not include pruning packets. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If you do not enter any more parameters after entering **pruning**, the VTP pruning debugging messages are displayed.

## Examples

This example shows how to debug the software VLAN outgoing VTP packets:

```
Switch# debug sw-vlan vtp xmit
vtp xmit debugging is on
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **undebug sw-vlan vtp** (same as no debug sw-vlan vtp) | Disables debugging output. |

# debug udld

To enable the debugging of UDLD activity, use the **debug udld** command. To disable the debugging output, use the **no** form of this command.

**debug udld** {**events** | **packets** | **registries**}

**no debug udld** {**events** | **packets** | **registries**}

## Syntax Description

| | |
|---|---|
| **events** | Enables the debugging of UDLD process events as they occur. |
| **packets** | Enables the debugging of the UDLD process as it receives packets from the packet queue and attempts to transmit packets at the request of the UDLD protocol code. |
| **registries** | Enables the debugging of the UDLD process as it processes registry upcalls from the UDLD process-dependent module and other feature modules. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is supported only by the supervisor engine and can be entered only from the Catalyst 4500 series switch console.

## Examples

This example shows how to debug the UDLD events:

```
Switch# debug udld events
UDLD events debugging is on
Switch#
```

This example shows how to debug the UDLD packets:

```
Switch# debug udld packets
UDLD packets debugging is on
Switch#
```

This example shows how to debug the UDLD registry events:

```
Switch# debug udld registries
UDLD registries debugging is on
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| **undebug udld** (same as no debug udld) | Disables debugging output. |

# debug vqpc

To debug the VLAN Query Protocol (VQP), use the **debug vqpc** command. To disable the debugging output, use the **no** form of this command.

**debug vqpc** [**all** | **cli** | **events** | **learn** | **packet**]

**no debug vqpc** [**all** | **cli** | **events** | **learn** | **packet**]

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Debugs all the VQP events. |
| **cli** | (Optional) Debugs the VQP command-line interface. |
| **events** | (Optional) Debugs the VQP events. |
| **learn** | (Optional) Debugs the VQP address learning. |
| **packet** | (Optional) Debugs the VQP packets. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable all VQP debugging:

```
Switch# debug vqpc all
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| vmps reconfirm (privileged EXEC) | Immediately sends VLAN Query Protocol (VQP) queries to reconfirm all the dynamic VLAN assignments with the VLAN Membership Policy Server (VMPS). |

# define interface-range

To create a macro of interfaces, use the **define interface-range** command.

**define interface-range** *macro-name interface-range*

## Syntax Description

| | |
|---|---|
| *macro-name* | Name of the interface range macro; up to 32 characters. |
| *interface-range* | List of valid ranges when specifying interfaces; see the "Usage Guidelines" section. |

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The macro name is a character string of up to 32 characters.

A macro can contain up to five ranges. An interface range cannot span modules.

When entering the *interface-range*, use these formats:

- *interface-type* {*mod*}/{*first-interface*} - {*last-interface*}
- *interface-type* {*mod*}/{*first-interface*} - {*last-interface*}

The valid values for *interface-type* are as follows:

- **FastEthernet**
- **GigabitEthernet**
- **Vlan** *vlan_id*

## Examples

This example shows how to create a multiple-interface macro:

```
Switch(config)# define interface-range macro1 gigabitethernet 4/1-6, fastethernet 2/1-5
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| interface range | Runs a command on multiple ports at the same time. |

# deny

To deny an ARP packet based on matches against the DHCP bindings, use the **deny** command. To remove the specified ACEs from the access list, use the **no** form of this command.

**deny** {[**request**] **ip** {**any** | **host** *sender-ip* | *sender-ip sender-ip-mask*} **mac** {**any** | **host** *sender-mac* | *sender-mac sender-mac-mask*} | **response ip** {**any** | **host** *sender-ip* | *sender-ip sender-ip-mask*} [{**any** | **host** *target-ip* | *target-ip target-ip-mask*}] **mac** {**any** | **host** *sender-mac* | *sender-mac sender-mac-mask*} [{**any** | **host** *target-mac* | *target-mac target-mac-mask*}]} [**log**]

**no deny** {[**request**] **ip** {**any** | **host** *sender-ip* | *sender-ip sender-ip-mask*} **mac** {**any** | **host** *sender-mac* | *sender-mac sender-mac-mask*} | **response ip** {**any** | **host** *sender-ip* | *sender-ip sender-ip-mask*} [{**any** | **host** *target-ip* | *target-ip target-ip-mask*}] **mac** {**any** | **host** *sender-mac* | *sender-mac sender-mac-mask*} [{**any** | **host** *target-mac* | *target-mac target-mac-mask*}]} [**log**]

## Syntax Description

| | |
|---|---|
| **request** | (Optional) Requests a match for the ARP request. When **request** is not specified, matching is performed against all ARP packets. |
| **ip** | Specifies the sender IP address. |
| **any** | Specifies that any IP or MAC address will be accepted. |
| **host** *sender-ip* | Specifies that only a specific sender IP address will be accepted. |
| *sender-ip sender-ip-mask* | Specifies that a specific range of sender IP addresses will be accepted. |
| **mac** | Specifies the sender MAC address. |
| **host** *sender-mac* | Specifies that only a specific sender MAC address will be accepted. |
| *sender-mac sender-mac-mask* | Specifies that a specific range of sender MAC addresses will be accepted. |
| **response** | Specifies a match for the ARP responses. |
| **ip** | Specifies the IP address values for the ARP responses. |
| **host** *target-ip* | (Optional) Specifies that only a specific target IP address will be accepted. |
| *target-ip target-ip-mask* | (Optional) Specifies that a specific range of target IP addresses will be accepted. |
| **mac** | Specifies the MAC address values for the ARP responses. |
| **host** *target-mac* | (Optional) Specifies that only a specific target MAC address will be accepted. |
| *target-mac target-mac-mask* | (Optional) Specifies that a specific range of target MAC addresses will be accepted. |
| **log** | (Optional) Logs a packet when it matches the access control entry (ACE). |

## Defaults

At the end of the ARP access list, there is an implicit **deny ip any mac any** command.

## Command Modes

arp-nacl configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Deny clauses can be added to forward or drop ARP packets based on some matching criteria.

## Examples

This example shows a host with a MAC address of 0000.0000.abcd and an IP address of 1.1.1.1. This example shows howto deny both requests and responses from this host:

```
Switch(config)# arp access-list static-hosts
Switch(config-arp-nacl)# deny ip host 1.1.1.1 mac host 0000.0000.abcd
Switch(config-arp-nacl)# end
Switch# show arp access-list

ARP access list static-hosts
    deny ip host 1.1.1.1 mac host 0000.0000.abcd
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| ip arp inspection filter vlan | Permits ARPs from hosts that are configured for static IP when DAI is enabled and to define an ARP access list and applies it to a VLAN. |
| permit | Permits an ARP packet based on matches against the DHCP bindings. |

# diagnostic monitor action

To direct the action of the switch when it detects a packet memory failure, use the **diagnostic monitor action** command.

**diagnostic monitor action** [**conservative** | **normal** | **aggressive**]

## Syntax Description

| | |
|---|---|
| **conservative** | (Optional) Specifies that the bootup SRAM diagnostics log all failures and remove all affected buffers from the hardware operation. The ongoing SRAM diagnostics will log events, but will take no other action. |
| **normal** | (Optional) Specifies that the SRAM diagnostics operate as in conservative mode, except that an ongoing failure resets the supervisor engine; allows for the bootup tests to map out the affected memory. |
| **aggressive** | (Optional) Specifies that the SRAM diagnostics operate as in normal mode, except that a bootup failure only logs failures and does not allow the supervisor engine to come online; allows for either a redundant supervisor engine or network-level redundancy to take over. |

## Defaults

normal mode

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Use the **conservative** keyword when you do not want the switch to reboot so that the problem can be fixed.

Use the **aggressive** keyword when you have redundant supervisor engines, or when network-level redundancy has been provided.

## Examples

This example shows how to configure the switch to initiate an RPR switchover when an ongoing failure occurs:

```
Switch# configure terminal
Switch (config)# diagnostic monitor action normal
```

## Related Commands

| Command | Description |
|---|---|
| show diagnostic result module test 2 | Displays the module-based diagnostic test results. |
| show diagnostic result module test 3 | Displays the module-based diagnostic test results. |

# diagnostic start

To run the specified diagnostic test, use the **diagnostic start** command.

**diagnostic start** {**module** *num*} {**test** *test-id*} [**port** *num*]

## Syntax Description

| | |
|---|---|
| **module** *num* | Module number. |
| **test** | Specifies a test to run. |
| *test-id* | Specifies an identification number for the test to be run; can be the cable diagnostic *test-id*, or the **cable-tdr** keyword. |
| **port** *num* | (Optional) Specifies the interface port number. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to run the specified diagnostic test at the specified module:

```
This exec command starts the TDR test on specified interface
Switch# diagnostic start module 1 test cable-tdr port 3
diagnostic start module 1 test cable-tdr port 3
module 1: Running test(s) 5 Run interface level cable diags
module 1: Running test(s) 5 may disrupt normal system operation
Do you want to continue? [no]: yes
yes
Switch#
2d16h: %DIAG-6-TEST_RUNNING: module 1: Running online-diag-tdr{ID=5} ...
2d16h: %DIAG-6-TEST_OK: module 1: online-diag-tdr{ID=5} has completed successfully

Switch#
```

**Note** The **show cable-diagnostic tdr** command is used to display the results of a TDR test. The test results will not be available until approximately 1 minute after the test starts. If you type the **show cable-diagnostic tdr** command within 1 minute of the test starting, you may see a "TDR test is in progress on interface..." message.

## Related Commands

| Command | Description |
|---|---|
| **show diagnostic content** | Displays diagnostic content information. |

# dot1x auth-fail max-attempts

To configure the max number of attempts before a port is moved to the auth-fail VLAN, use the **dot1x auth-fail max-attempts** command. To return to the default setting, use the **no** form of this command.

**dot1x auth-fail max-attempts** *max-attempts*

**no dot1x auth-fail max-attempts** *max-attempts*

## Syntax Description

| | |
|---|---|
| *max-attempts* | Specifies a maximum number of attempts before a port is moved to the auth-fail VLAN in the range of 1 to 10. |

## Defaults

Default is 3.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to configure the maximum number of attempts before the port is moved to the auth-fail VLAN on Fast Ethernet interface 4/3:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet4/3
Switch(config-if)# dot1x auth-fail max-attempts 5
Switch(config-if)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **dot1x max-reauth-req** | Sets the maximum number of times that the switch will retransmit an EAP-Request/Identity frame to the client before restarting the authentication process. |
| **show dot1x** | Displays dot1x information. |

# dot1x auth-fail vlan

To enable the auth-fail VLAN on a port, use the **dot1x auth-fail vlan** command. To return to the default setting, use the **no** form of this command.

**dot1x auth-fail vlan** *vlan-id*

**no dot1x auth-fail vlan** *vlan-id*

## Syntax Description

| | |
|---|---|
| *vlan-id* | Specifies a VLAN in the range of 1 to 4094. |

## Defaults

None

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to configure the auth-fail VLAN on Fast Ethernet interface 4/3:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet4/3
Switch(config-if)# dot1x auth-fail vlan 40
Switch(config-if)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **dot1x max-reauth-req** | Sets the maximum number of times that the switch will retransmit an EAP-Request/Identity frame to the client before restarting the authentication process. |
| **show dot1x** | Displays dot1x information. |

# dot1x control-direction

To enable unidirectional port control on a per-port basis on a switch, use the **dot1x control-direction** command. Use the **no** form of this command to disable unidirectional port control.

**dot1x control-direction** [**in** | **both**]

**no dot1x control-direction**

## Syntax Description

| | |
|---|---|
| **in** | (Optional) Specifies controlling in-bound traffic on a port. |
| **both** | (Optional) Specifies controlling both in-bound and out-bound traffic on a port. |

## Defaults

Both in-bound and out-bound traffic will be controlled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You can manage remote systems using unidirectional control. Unidirectional control enables you to turn on systems remotely using a specific Ethernet packet, known as a magic packet.

Using unidirectional control enables you to remotely manage systems using 802.1X ports. In the past, the port became unauthorized after the systems was turned off. In this state, the port only allowed the receipt and transmission of EAPoL packets. Therefore, there was no way for the unidirectional control magic packet to reach the host and without being turned on there was no way for the system to authenticate and open the port.

## Examples

This example shows how to enable unidirectional control on incoming packets:

```
Switch(config-if)# dot1x control-direction in
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **show dot1x** | Displays dot1x information. |

# dot1x critical

To enable the 802.1X critical authentication on a port, use the **dot1x critical** command. To return to the default setting, use the **no** form of this command.

**dot1x critical**

**no dot1x critical**

## Syntax Description

This command has no keywords or variables.

## Defaults

Critical authentication is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable 802.1x critical authentication:

```
Switch(config-if)# dot1x critical
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **dot1x critical eapol** | Enables sending EAPOL success packets when a port is critically authorized partway through an EAP exchange. |
| **dot1x critical recovery delay** | Sets the time interval between port reinitializations. |
| **dot1x critical vlan** | Assigns a critically authenticated port to a specific VLAN. |
| **show dot1x** | Displays dot1x information. |

# dot1x critical eapol

To enable sending EAPOL success packets when a port is critically authorized partway through an EAP exchange, use the **dot1x critical eapol** command. To return to the default setting, use the **no** form of this command.

**dot1x critical eapol**

**no dot1x critical eapol**

## Syntax Description

This command has no keywords or variables.

## Defaults

The default is to not send EAPOL success packets.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable sending EAPOL success packets:

```
Switch(config-if)# dot1x critical eapol
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| dot1x critical | Enables the 802.1X critical authentication on a port. |
| dot1x critical recovery delay | Sets the time interval between port reinitializations. |
| dot1x critical vlan | Assigns a critically authenticated port to a specific VLAN. |
| show dot1x | Displays dot1x information. |

# dot1x critical recovery delay

To set the time interval between port reinitializations, use the **dot1x critical recovery delay** command. To return to the default setting, use the **no** form of this command.

**dot1x critical recovery delay** *delay-time*

**no dot1x critical recovery delay**

## Syntax Description

| | |
|---|---|
| *delay-time* | Specifies the interval between port reinitializations when AAA transistion occurs; valid values are from 1 to 10,000 milliseconds. |

## Defaults

Delay time is set to 100 milliseconds.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to set the 802.1x critical recovery delay time to 500:

```
Switch(config-if)# dot1x critical recovery delay 500
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **dot1x critical** | Enables the 802.1X critical authentication on a port. |
| **dot1x critical eapol** | Enables sending EAPOL success packets when a port is critically authorized partway through an EAP exchange. |
| **dot1x critical vlan** | Assigns a critically authenticated port to a specific VLAN. |
| **show dot1x** | Displays dot1x information. |

# dot1x critical vlan

To assign a critically authenticated port to a specific VLAN, use the **dot1x critical vlan** command. To return to the default setting, use the **no** form of this command

**dot1x critical vlan** *vlan-id*

**no dot1x critical** *vlan-id*

## Syntax Description

| | |
|---|---|
| *vlan-id* | (Optional) Specifies the VLANs; valid values are from 1 to 4094. |

## Defaults

Critical authentication is disabled on a ports VLAN.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The type of VLAN specified must match the type of the port. If the port is an access port, the VLAN must be a regular VLAN. If the port is a private-VLAN host port, the VLAN must be the secondary VLAN of a valid private-VLAN domain. If the port is a routed port, no VLAN may be specified.

This command is not supported on platforms such as Layer 3 switches that do not include the Critical Auth VLAN subsystem.

## Examples

This example shows how to enable 802.1x critical authentication on a ports VLAN:

```
Switch(config-if)# dot1x critical vlan 350
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **dot1x critical** | Enables the 802.1X critical authentication on a port. |
| **dot1x critical eapol** | Enables sending EAPOL success packets when a port is critically authorized partway through an EAP exchange. |
| **dot1x critical recovery delay** | Sets the time interval between port reinitializations. |
| **show dot1x** | Displays dot1x information. |

# dot1x guest-vlan

To enable a guest VLAN on a per-port basis, use the **dot1x guest-vlan** command. To return to the default setting, use the **no** form of this command.

**dot1x guest-vlan** *vlan-id*

**no dot1x guest-vlan** *vlan-id*

## Syntax Description

| | |
|---|---|
| *vlan-id* | Specifies a VLAN in the range of 1 to 4094. |

## Defaults

None; the guest VLAN feature is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EWA | Support for secondary VLAN as the configured guest VLAN ID was added. |

## Usage Guidelines

Guest VLANs can be configured only on ports that are statically configured as access ports or private VLAN host ports. Statically configured access ports can be configured with regular VLANs as guest VLANs; statically configured private VLAN host ports can be configured with secondary private VLANs as guest VLANs.

## Examples

This example shows how to enable a guest VLAN on Fast Ethernet interface 4/3:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet4/3
Switch(config-if)# dot1x port-control auto
Switch(config-if)# dot1x guest-vlan 26
Switch(config-if)# end
Switch(config)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **dot1x max-reauth-req** | Sets the maximum number of times that the switch will retransmit an EAP-Request/Identity frame to the client before restarting the authentication process. |
| **show dot1x** | Displays dot1x information. |

# dot1x guest-vlan supplicant

To place an 802.1X-capable supplicant (host) into a guest VLAN, use the **dot1x guest-vlan supplicant** global configuration command. To return to the default setting, use the **no** form of this command.

**dot1x quest-vlan supplicant**

**no dot1x quest-vlan supplicant**

## Syntax Description

This command has no arguments or keywords.

## Defaults

802.1X-capable hosts are not put into a guest VLAN.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EWA | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

With Cisco Release 12.2(25) EWA, you can use the **dot1x guest-vlan supplicant** command to place an 802.1X-capable host into a guest VLAN. Prior to Cisco Release 12.2(25)EWA, you could only place non-802.1X capable hosts into a guest VLAN.

When guest VLAN supplicant behavior is enabled, the Catalyst 4500 series switch does not maintain EAPOL packet history. The switch allows clients that fail 802.1X authentication to access a guest VLAN, whether or not EAPOL packets have been detected on the interface.

## Examples

This example shows how to place an 802.1X-capable supplicant (host) into a guest VLAN:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# dot1x guest-vlan supplicant
Switch(config)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| dot1x system-auth-control | Enables 802.1X authentication on the switch. |
| show dot1x | Displays dot1x information. |

# dot1x host-mode

Use the **dot1x host-mode** interface configuration command on the switch stack or on a standalone switch to allow a single host (client) or multiple hosts on an IEEE 802.1x-authorized port. Use the **multi-domain** keyword to enable multidomain authentication (MDA) on an IEEE 802.1x-authorized port. Use the **no** form of this command to return to the default setting.

**dot1x host-mode** {**multi-host** | **single-host** | **multi-domain**}

**no dot1x host-mode** [**multi-host** | **single-host** | **multi-domain**}

## Syntax Description

| | |
|---|---|
| **multi-host** | Enable multiple-hosts mode on the switch. |
| **single-host** | Enable single-host mode on the switch. |
| multi-domain | Enable MDA on a switch port. |

## Defaults

The default is single-host mode.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(20)EWA | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(37)SG | Added support for multiple domains. |

## Usage Guidelines

Use this command to limit an IEEE 802.1x-enabled port to a single client or to attach multiple clients to an IEEE 802.1x-enabled port. In multiple-hosts mode, only one of the attached hosts needs to be successfully authorized for all hosts to be granted network access. If the port becomes unauthorized (re-authentication fails or an Extensible Authentication Protocol over LAN [EAPOL]-logoff message is received), all attached clients are denied access to the network.

Use the **multi-domain** keyword to enable MDA on a port. MDA divides the port into both a data domain and a voice domain. MDA allows both a data device and a voice device, such as an IP phone (Cisco or non-Cisco), on the same IEEE 802.1x-enabled port.

Before entering this command, make sure that the **dot1x port-control** interface configuration command is set to **auto** for the specified port.

## Examples

This example shows how to enable IEEE 802.1x authentication and to enable multiple-hosts mode:

```
Switch# configure t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet6/1
Switch(config-if)# dot1x port-control auto
Switch(config-if)# dot1x host-mode multi-host
Switch(config-if)# end
Switch#
```

This example shows how to enable MDA and to allow both a host and a voice device on the port:

```
Switch# configure t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface FastEthernet6/1
Switch(config-if)# switchport access vlan 12
Switch(config-if)# switchport mode access
Switch(config-if)# switchport voice vlan 10
Switch(config-if)# dot1x pae authenticator
Switch(config-if)# dot1x port-control auto
Switch(config-if)# dot1x host-mode multi-domain
Switch(config-if)# no shutdown
Switch(config-if)# end
Switch#
```

You can verify your settings by entering the **show dot1x** [**interface** *interface-id*] privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **show dot1x** | Displays dot1x information. |

# dot1x initialize

To unauthorize an interface before reinitializing 802.1X, use the **dot1x initialize** command.

**dot1x initialize** *interface*

## Syntax Description

| | |
|---|---|
| *interface* | Number of the interface. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Use this command to initialize state machines and to set up the environment for fresh authentication.

## Examples

This example shows how to initialize the 802.1X state machines on an interface:

```
Switch# dot1x initialize
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show dot1x** | Displays dot1x information. |

# dot1x mac-auth-bypass

To enable the 802.1X MAC address bypassing on a switch, use the **dot1x mac-auth-bypass** command. Use the **no** form of this command to disable MAC address bypassing.

**dot1x mac-auth-bypass** [**eap**]

**no dot1x mac-auth-bypass** [**eap**]

## Syntax Description

| | |
|---|---|
| **eap** | (Optional) Specifies using EAP MAC address authentication. |

## Defaults

There is no default setting.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The removal of the **dot1x mac-auth-bypass** configuration from a port does not affect the authorization or authentication state of a port. If the port is in unauthenticated state, it remains unauthenticated, and if MAB is active, the authentication will revert back to the 802.1X Authenticator. If the port is authorized with a MAC address, and the MAB configuration is removed the port remains authorized until re-authentication takes place. When re-authentication occurs the MAC address is removed in favor of an 802.1X supplicant, which is detected on the wire.

## Examples

This example shows how to enable EAP MAC address authentication:

```
Switch(config-if)# dot1x mac-auth-bypass
Switch(config-if)#
```

# dot1x max-reauth-req

To set the maximum number of times that the switch will retransmit an EAP-Request/Identity frame to the client before restarting the authentication process, use the **dot1x max-reauth-req** command. To return to the default setting, use the **no** form of this command.

**dot1x max-reauth-req** *count*

**no dot1x max-reauth-req**

## Syntax Description

| | |
|---|---|
| *count* | Number of times that the switch retransmits EAP-Request/Identity frames before restarting the authentication process; valid values are from 1 to 10. |

## Defaults

The switch sends a maximum of two retransmissions.

## Command Modes

Interface configuration mode.

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

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. This setting impacts the wait before a non-dot1x-capable client is admitted to the guest VLAN, if one is configured.

You can verify your settings by entering the **show dot1x** privileged EXEC command.

## Examples

This example shows how to set 5 as the number of times that the switch retransmits an EAP-Request/Identity frame before restarting the authentication process:

```
Switch(config-if)# dot1x max-reauth-req 5
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **show dot1x** | Displays dot1x information. |

# dot1x max-req

To set the maximum number of times that the switch retransmits an Extensible Authentication Protocol (EAP)-Request frame of types other than EAP-Request/Identity to the client before restarting the authentication process, use the **dot1x max-req** command. To return to the default setting, use the **no** form of this command.

**dot1x max-req** *count*

**no dot1x max-req**

## Syntax Description

| | |
|---|---|
| *count* | Number of times that the switch retransmits EAP-Request frames of types other than EAP-Request/Identity before restarting the authentication process; valid values are from 1 to 10. |

## Defaults

The switch sends a maximum of two retransmissions.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | This command was modified to control on EAP-Request/Identity retransmission limits. |

## Usage Guidelines

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.

You can verify your settings by entering the **show dot1x** privileged EXEC command.

## Examples

This example shows how to set 5 as the number of times that the switch retransmits an EAP-Request frame before restarting the authentication process:

```
Switch(config-if)# dot1x max-req 5
Switch(config-if)#
```

This example shows how to return to the default setting:

```
Switch(config-if)# no dot1x max-req
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **dot1x initialize** | Unauthorizes an interface before reinitializing 802.1X. |
| **dot1x max-reauth-req** | Sets the maximum number of times that the switch will retransmit an EAP-Request/Identity frame to the client before restarting the authentication process. |
| **show dot1x** | Displays dot1x information. |

# dot1x port-control

To enable manual control of the authorization state on a port, use the **dot1x port-control** command. To return to the default setting, use the **no** form of this command.

**dot1x port-control** {**auto** | **force-authorized** | **force-unauthorized**}

**no dot1x port-control** {**auto** | **force-authorized** | **force-unauthorized**}

## Syntax Description

| | |
|---|---|
| **auto** | Enables 802.1X authentication on the interface and causes the port to transition to the authorized or unauthorized state based on the 802.1X authentication exchange between the switch and the client. |
| **force-authorized** | Disables 802.1X authentication on the interface and causes the port to transition to the authorized state without any authentication exchange required. The port transmits and receives normal traffic without 802.1X-based authentication of the client. |
| **force-unauthorized** | Denies all access through the specified interface by forcing the port to transition to the unauthorized state, ignoring all attempts by the client to authenticate. The switch cannot provide authentication services to the client through the interface. |

## Defaults

The port 802.1X authorization is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The 802.1X protocol is supported on both the Layer 2 static-access ports and the Layer 3-routed ports.

You can use the **auto** keyword only if the port is not configured as follows:

- Trunk port—If you try to enable 802.1X on a trunk port, an error message appears, and 802.1X is not enabled. If you try to change the mode of an 802.1X-enabled port to trunk, the port mode is not changed.
- Dynamic ports—A port in dynamic mode can negotiate with its neighbor to become a trunk port. If you try to enable 802.1X on a dynamic port, an error message appears, and 802.1X is not enabled. If you try to change the mode of an 802.1X-enabled port to dynamic, the port mode is not changed.
- EtherChannel port—Before enabling 802.1X on the port, you must first remove it from the EtherChannel. If you try to enable 802.1X on an EtherChannel or on an active port in an EtherChannel, an error message appears, and 802.1X is not enabled. If you enable 802.1X on an inactive port of an EtherChannel, the port does not join the EtherChannel.

- Switch Port Analyzer (SPAN) destination port—You can enable 802.1X on a port that is a SPAN destination port; however, 802.1X is disabled until the port is removed as a SPAN destination. You can enable 802.1X on a SPAN source port.

To globally disable 802.1X on the switch, you must disable it on each port. There is no global configuration command for this task.

## Examples

This example shows how to enable 802.1X on Gigabit Ethernet 1/1:

```
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# dot1x port-control auto
Switch#
```

You can verify your settings by usingthe **show dot1x all** or **show dot1x interface** *int* commands to show the port-control status. An enabled status indicates that the port-control value is set either to **auto** or to **force-unauthorized**.

## Related Commands

| Command | Description |
|---|---|
| **show dot1x** | Displays dot1x information. |

# dot1x re-authenticate

To manually initiate a reauthentication of all 802.1X-enabled ports or the specified 802.1X-enabled port, use the **dot1x re-authenticate** command.

**dot1x re-authenticate** [**interface** *interface-id*]

**Syntax Description**

| | |
|---|---|
| **interface** *interface-id* | (Optional) Module and port number of the interface. |

**Defaults**

This command has no default settings.

**Command Modes**

Privileged EXEC mode

**Command History**

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

**Usage Guidelines**

You can use this command to reauthenticate a client without waiting for the configured number of seconds between reauthentication attempts (re-authperiod) and automatic reauthentication.

**Examples**

This example shows how to manually reauthenticate the device connected to Gigabit Ethernet interface 1/1:

```
Switch# dot1x re-authenticate interface gigabitethernet1/1
Starting reauthentication on gigabitethernet1/1
Switch#
```

# dot1x re-authentication

To enable the periodic reauthentication of the client, use the **dot1x re-authentication** command. To return to the default setting, use the **no** form of this command.

**dot1x re-authentication**

**no dot1x re-authentication**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The periodic reauthentication is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You configure the amount of time between the periodic reauthentication attempts by using the **dot1x timeout re-authperiod** global configuration command.

## Examples

This example shows how to disable the periodic reauthentication of the client:

```
Switch(config-if)# no dot1x re-authentication
Switch(config-if)#
```

This example shows how to enable the periodic reauthentication and set the number of seconds between the reauthentication attempts to 4000 seconds:

```
Switch(config-if)# dot1x re-authentication
Switch(config-if)# dot1x timeout re-authperiod 4000
Switch#
```

You can verify your settings by entering the **show dot1x** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| dot1x timeout | Sets the reauthentication timer. |
| show dot1x | Displays dot1x information. |

# dot1x system-auth-control

To enable 802.1X authentication on the switch, use the **dot1x system-auth-control** command. To disable 802.1X authentication on the system, use the **no** form of this command.

**dot1x system-auth-control**

**no dot1x system-auth-control**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The 802.1X authentication is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You must enable **dot1x system-auth-control** if you want to use the 802.1X access controls on any port on the switch. You can then use the **dot1x port-control auto** command on each specific port on which you want the 802.1X access controls to be used.

## Examples

This example shows how to enable 802.1X authentication:

```
Switch(config)# dot1x system-auth-control
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| dot1x initialize | Unauthorizes an interface before reinitializing 802.1X. |
| show dot1x | Displays dot1x information. |

# dot1x timeout

To set the reauthentication timer, use the **dot1x timeout** command. To return to the default setting, use the **no** form of this command.

**dot1x timeout** {**reauth-period** {*seconds* | **server**} | **quiet-period** *seconds* | **tx-period** *seconds* | **supp-timeout** *seconds* | **server-timeout** *seconds*}

**no dot1x timeout** {**reauth-period** | **quiet-period** | **tx-period** | **supp-timeout** | **server-timeout**}

## Syntax Description

| | |
|---|---|
| **reauth-period** *seconds* | Number of seconds between reauthentication attempts; valid values are from 1 to 65535. See the "Usage Guidelines" section for more information. |
| **reauth-period server** | Number of seconds between reauthentication attempts; valid values are from 1 to 65535 as derived from the Session-Timeout RADIUS attribute. See the "Usage Guidelines" section for more information. |
| **quiet-period** *seconds* | Number of seconds that the switch remains in the quiet state following a failed authentication exchange with the client; valid values are from 0 to 65535 seconds. |
| **tx-period** *seconds* | Number of seconds that the switch waits for a response to an EAP-request/identity frame from the client before retransmitting the request; valid values are from 1 to 65535 seconds. |
| **supp-timeout** *seconds* | Number of seconds that the switch waits for the retransmission of EAP-Request packets; valid values are from 30 to 65535 seconds. |
| **server-timeout** *seconds* | Number of seconds that the switch waits for the retransmission of packets by the back-end authenticator to the authentication server; valid values are from 30 to 65535 seconds. |

## Defaults

The default settings are as follows:

- Reauthentication period is 3600 seconds.
- Quiet period is 60 seconds.
- Transmission period is 30 seconds.
- Supplicant timeout is 30 seconds.
- Server timeout is 30 seconds.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12)EW | Support for this command was introduced on the Catalyst 4500 series switches. |
| 12.2(25)EWA | Support for selecting the reauthentication timer from the "server" was added. |

## Usage Guidelines

The periodic reauthentication must be enabled before entering the **dot1x timeout re-authperiod** command. Enter the **dot1x re-authentication** command to enable periodic reauthentication.

## Examples

This example shows how to set 60 as the number of seconds that the switch waits for a response to an EAP-request/identity frame from the client before retransmitting the request:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet4/3
Switch(config-if)# dot1x timeout tx-period 60
Switch(config-if)# end
Switch#
```

You can verify your settings by entering the **show dot1x** privileged EXEC command.

This example shows how to set up the switch to use a reauthentication timeout derived from a Session-Timeout attribute taken from the RADIUS Access-Accept message received when a host successfully authenticates via 802.1X:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet4/3
Switch(config-if)# dot1x timeout reauth-period server
Switch(config-if)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **dot1x initialize** | Unauthorizes an interface before reinitializing 802.1X. |
| **show dot1x** | Displays dot1x information. |

# duplex

To configure the duplex operation on an interface, use the **duplex** command. To return to the default setting, use the **no** form of this command.

**duplex** {**auto** | **full** | **half**}

**no duplex**

## Syntax Description

| | |
|---|---|
| **auto** | Specifies the autonegotiation operation. |
| **full** | Specifies the full-duplex operation. |
| **half** | Specifies the half-duplex operation. |

## Defaults

Half-duplex operation

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Table 2-1 lists the supported command options by interface.

*Table 2-1 Supported duplex Command Options*

| Interface Type | Supported Syntax | Default Setting | Guidelines |
|---|---|---|---|
| 10/100-Mbps module | **duplex** [**half** \| **full**] | **half** | If the speed is set to **auto**, you will not be able to set the **duplex** mode.<br>If the speed is set to **10** or **100**, and you do not configure the duplex setting, the duplex mode is set to **half** duplex. |
| 100-Mbps fiber modules | **duplex** [**half** \| **full**] | **half** | |
| Gigabit Ethernet Interface | Not supported. | Not supported. | Gigabit Ethernet interfaces are set to **full** duplex. |
| 10/100/1000 | **duplex** [**half** \| **full**] | | If the speed is set to **auto** or **1000**, you will not be able to set **duplex**.<br>If the speed is set to **10** or **100**, and you do not configure the duplex setting, the duplex mode is set to **half** duplex. |

If the transmission speed on a 16-port RJ-45 Gigabit Ethernet port is set to **1000**, the duplex mode is set to **full**. If the transmission speed is changed to **10** or **100**, the duplex mode stays at **full**. You must configure the correct duplex mode on the switch when the transmission speed changes to **10** or **100** from 1000 Mbps.

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

Table 2-2 describes the system performance for different combinations of the duplex and speed modes. The specified **duplex** command that is configured with the specified **speed** command produces the resulting action shown in the table.

*Table 2-2 Relationship Between duplex and speed Commands*

| duplex Command | speed Command | Resulting System Action |
|---|---|---|
| **duplex half** or **duplex full** | **speed auto** | Autonegotiates both speed and duplex modes |
| **duplex half** | **speed 10** | Forces 10 Mbps and half duplex |
| **duplex full** | **speed 10** | Forces 10 Mbps and full duplex |
| **duplex half** | **speed 100** | Forces 100 Mbps and half duplex |
| **duplex full** | **speed 100** | Forces 100 Mbps and full duplex |
| **duplex full** | **speed 1000** | Forces 1000 Mbps and full duplex |

## Examples

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

```
Switch(config-if)# duplex full
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **speed** | Configures the interface speed. |
| **interface** (refer to Cisco IOS documentation) | Configures an interface. |
| **show controllers** (refer to Cisco IOS documentation) | Displays controller information. |
| **show interfaces** | Displays interface information. |

# erase

To erase a file system, use the **erase** command.

**erase** {**/all** [**non-default** | **nvram:**] | **cat4000_flash** | **nvram:** | **startup-config**}

## Syntax Description

| | |
|---|---|
| **/all nvram**: | Erases everything in nvram:. |
| **/all non-default** | Erases files and configuration in non-volatile storage including nvram:, bootflash:, cat4000_flash:, and crashinfo: of the local supervisor engine. Resets the Catalyst 4500 series switch to the factory default settings.<br>**Note** This command option is intended to work only on a stand-alone supervisor engine. |
| **cat4000_flash:** | Erases the VLAN database configuration file. |
| **nvram:** | Erases the startup-config and private-config file in nvram. |
| **startup-config:** | Erases the startup-config and private-config file in nvram. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

**Caution** When you use the **erase** command to erase a file system, you cannot recover the files in the file system.

In addition to the command options shown above, options with the prefix slave that are used to identify nvram: and flash (like slavenvram: and slavecat4000_flash:) appear in the command help messages on the dual supervisor redundancy switch.

The **erase nvram:** command replaces the **write erase** and the **erase startup-confg** commands. Like these two commands, it erases both the startup-config and the private-config file.

The **erase /all nvram:** command erases all files in nvram: in addition to startup-config file and private-config file.

The **erase cat4000_flash:** command erases the VLAN database configuration file.

The **erase /all non-default** command facilitates the work of a manufacturing facility and repair center. It erases the configuration and states stored in the non-volatile storage and resets the Catalyst 4500 series switch to the factory default settings. The default settings include those mentioned in the IOS library (below) as well as those set by the **erase /all non-default** command (vtp mode=transparent, and the ROMMON variables: ConfigReg=0x2101, PS1= “rommon ! >” and EnableAutoConfig=1).

- *Cisco IOS Configuration Fundamentals Configuration Guide*, Release 12.2, at this URL:

  http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/fun_c/index.htm
- *Cisco IOS Configuration Fundamentals Configuration Command Reference*, Release 12.2, at this URL:

  http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122cgcr/fun_r/index.htm

**Caution** The erase /all non-default command can erase IOS images in bootflash:. Ensure that 1) an IOS image can be copied back to the bootflash: (such as, from a accessible TFTP server or a flash card inserted in slot0: (available on most chassis models), or 2) the switch can boot from a image stored in an accessible network server.

## Examples

This example shows how to erase the files and configuration in a non-volatile storage and reset the switch to factory default settings:

```
Switch# erase /all non-default
Switch#
Erase and format operation will destroy all data in non-volatile storage.  Continue?
[confirm]
Formatting bootflash: ...

Format of bootflash complete
Erasing nvram:
Erasing cat4000_flash:
Clearing crashinfo:data
Clearing the last power failure timestamp
Clearing all ROMMON variables
Setting default ROMMON variables:
     ConfigReg=0x2101
     PS1=rommon ! >
     EnableAutoConfig=1
Setting vtp mode to transparent
%WARNING! Please reboot the system for the changes to take effect
Switch#
00:01:48: %SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Switch#
```

This example shows how to erase the contents in nvram.

```
Switch# erase /all nvram:
Erasing the nvram filesystem will remove all files! Continue? [confirm]
[OK]
Erase of nvram: complete
Switch#
00:38:10: %SYS-7-NV_BLOCK_INIT: Initalized the geometry of nvram
Switch#
```

This example shows how to erase filesystem cat4000_flash.

```
Switch# erase cat4000_flash:
Erasing the cat4000_flash filesystem will remove all files! Continue? [confirm]
[OK]
Erase of cat4000_flash:complete
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **boot config** (refer to Cisco IOS documentation) | Specifies the device and filename of the configuration file. |
| **delete** (refer to Cisco IOS documentation) | Deletes a file from a Flash memory device or NVRAM. |
| **show bootvar** | Displays BOOT environment variable information. |
| **undelete** (refer to Cisco IOS documentation) | Recovers a file marked “deleted” on a Class A Flash file system. |

# errdisable detect

To enable error-disable detection, use the **errdisable detect** command. To disable the error-disable detection feature, use the **no** form of this command.

**errdisable detect cause** {**all** | **arp-inspection** | **dhcp-rate-limit** | **dtp-flap** | **gbic-invalid** | **l2ptguard** | **link-flap** | **pagp-flap**}

**no errdisable detect cause** {**all** | **arp-inspection** | **dhcp-rate-limit** | **dtp-flap** | **gbic-invalid** | **l2ptguard** | **link-flap** | **pagp-flap**}

## Syntax Description

| | |
|---|---|
| **cause** | Specifies error-disable detection to detect from a specific cause. |
| **all** | Specifies error-disable detection for all error-disable causes. |
| **arp-inspection** | Specifies the detection for the ARP inspection error-disable cause. |
| **dhcp-rate-limit** | Specifies the detection for the DHCP rate-limit error-disable cause. |
| **dtp-flap** | Specifies the detection for the DTP flap error-disable cause. |
| **gbic-invalid** | Specifies the detection for the GBIC invalid error-disable cause. |
| **l2ptguard** | Specifies the detection for the Layer 2 protocol-tunnel error-disable cause. |
| **link-flap** | Specifies the detection for the link flap error-disable cause. |
| **pagp-flap** | Specifies the detection for the PAgP flap error-disable cause. |

## Defaults

All error-disable causes are detected.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

A cause (dtp-flap, link-flap, pagp-flap) is defined as the reason why the error-disabled state occurred. When a cause is detected on an interface, the interface is placed in error-disabled state (an operational state that is similar to link-down state).

You must enter the **shutdown** command and then the **no shutdown** command to recover an interface manually from the error-disable state.

## Examples

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

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

This example shows how to disable error-disable detection for DAI:

```
Switch(config)# no errdisable detect cause arp-inspection
Switch(config)# end
Switch# show errdisable detect
ErrDisable Reason    Detection status
-----------------    ----------------
udld                 Enabled
bpduguard            Enabled
security-violatio    Enabled
channel-misconfig    Disabled
psecure-violation    Enabled
vmps                 Enabled
pagp-flap            Enabled
dtp-flap             Enabled
link-flap            Enabled
l2ptguard            Enabled
gbic-invalid         Enabled
dhcp-rate-limit      Enabled
unicast-flood        Enabled
storm-control        Enabled
ilpower              Enabled
arp-inspection       Disabled
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show errdisable detect** | Displays the error disable detection status. |
| **show interfaces status** | Displays the interface status or a list of interfaces in error-disabled state. |

# errdisable recovery

To configure the recovery mechanism variables, use the **errdisable recovery** command. 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** | **l2ptguard** | **link-flap** | **pagp-flap** | **pesecure-violation** | **security-violation** | **storm-control** | **udld** | **unicastflood** | **vmps**} [**arp-inspection**] [**interval** {*interval*}]]

**no errdisable recovery** [**cause** {**all** | **arp-inspection** | **bpduguard** | **channel-misconfig** | **dhcp-rate-limit** | **dtp-flap** | **gbic-invalid** | **l2ptguard** | **link-flap** | **pagp-flap** | **pesecure-violation** | **security-violation** | **storm-control** | **udld** | **unicastflood** | **vmps**} [**arp-inspection**] [**interval** {*interval*}]]

## Syntax Description

| | |
|---|---|
| **cause** | (Optional) Enables the error-disable recovery to recover from a specific cause. |
| **all** | (Optional) Enables the recovery timers for all error-disable causes. |
| **arp-inspection** | (Optional) Enables the recovery timer for the ARP inspection cause. |
| **bpduguard** | (Optional) Enables the recovery timer for the BPDU guard error-disable cause. |
| **channel-misconfig** | (Optional) Enables the recovery timer for the channel-misconfig error-disable cause. |
| **dhcp-rate-limit** | (Optional) Enables the recovery timer for the DHCP rate limit error-disable cause. |
| **dtp-flap** | (Optional) Enables the recovery timer for the DTP flap error-disable cause. |
| **gbic-invalid** | (Optional) Enables the recovery timer for the GBIC invalid error-disable cause. |
| **l2ptguard** | (Optional) Enables the recovery timer for the Layer 2 protocol-tunnel error-disable cause. |
| **link-flap** | (Optional) Enables the recovery timer for the link flap error-disable cause. |
| **pagp-flap** | (Optional) Enables the recovery timer for the PAgP flap error-disable cause. |
| **pesecure-violation** | (Optional) Enables the recovery timer for the pesecure violation error-disable cause. |
| **security-violation** | (Optional) Enables the automatic recovery of ports disabled due to 802.1X security violations. |
| **storm-control** | (Optional) Enables the timer to recover from storm-control error-disable state. |
| **udld** | (Optional) Enables the recovery timer for the UDLD error-disable cause. |
| **unicastflood** | (Optional) Enables the recovery timer for the unicast flood error-disable cause. |
| **vmps** | (Optional) Enables the recovery timer for the VMPS error-disable cause. |
| **arp-inspection** | (Optional) Enables the ARP inspection cause and recovery timeout. |
| **interval** *interval* | (Optional) Specifies the time to recover from a specified error-disable cause; valid values are from 30 to 86400 seconds. |

**Defaults**

Error disable recovery is disabled.

The recovery interval is set to 300 seconds.

**Command Modes**

Configuration

**Command History**

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | Support for the storm-control feature. |

**Usage Guidelines**

A cause (bpduguard, dtp-flap, link-flap, pagp-flap, udld) is defined as the reason why the error-disabled state occurred. When a cause is detected on an interface, the interface is placed in error-disabled state (an operational state that is similar to the link-down state). If you do not enable error-disable recovery for the cause, the interface stays in the error-disabled state until a shutdown and no shutdown occurs. If you enable recovery for a cause, the interface is brought out of the error-disabled state and allowed to retry operation again once all the causes have timed out.

You must enter the **shutdown** command and then the **no shutdown** command to recover an interface manually from error disable.

**Examples**

This example shows how to enable the recovery timer for the BPDU guard error disable cause:

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

This example shows how to set the timer to 300 seconds:

```
Switch(config)# errdisable recovery interval 300
Switch(config)#
```

This example shows how to enable the errdisable recovery for arp-inspection:

```
Switch(config)# errdisable recovery cause arp-inspection
Switch(config)# end
Switch# show errdisable recovery
ErrDisable Reason    Timer Status
-----------------    --------------
udld                 Disabled
bpduguard            Disabled
security-violatio    Disabled
channel-misconfig    Disabled
vmps                 Disabled
pagp-flap            Disabled
dtp-flap             Disabled
link-flap            Disabled
l2ptguard            Disabled
psecure-violation    Disabled
gbic-invalid         Disabled
dhcp-rate-limit      Disabled
unicast-flood        Disabled
storm-control        Disabled
arp-inspection       Enabled
```

```
Timer interval: 300 seconds

Interfaces that will be enabled at the next timeout:

Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show errdisable detect** | Displays the error disable detection status. |
| **show errdisable recovery** | Displays error disable recovery timer information. |
| **show interfaces status** | Displays the interface status or a list of interfaces in error-disabled state. |

# flowcontrol

To configure a Gigabit Ethernet interface to send or receive pause frames, use the **flowcontrol** command. To disable the flow control setting, use the **no** form of this command.

**flowcontrol** {**receive** | **send**} {**off** | **on** | **desired**}

**no flowcontrol** {**receive** | **send**} {**off** | **on** | **desired**}

## Syntax Description

| | |
|---|---|
| **receive** | Specifies that the interface processes pause frames. |
| **send** | Specifies that the interface sends pause frames. |
| **off** | Prevents a local port from receiving and processing pause frames from remote ports or from sending pause frames to remote ports. |
| **on** | Enables a local port to receive and process pause frames from remote ports or send pause frames to remote ports. |
| **desired** | Obtains predictable results whether a remote port is set to on, off, or desired. |

## Defaults

The default settings for Gigabit Ethernet interfaces are as follows:

- Sending pause frames is off—non-oversubscribed Gigabit Ethernet interfaces.
- Receiving pause frames is desired—non-oversubscribed Gigabit Ethernet interfaces.
- Sending pause frames is on—Oversubscribed Gigabit Ethernet interfaces.
- Receiving pause frames is desired—Oversubscribed Gigabit Ethernet interfaces

Table 2-3 shows the default settings for the modules.

*Table 2-3 Default Module Settings*

| Module | Ports | Send |
|---|---|---|
| All modules except WS-X4418-GB and WS-X4416-2GB-TX | All ports except for the oversubscribed ports | Off |
| WS-X4418-GB | Uplink ports (1–2) | Off |
| WS-X4418-GB | Oversubscribed ports (3–18) | On |
| WS-X4412-2GB-TX | Uplink ports (13–14) | Off |
| WS-X4412-2GB-TX | Oversubscribed ports (1–12) | On |
| WS-X4416-2GB-TX | Uplink ports (17–18) | Off |

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The pause frames are special packets that signal a source to stop sending frames for a specific period of time because the buffers are full.

Table 2-4 describes the guidelines for using the different configurations of the **send** and **receive** keywords with the **flowcontrol** command.

*Table 2-4 Keyword Configurations for send and receive*

| Configuration | Description |
|---|---|
| **send on** | Enables a local port to send pause frames to remote ports. To obtain predictable results, use **send on** only when remote ports are set to **receive on** or **receive desired**. |
| **send off** | Prevents a local port from sending pause frames to remote ports. To obtain predictable results, use **send off** only when remote ports are set to **receive off** or **receive desired**. |
| **send desired** | Obtains predictable results whether a remote port is set to **receive on**, **receive off**, or **receive desired**. |
| **receive on** | Enables a local port to process pause frames that a remote port sends. To obtain predictable results, use **receive on** only when remote ports are set to **send on** or **send desired**. |
| **receive off** | Prevents remote ports from sending pause frames to a local port. To obtain predictable results, use **send off** only when remote ports are set to **receive off** or **receive desired**. |
| **receive desired** | Obtains predictable results whether a remote port is set to **send on**, **send off**, or **send desired**. |

Table 2-5 identifies how the flow control will be forced or negotiated on the Gigabit Ethernet interfaces based on their speed settings.

*Table 2-5 Send Capability by Switch Type, Module, and Port*

| Interface Type | Configured Speed | Advertised Flow Control |
|---|---|---|
| 10/100/1000BASE-TX | Speed 1000 | Configured flow control always |
| 1000BASE-T | Negotiation always enabled | Configured flow control always negotiated |
| 1000BASE-X | No speed nonegotiation | Configured flow control negotiated |
| 1000BASE-X | Speed nonegotiation | Configured flow control forced |

## Examples

This example shows how to enable send flow control:

```
Switch(config-if)# flowcontrol receive on
Switch(config-if)#
```

This example shows how to disable send flow control:

```
Switch(config-if)# flowcontrol send off
Switch(config-if)#
```

This example shows how to set receive flow control to desired:

```
Switch(config-if)# flowcontrol receive desired
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **interface port-channel** | Accesses or creates a port-channel interface. |
| **interface range** | Runs a command on multiple ports at the same time. |
| **show flowcontrol** | Displays the per-interface status and statistics related to flow control. |
| **show running-config** | Displays the running-configuration for a switch. |
| **speed** | Configures the interface speed. |

# hardware statistics

To enable TCAM hardware statistics in your ACLs use the **hardware statistics** command. To disable TCAM hardware statistics, use the **no** form of this command.

**hardware statistics**

**no hardware statistics**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Hardware statistics is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | Support for the Supervisor Engine 6-E and Catalyst 4900M chassis is introduced. |

## Usage Guidelines

The Supervisor Engine 6-E and Catalyst 4900M chassis TCAM hardware does not have enough hardware statistics entries for every classification/QoS cam entry. Therefore, the statistics for each cam entry needs to be enabled as needed.

## Examples

This example shows how to enable TCAM hardware statistics in your ACLs ace:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ip access-list extended myv4
Switch(config-ext-nacl)#permit ip any any
Switch(config-ext-nacl)#hardware statistics
Switch(config-ext-nacl)#end
```

## Related Commands

| Command | Description |
|---|---|
| **ip access list** (refer to Cisco IOS documentation) | Creates an IP ACL (Access Control List). |
| **ipv6 access list** (refer to Cisco IOS documentation) | Creates an IPv6 ACL. |
| **mac access-list extended** | Defines the extended MAC access lists. |

# hw-module port-group

To select either Gigabit Ethernet or Ten Gigabit Ethernet interfaces on your module, use the **hw-module port-group** command.

**hw-module module** *number* **port-group** *number* **select** [**gigabitethernet** | **tengigabitethernet**]

## Syntax Description

| | |
|---|---|
| **module** | Specifies a line module. |
| *number* | Specifies a module which supports TwinGig converter. |
| **port-group** *number* | Port-group number on a switch. |
| **select** | Specifies an interface type; valid values are Gigabit Ethernet and 10-Gigabit Ethernet. |
| **gigabitethernet** | (Optional) Specifies Gigabit Ethernet. |
| **tengigabitethernet** | (Optional) Specifies 10-Gigabit Ethernet. |

## Defaults

10 Gigabit.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | Support for TwinGig converter module introduced. |

## Usage Guidelines

Support for this command is available on the Cisco Catalyst 4500 modules that support TwinGig converter modules. Such as, the Supervisor Engine 6-E and WS-X4606-10GE-E.

## Examples

This example shows how to select Gigabit Ethernet interfaces on a WS-X4606-10GE-E using the TwinGig Converter:

```
Switch# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# hw-module module 1 port-group 1 select gigabitethernet
Switch(config)# exit
```

Use the **show interfaces status** command to display your configuration.

## Related Commands

| Command | Description |
|---|---|
| **show hw-module port-group** | Displays how the X2 holes on a module are grouped. |
| **show interfaces status** | Displays the interface status or a list of interfaces in error-disabled state. |

# hw-module power

To turn the power off on a slot or line module, use the **no hw-module power** command. To turn the power back on, use the **hw-module power** command.

**hw-module** [**slot** | **module**] *number* **power**

**no hw-module** [**slot** | **module**] *number* **power**

## Syntax Description

| | |
|---|---|
| **slot** | (Optional) Specifies a slot on a chassis. |
| **module** | (Optional) Specifies a line module. |
| *number* | (Optional) Slot or module number. |

## Defaults

After a boot up, the power is on.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(18)EW | Add slot and module keywords. |

## Examples

This example shows how to shut off power to a module in slot 5:

```
Switch# no hw-module slot 5 power
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| clear hw-module slot password | Clears the password on an intelligent line module. |

# hw-module uplink mode shared-backplane

To change the uplink mode so that you can use all four Ten-Gigabit Ethernet ports as blocking ports on the Supervisor Engine 6-E and Catalyst 4900M chassis when operating in redundant mode, use the **hw-module uplink mode shared-backplane** command.

To disable shared-backplane uplink mode, use the **no** form of the command.

**[no] hw-module uplink mode shared-backplane**

## Syntax Description

This command has no keywords or arguments.

## Defaults

Only two Ten-Gigabit Ethernet ports OR four One-Gigabit Ethernet ports can be used on the supervisor engine.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(44)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

When changing the uplink mode using the **hw-module uplink mode shared-backplane** command, you must reload the system. A message is printed on the console to reflect this.

## Examples

This example shows how to enable shared-backplane uplink mode:

```
Switch(config)# hw-module uplink mode shared-backplane
A reload of the active supervisor is required to apply the new configuration.
Switch(config)# exit
Switch#
```

This example shows how to disable shared-backplane uplink mode:

```
Switch(config)# no hw-module uplink mode shared-backplane
A reload of the active supervisor is required to apply the new configuration.
Switch(config)# exit
Switch#
```

This example shows how to display the current state of uplink-mode:

```
Switch# show hw-module uplink
Active uplink mode configuration is Default
(will be Shared-backplane after next reload)

A reload of active supervisor is required to apply the new configuration.
```

**Related Commands**

| Command | Description |
|---|---|
| show hw-module uplink | Displays hw-module uplink information. |

# hw-module uplink select

To select the 10-Gigabit Ethernet or Gigabit Ethernet uplinks on the Supervisor Engine V-10GE within the W-C4510R chassis, use the **hw-module uplink select** command.

**hw-module uplink select** {**tengigabitethernet** | **gigabitethernet** | **all**}

## Syntax Description

| | |
|---|---|
| **tengigabitethernet** | (Optional) Specifies the 10-Gigabit Ethernet uplinks. |
| **gigabitethernet** | (Optional) Specifies the Gigabit Ethernet uplinks. |
| **all** | (Optional) Specifies all uplinks (10-Gigabit Ethernet and Gigabit Ethernet). |

## Defaults

tengigabitethernet

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)SG | Support for the **all** keyword was added. |

## Usage Guidelines

On a Supervisor Engine V-10GE (WS-X4516-10GE) in a 10 slot chassis (Catalyst 4510R and 4510R-E), if a startup configuration with a new uplink mode is copied into flash memory and the system is power cycled, the system will not come up with the new uplink mode. After copying the startup configuration with the new uplink mode into flash memory, the uplink mode must be changed to the new uplink mode through the command interface before the system is power cycled. This ensures that the system comes up in the new uplink mode.

Supervisor Engine V-10GE and Supervisor Engine II+10GE support 10-Gigabit Ethernet and Gigabit Ethernet uplink ports. On the Supervisor Engine II+10GE, all uplink ports are always available. Similarly, when a Supervisor Engine V-10GE is plugged into a W-C4503, W-4506, or W-4507R chassis, all uplink ports are always available. When a Supervisor Engine V-10GE is plugged into a W-4510R chassis, you can choose to use the 10-Gigabit Ethernet uplink ports, the Gigabit Ethernet uplink ports, or all uplink ports. If you choose to use all uplink ports, then the tenth slot will support only the WS-X4302-GB switching linecard. Be aware that this command takes effect only after a reload (after you have executed the **redundancy reload shelf** command).

Because the uplink selection is programmed into hardware during initialization, changing the active uplinks requires saving the configuration and reloading the switch. When you are configuring a change to the uplinks, the system responds with a message informing you that the switch must be reloaded and suggesting the appropriate command (depending on redundancy mode) to reload the switch.

If you select the **all** keyword, ensure that the tenth slot is either empty or has a WS-X4302-GB switching module.

A **no** form of this command does not exist. To undo the configuration, you must configure the uplinks.

## Examples

This example shows how to select the Gigabit Ethernet uplinks:

```
Switch(config)# hw-module uplink select gigabitethernet
A reload of the active supervisor is required to apply the new configuration.
Switch(config)# exit
Switch#
```

**Note** The Gigabit Ethernet uplinks will be active after the next reload.

This example shows how to select the Gigabit Ethernet uplinks in a redundant system in SSO mode:

```
Switch(config)# hw-module uplink select gigabitethernet
A 'redundancy reload shelf' or power-cycle of chassis is required to apply the new
configuration
Switch(config)# exit
Switch#
```

**Note** The Gigabit Ethernet uplinks will be active after the next reload of the chassis/shelf. Use the **redundancy reload shelf** command to reload the chassis/shelf.

This example shows how to select the Gigabit Ethernet uplinks in a redundant system in RPR mode:

```
Switch(config)# hw-module uplink select gigabitethernet
A reload of the active supervisor is required to apply the new configuration.
Switch(config)# exit
Switch#
```

**Note** The Gigabit Ethernet uplinks will be active on a switchover or reload of the active supervisor engine.

This example shows how to select all the uplinks in a redundant system in SSO mode:

```
Switch(config)# hw-module uplink select all
Warning: This configuration mode may disable slot10.
A 'redundancy reload shelf' or power-cycle of chassis is required to apply the new
configuration.
Switch(config)# exit
Switch#
```

**Note** If you select the **all** keyword, only the Drome board will be supported in the tenth slot of the supervisor engine.

## Related Commands

| Command | Description |
|---|---|
| show hw-module uplink | Displays hw-module uplink information. |

# instance

To map a VLAN or a set of VLANs to an MST instance, use the **instance** command. To return the VLANs to the common instance default, use the **no** form of this command.

**instance** *instance-id* {**vlans** *vlan-range*}

**no instance** *instance-id*

## Syntax Description

| | |
|---|---|
| *instance-id* | MST instance to which the specified VLANs are mapped; valid values are from 0 to 15. |
| **vlans** *vlan-range* | Specifies the number of the VLANs to be mapped to the specified instance. The number is entered as a single value or a range; valid values are from 1 to 4094. |

## Defaults

Mapping is disabled.

## Command Modes

MST configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The mapping is incremental, not absolute. When you enter a range of VLANs, this range is added or removed to the existing ones.

Any unmapped VLAN is mapped to the CIST instance.

## Examples

This example shows how to map a range of VLANs to instance 2:

```
Switch(config-mst)# instance 2 vlans 1-100
Switch(config-mst)#
```

This example shows how to map a VLAN to instance 5:

```
Switch(config-mst)# instance 5 vlans 1100
Switch(config-mst)#
```

This example shows how to move a range of VLANs from instance 2 to the CIST instance:

```
Switch(config-mst)# no instance 2 vlans 40-60
Switch(config-mst)#
```

This example shows how to move all the VLANs mapped to instance 2 back to the CIST instance:

```
Switch(config-mst)# no instance 2
Switch(config-mst)#
```

## Related Commands

| Command | Description |
|---|---|
| **name** | Sets the MST region name. |
| **revision** | Sets the MST configuration revision number. |
| **show spanning-tree mst** | Displays MST protocol information. |
| **spanning-tree mst configuration** | Enters the MST configuration submode. |

# interface

To select an interface to configure and to enter interface configuration mode, use the **interface** command.

**interface** *type number*

## Syntax Description

| | |
|---|---|
| *type* | Type of interface to be configured; see Table 2-6 for valid values. |
| *number* | Module and port number. |

## Defaults

No interface types are configured.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EW | Extended to include the 10-Gigabit Ethernet interface. |

## Usage Guidelines

Table 2-6 lists the valid values for *type*.

***Table 2-6 Valid type Values***

| Keyword | Definition |
|---|---|
| **ethernet** | Ethernet IEEE 802.3 interface. |
| **fastethernet** | 100-Mbps Ethernet interface. |
| **gigabitethernet** | Gigabit Ethernet IEEE 802.3z interface. |
| **tengigabitethernet** | 10-Gigabit Ethernet IEEE 802.3ae interface. |
| **ge-wan** | Gigabit Ethernet WAN IEEE 802.3z interface; supported on Catalyst 4500 series switches that are configured with a Supervisor Engine 2 only. |
| **pos** | Packet OC-3 interface on the Packet over SONET Interface Processor; supported on Catalyst 4500 series switches that are configured with a Supervisor Engine 2 only. |
| **atm** | ATM interface; supported on Catalyst 4500 series switches that are configured with a Supervisor Engine 2 only. |
| **vlan** | VLAN interface; see the **interface vlan** command. |
| **port-channel** | Port channel interface; see the **interface port-channel** command. |
| **null** | Null interface; the valid value is **0**. |

## Examples

This example shows how to enter the interface configuration mode on the Fast Ethernet interface 2/4:

```
Switch(config)# interface fastethernet2/4
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces | Displays interface information. |

# interface port-channel

To access or create a port-channel interface, use the **interface port-channel** command.

**interface port-channel** *channel-group*

## Syntax Description

| | |
|---|---|
| *channel-group* | Port-channel group number; valid values are from 1 to 64. |

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You do not have to create a port-channel interface before assigning a physical interface to a channel group. A port-channel interface is created automatically when the channel group gets its first physical interface, if it is not already created.

You can also create the port channels by entering the **interface port-channel** command. This will create a Layer 3 port channel. To change the Layer 3 port channel into a Layer 2 port channel, use the **switchport** command before you assign the physical interfaces to the channel group. A port channel cannot be changed from Layer 3 to Layer 2 or vice versa when it contains member ports.

Only one port channel in a channel group is allowed.

**Caution** The Layer 3 port-channel interface is the routed interface. Do not enable Layer 3 addresses on the physical Fast Ethernet interfaces.

If you want to use CDP, you must configure it only on the physical Fast Ethernet interface and not on the port-channel interface.

## Examples

This example creates a port-channel interface with a channel-group number of 64:

```
Switch(config)# interface port-channel 64
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **channel-group** | Assigns and configures an EtherChannel interface to an EtherChannel group. |
| **show etherchannel** | Displays EtherChannel information for a channel. |

# interface range

To run a command on multiple ports at the same time, use the **interface range** command.

**interface range** {**vlan** *vlan_id - vlan_id*} {*port-range* | **macro** *name*}

## Syntax Description

| | |
|---|---|
| **vlan** *vlan_id - vlan_id* | Specifies a VLAN range; valid values are from 1 to 4094. |
| *port-range* | Port range; for a list of valid values for *port-range*, see the "Usage Guidelines" section. |
| **macro** *name* | Specifies the name of a macro. |

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended VLAN addresses added. |

## Usage Guidelines

You can use the **interface range** command on the existing VLAN SVIs only. To display the VLAN SVIs, enter the **show running config** command. The VLANs that are not displayed cannot be used in the **interface range** command.

The values that are entered with the **interface range** command are applied to all the existing VLAN SVIs.

Before you can use a macro, you must define a range using the **define interface-range** command.

All configuration changes that are made to a port range are saved to NVRAM, but the port ranges that are created with the **interface range** command do not get saved to NVRAM.

You can enter the port range in two ways:

- Specifying up to five port ranges
- Specifying a previously defined macro

You can either specify the ports or the name of a port-range macro. A port range must consist of the same port type, and the ports within a range cannot span the modules.

You can define up to five port ranges on a single command; separate each range with a comma.

When you define a range, you must enter a space between the first port and the hyphen (-):

```
interface range gigabitethernet 5/1 -20, gigabitethernet4/5 -20.
```

Use these formats when entering the *port-range*:

- *interface-type* {*mod*}/{*first-port*} - {*last-port*}
- *interface-type* {*mod*}/{*first-port*} - {*last-port*}

Valid values for *interface-type* are as follows:

- **FastEthernet**
- **GigabitEthernet**
- **Vlan** *vlan_id*

You cannot specify both a macro and an interface range in the same command. After creating a macro, you can enter additional ranges. If you have already entered an interface range, the CLI does not allow you to enter a macro.

You can specify a single interface in the *port-range* value. This makes the command similar to the **interface** *interface-number* command.

## Examples

This example shows how to use the **interface range** command to interface to FE 5/18 - 20:

```
Switch(config)# interface range fastethernet 5/18 - 20
Switch(config-if)#
```

This command shows how to run a port-range macro:

```
Switch(config)# interface range macro macro1
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **define interface-range** | Creates a macro of interfaces. |
| **show running config** (refer to Cisco IOS documentation) | Displays the running configuration for a switch. |

# interface vlan

To create or access a Layer 3 switch virtual interface (SVI), use the **interface vlan** command. To delete an SVI, use the **no** form of this command.

**interface vlan** *vlan_id*

**no interface vlan** *vlan_id*

## Syntax Description

| | |
|---|---|
| *vlan_id* | Number of the VLAN; valid values are from 1 to 4094. |

## Defaults

Fast EtherChannel is not specified.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended addressing was added. |

## Usage Guidelines

The SVIs are created the first time that you enter the **interface vlan** *vlan_id* command for a particular VLAN. The *vlan_id* value corresponds to the VLAN tag that is associated with the data frames on an ISL or 802.1Q-encapsulated trunk or the VLAN ID that is configured for an access port. A message is displayed whenever a VLAN interface is newly created, so you can check that you entered the correct VLAN number.

If you delete an SVI by entering the **no interface vlan** *vlan_id* command, the associated interface is forced into an administrative down state and marked as deleted. The deleted interface will no longer be visible in a **show interface** command.

You can reinstate a deleted SVI by entering the **interface vlan** *vlan_id* command for the deleted interface. The interface comes back up, but much of the previous configuration will be gone.

## Examples

This example shows the output when you enter the **interface vlan** *vlan_id* command for a new VLAN number:

```
Switch(config)# interface vlan 23
% Creating new VLAN interface.
Switch(config)#
```

# ip arp inspection filter vlan

To permit ARPs from hosts that are configured for static IP when DAI is enabled and to define an ARP access list and apply it to a VLAN, use the **ip arp inspection filter vlan** command. To disable this application, use the **no** form of this command.

**ip arp inspection** *filter arp-acl-name* **vlan** *vlan-range* [*static*]

**no ip arp inspection** *filter arp-acl-name* **vlan** *vlan-range* [*static*]

## Syntax Description

| | |
|---|---|
| *arp-acl-name* | Access control list name. |
| *vlan-range* | VLAN number or range; valid values are from 1 to 4094. |
| *static* | (Optional) Specifies that the access control list should be applied statically. |

## Defaults

No defined ARP ACLs are applied to any VLAN.

## Command Modes

Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

When an ARP access control list is applied to a VLAN for dynamic ARP inspection, the ARP packets containing only the IP-to-Ethernet MAC bindings are compared against the ACLs. All other packet types are bridged in the incoming VLAN without validation.

This command specifies that the incoming ARP packets are compared against the ARP access control list, and the packets are permitted only if the access control list permits them.

If the access control lists deny the packets because of explicit denies, the packets are dropped. If the packets are denied because of an implicit deny, they are then matched against the list of DHCP bindings if the ACL is not applied statically.

## Examples

This example shows how to apply the ARP ACL “static-hosts” to VLAN 1 for DAI:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip arp inspection filter static-hosts vlan 1
Switch(config)# end
Switch#
Switch# show ip arp inspection vlan 1
Source Mac Validation      : Enabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled
```

```
 Vlan     Configuration    Operation   ACL Match          Static ACL
 ----     -------------    ---------   ---------          ----------
    1     Enabled          Active      static-hosts      No

 Vlan     ACL Logging      DHCP Logging
 ----     -----------      ------------
    1     Acl-Match        Deny
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| show ip arp inspection | Displays the status of dynamic ARP inspection for a specific range of VLANs. |

# ip arp inspection limit (interface)

To limit the rate of incoming ARP requests and responses on an interface and prevent DAI from consuming all of the system's resources in the event of a DoS attack, use the **ip arp inspection limit** command. To release the limit, use the **no** form of this command.

**ip arp inspection limit** {**rate** *pps* | **none**} [**burst interval** *seconds*]

**no ip arp inspection limit**

## Syntax Description

| | |
|---|---|
| **rate** *pps* | Specifies an upper limit on the number of incoming packets processed per second. The rate can range from 1 to 10000. |
| **none** | Specifies no upper limit on the rate of the incoming ARP packets that can be processed. |
| **burst interval** *seconds* | (Optional) Specifies the consecutive interval in seconds over which the interface is monitored for the high rate of the ARP packets. The interval is configurable from 1 to 15 seconds. |

## Defaults

The rate is set to 15 packets per second on the untrusted interfaces, assuming that the network is a switched network with a host connecting to as many as 15 new hosts per second.

The rate is unlimited on all the trusted interfaces.

The burst interval is set to 1 second by default.

## Command Modes

Interface

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(20)EW | Added support for interface monitoring. |

## Usage Guidelines

The trunk ports should be configured with higher rates to reflect their aggregation. When the rate of the incoming packets exceeds the user-configured rate, the interface is placed into an error-disabled state. The error-disable timeout feature can be used to remove the port from the error-disabled state. The rate applies to both the trusted and nontrusted interfaces. Configure appropriate rates on trunks to handle the packets across multiple DAI-enabled VLANs or use the **none** keyword to make the rate unlimited.

The rate of the incoming ARP packets onthe channel ports is equal to the sum of the incoming rate of packets from all the channel members. Configure the rate limit for the channel ports only after examining the rate of the incoming ARP packets on the channel members.

After a switch receives more than the configured rate of packets every second consecutively over a period of burst seconds, the interface is placed into an error-disabled state.

## Examples

This example shows how to limit the rate of the incoming ARP requests to 25 packets per second:

```
Switch# config terminal
Switch(config)# interface fa6/3
Switch(config-if)# ip arp inspection limit rate 25
Switch(config-if)# end
Switch# show ip arp inspection interfaces fastEthernet 6/3
Interface        Trust State     Rate (pps)
 ---------------  -----------     ----------
 Fa6/3            Trusted                25
Switch#
```

This example shows how to limit the rate of the incoming ARP requests to 20 packets per second and to set the interface monitoring interval to 5 consecutive seconds:

```
Switch# config terminal
Switch(config)# interface fa6/1
Switch(config-if)# ip arp inspection limit rate 20 burst interval 5
Switch(config-if)# end
```

## Related Commands

| Command | Description |
|---|---|
| show ip arp inspection | Displays the status of dynamic ARP inspection for a specific range of VLANs. |

# ip arp inspection log-buffer

To configure the parameters that are associated with the logging buffer, use the **ip arp inspection log-buffer** command. To disable the parameters, use the **no** form of this command.

**ip arp inspection log-buffer** {**entries** *number* | **logs** *number* **interval** *seconds*}

**no ip arp inspection log-buffer** {**entries** | **logs**}

## Syntax Description

| | |
|---|---|
| **entries** *number* | Number of entries from the logging buffer; the range is from 0 to 1024. |
| **logs** *number* | Number of entries to be logged in an interval; the range is from 0 to 1024. A 0 value indicates that entries should not be logged out of this buffer. |
| **interval** *seconds* | Logging rate; the range is from 0 to 86400 (1 day). A 0 value indicates an immediate log. |

## Defaults

When dynamic ARP inspection is enabled, denied, or dropped, the ARP packets are logged.

The number of entries is set to 32.

The number of logging entries is limited to 5 per second.

The interval is set to 1.

## Command Modes

Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The first dropped packet of a given flow is logged immediately. The subsequent packets for the same flow are registered but are not logged immediately. Registering these packets is done in a log buffer that is shared by all the VLANs. Entries from this buffer are logged on a rate-controlled basis.

## Examples

This example shows how to configure the logging buffer to hold up to 45 entries:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip arp inspection log-buffer entries 45
Switch(config)# end
Switch# show ip arp inspection log
Total Log Buffer Size : 45
Syslog rate : 5 entries per 1 seconds.
No entries in log buffer.
Switch#
```

This example shows how to configure the logging rate to 10 logs per 3 seconds:

```
Switch(config)# ip arp inspection log-buffer logs 10 interval 3
Switch(config)# end
Switch# show ip arp inspection log
Total Log Buffer Size : 45
Syslog rate : 10 entries per 3 seconds.
No entries in log buffer.
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| show ip arp inspection | Displays the status of dynamic ARP inspection for a specific range of VLANs. |

# ip arp inspection trust

To set a per-port configurable trust state that determines the set of interfaces where incoming ARP packets are inspected, use the **ip arp inspection trust** command. To make the interfaces untrusted, use the **no** form of this command.

**ip arp inspection trust**

**no ip arp inspection trust**

## Syntax Description

This command has no arguments or keywords.

## Defaults

None

## Command Modes

Interface

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to configure an interface to be trusted:

```
Switch# config terminal
Switch(config)# interface fastEthernet 6/3
Switch(config-if)# ip arp inspection trust
Switch(config-if)# end
```

To verify the configuration, use the show form of this command:

```
Switch# show ip arp inspection interfaces fastEthernet 6/3

 Interface        Trust State     Rate (pps)     Burst Interval
 ---------------  -----------     ----------     --------------
 Fa6/3            Trusted              None                  1
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show ip arp inspection | Displays the status of dynamic ARP inspection for a specific range of VLANs. |

# ip arp inspection validate

To perform specific checks for ARP inspection, use the **ip arp inspection validate** command. To disable checks, use the **no** form of this command.

**ip arp inspection validate** [**src-mac**] [**dst-mac**] [**ip**]

**no ip arp inspection validate** [**src-mac**] [**dst-mac**] [**ip**]

## Syntax Description

| | |
|---|---|
| **src-mac** | (Optional) Checks the source MAC address in the Ethernet header against the sender's MAC address in the ARP body. This checking is done against both ARP requests and responses.<br>**Note** When **src-mac** is enabled, packets with different MAC addresses are classified as invalid and are dropped. |
| **dst-mac** | (Optional) Checks the destination MAC address in the Ethernet header against the target MAC address in ARP body. This checking is done for ARP responses.<br>**Note** When **dst-mac** is enabled, the packets with different MAC addresses are classified as invalid and are dropped. |
| **ip** | (Optional) Checks the ARP body for invalid and unexpected IP addresses. Addresses include 0.0.0.0, 255.255.255.255, and all IP multicast addresses.<br>The sender IP addresses are checked in all ARP requests and responses and target IP addresses are checked only in ARP responses. |

## Defaults

Checks are disabled.

## Command Modes

Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

When enabling the checks, specify at least one of the keywords (**src-mac**, **dst-mac**, and **ip**) on the command line. Each command overrides the configuration of the previous command. If a command enables **src** and **dst mac** validations, and a second command enables IP validation only, the **src** and **dst mac** validations are disabled as a result of the second command.

The **no** form of this command disables only the specified checks. If none of the check options are enabled, all the checks are disabled.

## Examples

This example show how to enable the source MAC validation:

```
Switch(config)# ip arp inspection validate src-mac
Switch(config)# end
Switch# show ip arp inspection vlan 1
Source Mac Validation      : Enabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled

 Vlan     Configuration    Operation   ACL Match          Static ACL
 ----     -------------    ---------   ---------          ----------
    1     Enabled          Active

 Vlan     ACL Logging      DHCP Logging
 ----     -----------      ------------
    1     Deny             Deny
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| show ip arp inspection | Displays the status of dynamic ARP inspection for a specific range of VLANs. |

# ip arp inspection vlan

To enable dynamic ARP inspection (DAI) on a per-VLAN basis, use the **ip arp inspection vlan** command. To disable DAI, use the **no** form of this command.

**ip arp inspection vlan** *vlan-range*

**no ip arp inspection vlan** *vlan-range*

## Syntax Description

| | |
|---|---|
| *vlan-range* | VLAN number or range; valid values are from 1 to 4094. |

## Defaults

ARP inspection is disabled on all VLANs.

## Command Modes

Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You must specify on which VLANs to enable DAI. DAI may not function on the configured VLANs if they have not been created or if they are private.

## Examples

This example shows how to enable DAI on VLAN 1:

```
Switch# configure terminal
Switch(config)# ip arp inspection vlan 1
Switch(config)# end
Switch# show ip arp inspection vlan 1

Source Mac Validation      : Disabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled
Vlan     Configuration    Operation   ACL Match          Static ACL
 ----     -------------    ---------   ---------          ----------
    1     Enabled          Active
Vlan     ACL Logging      DHCP Logging
 ----     -----------      ------------
    1     Deny             Deny
Switch#
```

This example shows how to disable DAI on VLAN 1:

```
Switch# configure terminal
Switch(config)# no ip arp inspection vlan 1
Switch(config)#
```

**Related Commands**

| Command | Description |
|---|---|
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| show ip arp inspection | Displays the status of dynamic ARP inspection for a specific range of VLANs. |

# ip arp inspection vlan logging

To control the type of packets that are logged, use the **ip arp inspection vlan logging** command. To disable this logging control, use the **no** form of this command.

**ip arp inspection vlan** *vlan-range* **logging** {**acl-match** {**matchlog** | **none**} | **dhcp-bindings** {**permit** | **all** | **none**}}

**no ip arp inspection vlan** *vlan-range* **logging** {**acl-match** | **dhcp-bindings**}

## Syntax Description

| | |
|---|---|
| *vlan-range* | Number of the VLANs to be mapped to the specified instance. The number is entered as a single value or a range; valid values are from 1 to 4094. |
| **acl-match** | Specifies the logging criteria for packets that are dropped or permitted based on ACL matches. |
| **matchlog** | Specifies that logging of packets matched against ACLs is controlled by the **matchlog** keyword in the permit and deny access control entries of the ACL.<br>**Note** By default, the **matchlog** keyword is not available on the ACEs. When the keyword is used, denied packets are not logged. Packets are logged only when they match against an ACE that has the **matchlog** keyword. |
| **none** | Specifies that ACL-matched packets are not logged. |
| **dhcp-bindings** | Specifies the logging criteria for packets dropped or permitted based on matches against the DHCP bindings. |
| **permit** | Specifies logging when permitted by DHCP bindings. |
| **all** | Specifies logging when permitted or denied by DHCP bindings. |
| **none** | Prevents all logging of packets permitted or denied by DHCP bindings. |

## Defaults

All denied or dropped packets are logged.

## Command Modes

Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **acl-match** and **dhcp-bindings** keywords merge with each other. When you set an ACL match configuration, the DHCP bindings configuration is not disabled. You can use the **no** form of this command to reset some of the logging criteria to their defaults. If you do not specify either option, all the logging types are reset to log on when the ARP packets are denied. The two options that are available to you are as follows:

- **acl-match**—Logging on ACL matches is reset to log on deny
- **dhcp-bindings**—Logging on DHCP binding compared is reset to log on deny

## Examples

This example shows how to configure an ARP inspection on VLAN 1 to add packets to a log on matching against the ACLs with the **logging** keyword:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip arp inspection vlan 1 logging acl-match matchlog
Switch(config)# end
Switch# show ip arp inspection vlan 1

Source Mac Validation      : Enabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled

 Vlan     Configuration    Operation   ACL Match          Static ACL
 ----     -------------    ---------   ---------          ----------
    1     Enabled          Active

 Vlan     ACL Logging      DHCP Logging
 ----     -----------      ------------
    1     Acl-Match        Deny
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| show ip arp inspection | Displays the status of dynamic ARP inspection for a specific range of VLANs. |

# ip cef load-sharing algorithm

To configure the load-sharing hash function so that the source TCP/UDP port, the destination TCP/UDP port, or both ports can be included in the hash in addition to the source and destination IP addresses, use the **ip cef load-sharing algorithm** command. To revert back to the default, which does not include the ports, use the **no** form of this command.

**ip cef load-sharing algorithm** {**include-ports** {**source** *source* | **destination** *dest*} | **original** | **tunnel** | **universal**}

**no ip cef load-sharing algorithm** {**include-ports** {**source** *source* | **destination** *dest*} | **original** | **tunnel** | **universal**}

## Syntax Description

| | |
|---|---|
| **include-ports** | Specifies the algorithm that includes the Layer 4 ports. |
| **source** *source* | Specifies the source port in the load-balancing hash functions. |
| **destination** *dest* | Specifies the destination port in the load-balancing hash. Uses the source and destination in hash functions. |
| **original** | Specifies the original algorithm; not recommended. |
| **tunnel** | Specifies the algorithm for use in tunnel-only environments. |
| **universal** | Specifies the default Cisco IOS load-sharing algorithm. |

## Defaults

Default load-sharing algorithm is disabled.

**Note** This option does not include the source or destination port in the load-balancing hash.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The original algorithm, tunnel algorithm, and universal algorithm are routed through the hardware. For software-routed packets, the algorithms are handled by the software. The **include-ports** option does not apply to the software-switched traffic.

## Examples

This example shows how to configure the IP CEF load-sharing algorithm that includes Layer 4 ports:

```
Switch(config)# ip cef load-sharing algorithm include-ports
Switch(config)#
```

This example shows how to configure the IP CEF load-sharing algorithm that includes Layer 4 tunneling ports:

```
Switch(config)# ip cef load-sharing algorithm include-ports tunnel
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| show ip cef vlan | Displays the IP CEF VLAN interface status and configuration information. |

# ip device tracking maximum

To enable IP port security binding tracking on a Layer 2 port, use the **ip device tracking maximum** command. To disable IP port security on untrusted Layer 2 interfaces, use the **no** form of this command.

**ip device tracking maximum** {*number*}

**no ip device tracking maximum** {*number*}

## Syntax Description

| | |
|---|---|
| *number* | Specifies the number of bindings created in the IP device tracking table for a port, valid values are from 0 to 2048. |

## Defaults

This command has no default settings.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(37)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable IP Port Security with IP-Mac filters on a Layer 2 access port:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip device tracking
Switch(config)# interface fastethernet 4/3
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 1
Switch(config-if)# ip device tracking maximum 5
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security maximum 5
Switch(config-if)# ip verify source tracking port-security
Switch(config-if)# end
```

You can verify your settings by entering the **show ip verify source** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| ip verify source | Enables IP source guard on untrusted Layer 2 interfaces. |
| show ip verify source | Displays the IP source guard configuration and filters on a particular interface. |

# ip dhcp snooping

To enable DHCP snooping globally, use the **ip dhcp snooping** command. To disable DHCP snooping, use the **no** form of this command.

**ip dhcp snooping**

**no ip dhcp snooping**

## Syntax Description

This command has no arguments or keywords.

## Defaults

DHCP snooping is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You must enable DHCP snooping globally before you can use DHCP snooping on a VLAN.

## Examples

This example shows how to enable DHCP snooping:

```
Switch(config)# ip dhcp snooping
Switch(config)#
```

This example shows how to disable DHCP snooping:

```
Switch(config)# no ip dhcp snooping
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping limit rate | Configures the number of the DHCP messages that an interface can receive per second. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# ip dhcp snooping binding

To set up and generate a DHCP binding configuration to restore bindings across reboots, use the **ip dhcp snooping binding** command. To disable the binding configuration, use the **no** form of this command.

**ip dhcp snooping binding** *mac-address* **vlan** *vlan-# ip-address* **interface** *interface* **expiry** *seconds*

**no ip dhcp snooping binding** *mac-address* **vlan** *vlan-# ip-address* **interface** *interface*

## Syntax Description

| | |
|---|---|
| *mac-address* | Specifies a MAC address. |
| **vlan** *vlan-#* | Specifies a valid VLAN number. |
| *ip-address* | Specifies an IP address. |
| **interface** *interface* | Specifies an interface type and number. |
| **expiry** *seconds* | Specifies the interval (in seconds) after which binding is no longer valid. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Whenever a binding is added or removed using this command, the binding database is marked as changed and a write is initiated.

## Examples

This example shows how to generate a DHCP binding configuration on interface gigabitethernet1/1 in VLAN 1 with an expiration time of 1000 seconds:

```
Switch# ip dhcp snooping binding 0001.1234.1234 vlan 1 172.20.50.5 interface gi1/1 expiry 1000
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **ip dhcp snooping** | Globally enables DHCP snooping. |
| **ip dhcp snooping information option** | Enables DHCP option 82 data insertion. |
| **ip dhcp snooping trust** | Enables DHCP snooping on a trusted VLAN. |
| **ip dhcp snooping vlan** | Enables DHCP snooping on a VLAN or a group of VLANs. |

| Command | Description |
|---|---|
| **show ip dhcp snooping** | Displays the DHCP snooping configuration. |
| **show ip dhcp snooping binding** | Displays the DHCP snooping binding entries. |

# ip dhcp snooping database

To store the bindings that are generated by DHCP snooping, use the **ip dhcp snooping database** command. To either reset the timeout, reset the write-delay, or delete the agent specified by the URL, use the **no** form of this command.

**ip dhcp snooping database** {*url* | **timeout** *seconds* | **write-delay** *seconds*}

**no ip dhcp snooping database** {**timeout** | **write-delay**}

## Syntax Description

| | |
|---|---|
| *url* | Specifies the URL in one of the following forms:<br>• tftp://<host>/<filename><br>• ftp://<user>:<password>@<host>/<filename><br>• rcp://<user>@<host>/<filename><br>• nvram:/<filename><br>• bootflash:/<filename> |
| **timeout** *seconds* | Specifies when to abort the database transfer process after a change to the binding database.<br>The minimum value of the delay is 15 seconds. 0 is defined as an infinite duration. |
| **write-delay** *seconds* | Specifies the duration for which the transfer should be delayed after a change to the binding database. |

## Defaults

The timeout value is set to 300 seconds (5 minutes).

The write-delay value is set to 300 seconds.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You need to create an empty file at the configured URL on network-based URLs (such as TFTP and FTP) before the switch can write the set of bindings for the first time at the URL.

**Note** Because both NVRAM and bootflash have limited storage capacity, using TFTP or network-based files is recommended . If you use flash to store the database file, new updates (by the agent) result in the creation of new files (flash fills quickly). In addition, due to the nature of the filesystem used on the flash, a large number of files cause access to be considerably slowed. When a file is stored in a remote location accessible through TFTP, an RPR/SSO standby supervisor engine can take over the binding list when a switchover occurs.

## Examples

This example shows how to store a database file with the IP address 10.1.1.1 within a directory called directory. A file named file must be present on the TFTP server.

```
Switch# config terminal
Switch(config)# ip dhcp snooping database tftp://10.1.1.1/directory/file
Switch(config)# end
Switch# show ip dhcp snooping database
Agent URL : tftp://10.1.1.1/directory/file
Write delay Timer : 300 seconds
Abort Timer : 300 seconds

Agent Running : Yes
Delay Timer Expiry : Not Running
Abort Timer Expiry : Not Running

Last Succeded Time : None
Last Failed Time : None
Last Failed Reason : No failure recorded.

Total Attempts       :        1   Startup Failures :        0
Successful Transfers :        0   Failed Transfers :        0
Successful Reads     :        0   Failed Reads     :        0
Successful Writes    :        0   Failed Writes    :        0
Media Failures       :        0

Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping binding | Sets up and generates a DHCP binding configuration to restore bindings across reboots. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# ip dhcp snooping information option

To enable DHCP option 82 data insertion, use the **ip dhcp snooping information option** command. To disable DHCP option 82 data insertion, use the **no** form of this command.

**ip dhcp snooping information option format remote-id** {**hostname** | **string** {*word*}}

**no ip dhcp snooping information option format remote-id** {**hostname** | **string** {*word*}}

## Syntax Description

| | |
|---|---|
| **format** | Specifies the Option 82 information format. |
| **remote-id** | Specifies the remote ID for Option 82. |
| **hostname** | Specifies the user-configured hostname for the remote ID. |
| **string** *word* | Specifies the user defined string for the remote ID. The word string can be from 1 to 63 characters long with no spaces. |

## Defaults

DHCP option 82 data insertion is enabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(40)SG | Added **remote-id** keyword to support Option 82 enhancement. |

## Usage Guidelines

If the hostname is longer than 63 characters it is truncated to 63 characters in the Remote ID.

## Examples

This example shows how to enable DHCP option 82 data insertion:

```
Switch(config)# ip dhcp snooping information option
Switch(config)#
```

This example shows how to disable DHCP option 82 data insertion:

```
Switch(config)# no ip dhcp snooping information option
Switch(config)#
```

This example shows how to configure the hostname as the Remote ID:

```
Switch(config)# ip dhcp snooping information option format remote-id hostname
Switch(config)#
```

The following example shows how to enable DHCP Snooping on Vlan 500 through 555 and Opton 82 remote-id.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# ip dhcp snooping
```

```
Switch(config)# ip dhcp snooping vlan 500 555
Switch(config)# ip dhcp snooping information option format remote-id string switch123
Switch(config)# interface GigabitEthernet 5/1
Switch(config-if)# ip dhcp snooping trust
Switch(config-if)# ip dhcp snooping limit rate 100
Switch(config-if)# ip dhcp snooping vlan 555 information option format-type circuit-id string customer-555
Switch(config-if)# interface FastEthernet 2/1
Switch(config-if)# ip dhcp snooping vlan 555 information option format-type circuit-id string customer-500
Switch(config)# end
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping limit rate | Configures the number of the DHCP messages that an interface can receive per second. |
| ip dhcp snooping binding | Sets up and generates a DHCP binding configuration to restore bindings across reboots. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |
| ip dhcp snooping vlan number information option format-type | Enables circuit-id (a sub-option of DHCP snooping option-82) on a VLAN. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# ip dhcp snooping information option allow-untrusted

To allow DHCP packets with option 82 data inserted to be received from a snooping untrusted port, use the **ip dhcp snooping information option allow-untrusted** command. To disallow receipt of these DHCP packets, use the **no** form of this command.

**ip dhcp snooping information option allow-untrusted**

**no ip dhcp snooping information option allow-untrusted**

## Syntax Description

This command has no arguments or keywords.

## Defaults

DHCP packets with option 82 are not allowed on snooping untrusted ports.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EWA | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to allow DHCP packets with option 82 data inserted to be received from a snooping untrusted port:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# ip dhcp snooping information option allow-untrusted
Switch(config)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping limit rate | Configures the number of the DHCP messages that an interface can receive per second. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# ip dhcp snooping limit rate

To configure the number of the DHCP messages that an interface can receive per second, use the **ip dhcp snooping limit rate** command. To disable the DHCP snooping rate limiting, use the **no** form of this command.

**ip dhcp snooping limit rate** *rate*

**no ip dhcp snooping limit rate**

## Syntax Description

| | |
|---|---|
| *rate* | Number of DHCP messages a switch can receive per second. |

## Defaults

DHCP snooping rate limiting is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Typically, the rate limit applies to the untrusted interfaces. If you want to set up rate limiting for the trusted interfaces, note that the trusted interfaces aggregate all DHCP traffic in the switch, and you will need to adjust the rate limit of the interfaces to a higher value.

## Examples

This example shows how to enable the DHCP message rate limiting:

```
Switch(config-if)# ip dhcp snooping limit rate 150
Switch(config)#
```

This example shows how to disable the DHCP message rate limiting:

```
Switch(config-if)# no ip dhcp snooping limit rate
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **ip dhcp snooping** | Globally enables DHCP snooping. |
| **ip dhcp snooping information option** | Enables DHCP option 82 data insertion. |
| **ip dhcp snooping trust** | Enables DHCP snooping on a trusted VLAN. |
| **ip dhcp snooping vlan** | Enables DHCP snooping on a VLAN or a group of VLANs. |
| **show ip dhcp snooping** | Displays the DHCP snooping configuration. |
| **show ip dhcp snooping binding** | Displays the DHCP snooping binding entries. |

# ip dhcp snooping trust

To configure an interface as trusted for DHCP snooping purposes, use the **ip dhcp snooping trust** command. To configure an interface as untrusted, use the **no** form of this command.

**ip dhcp snooping trust**

**no ip dhcp snooping trust**

## Syntax Description

This command has no arguments or keywords.

## Defaults

DHCP snooping trust is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable DHCP snooping trust on an interface:

```
Switch(config-if)# ip dhcp snooping trust
Switch(config)#
```

This example shows how to disable DHCP snooping trust on an interface:

```
Switch(config-if)# no ip dhcp snooping trust
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping limit rate | Configures the number of the DHCP messages that an interface can receive per second. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# ip dhcp snooping vlan

Use the **ip dhcp snooping vlan** command to enable DHCP snooping on a VLAN. To disable DHCP snooping on a VLAN, use the **no** form of this command.

**ip dhcp snooping** [**vlan** *number*]

**no ip dhcp snooping** [**vlan** *number*]

## Syntax Description

| | |
|---|---|
| **vlan** *number* | (Optional) Single VLAN number or a range of VLANs; valid values are from 1 to 4094. |

## Defaults

DHCP snooping is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

DHCP snooping is enabled on a VLAN only if both global snooping and the VLAN snooping are enabled.

## Examples

This example shows how to enable DHCP snooping on a VLAN:

```
Switch(config)# ip dhcp snooping vlan 10
Switch(config)#
```

This example shows how to disable DHCP snooping on a VLAN:

```
Switch(config)# no ip dhcp snooping vlan 10
Switch(config)#
```

This example shows how to enable DHCP snooping on a group of VLANs:

```
Switch(config)# ip dhcp snooping vlan 10 55
Switch(config)#
```

This example shows how to disable DHCP snooping on a group of VLANs:

```
Switch(config)# no ip dhcp snooping vlan 10 55
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping limit rate | Configures the number of the DHCP messages that an interface can receive per second. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan number information option format-type | Enables circuit-id (a sub-option of DHCP snooping option-82) on a VLAN. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# ip dhcp snooping vlan *number* information option format-type

To enable circuit-id (a sub-option of DHCP snooping option-82) on a VLAN, use the **ip dhcp snooping vlan** *number* **information option format-type** command. To disable circuit-id on a VLAN, use the **no** form of this command.

**ip dhcp snooping vlan** *number* **information option format-type circuit-id string** *string*

**no ip dhcp snooping vlan** *number* **information option format-type circuit-id string** *string*

## Syntax Description

| | |
|---|---|
| **vlan** *number* | Single VLAN number or a range of VLANs; valid values are from 1 to 4094. |
| **information** | Specifies DHCP snooping information 82 data insertion. |
| **option** | Specifies DHCP snooping information option. |
| **format-type** | Specifies option-82 information format. |
| **circuit-id** | Specifies using the string as the circuit ID. |
| **string** *string* | Specifies a user-defined string for the circuit ID. |

## Defaults

VLAN-mod-port, if DHCP snooping option-82 is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The curcuit-id suboption of DHCP option-82 is supported only when DHCP snooping is globally enabled and on VLANs using DHCP option-82.

## Examples

The following example shows how to enable DHCP Snooping on Vlan 500 through 555 and Opton 82 circuit-id.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# ip dhcp snooping
Switch(config)# ip dhcp snooping vlan 500 555
Switch(config)# ip dhcp snooping information option format remote-id string switch123
Switch(config)# interface GigabitEthernet 5/1
Switch(config-if)# ip dhcp snooping trust
Switch(config-if)# ip dhcp snooping limit rate 100
Switch(config-if)# ip dhcp snooping vlan 555 information option format-type circuit-id string customer-555
Switch(config-if)# interface FastEthernet 2/1
Switch(config-if)# ip dhcp snooping vlan 555 information option format-type circuit-id string customer-500
Switch(config)# end
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping limit rate | Configures the number of the DHCP messages that an interface can receive per second. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |
| show ip dhcp snooping | Displays the DHCP snooping configuration. |
| show ip dhcp snooping binding | Displays the DHCP snooping binding entries. |

# ip igmp filter

To control whether all hosts on a Layer 2 interface can join one or more IP multicast groups by applying an IGMP profile to the interface, use the **ip igmp filter** command. To remove a profile from the interface, use the **no** form of this command.

**ip igmp filter** *profile number*

**no ip igmp filter**

## Syntax Description

| | |
|---|---|
| *profile number* | IGMP profile number to be applied; valid values are from 1 to 429496795. |

## Defaults

Profiles are not applied.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(11b)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

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.

An IGMP profile can be applied to one or more switch port interfaces, but one port can have only one profile applied to it.

## Examples

This example shows how to apply IGMP profile 22 to an interface.

```
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# ip igmp filter 22
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| ip igmp profile | Create an IGMP profile. |
| show ip igmp profile | Displays all configured IGMP profiles or a specified IGMP profile. |

# ip igmp max-groups

To set the maximum number of IGMP groups that a Layer 2 interface can join, use the **ip igmp max-groups** command. To set the maximum back to the default, use the **no** form of this command.

**ip igmp max-groups** *number*

**no ip igmp max-groups**

## Syntax Description

| | |
|---|---|
| *number* | Maximum number of IGMP groups that an interface can join; valid values are from 0 to 4294967294. |

## Defaults

No maximum limit.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(11b)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You can use the **ip igmp max-groups** command only on Layer 2 physical interfaces; you cannot set the IGMP maximum groups for the routed ports, the switch virtual interfaces (SVIs), or the ports that belong to an EtherChannel group.

## Examples

This example shows how to limit the number of IGMP groups that an interface can join to 25:

```
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# ip igmp max-groups 25
Switch(config-if)
```

# ip igmp profile

To create an IGMP profile, use the **ip igmp profile** command. To delete the IGMP profile, use the **no** form of this command.

**ip igmp profile** *profile number*

**no ip igmp profile** *profile number*

## Syntax Description

| | |
|---|---|
| *profile number* | IGMP profile number being configured; valid values are from 1 to 4294967295. |

## Defaults

No profile created.

## Command Modes

Global configuration mode

IGMP profile configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(11b)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

When entering a range, enter the low IP multicast address, a space, and the high IP multicast address.

You can apply an IGMP profile to one or more Layer 2 interfaces, but each interface can have only one profile applied to it.

## Examples

This example shows how to configure IGMP profile 40 that permits the specified range of IP multicast addresses:

```
Switch # config terminal
Switch(config)# ip igmp profile 40
Switch(config-igmp-profile)# permit
Switch(config-igmp-profile)# range 233.1.1.1 233.255.255.255
Switch(config-igmp-profile)#
```

## Related Commands

| Command | Description |
|---|---|
| ip igmp filter | Controls whether all hosts on a Layer 2 interface can join one or more IP multicast groups by applying an IGMP profile to the interface. |
| show ip igmp profile | Displays all configured IGMP profiles or a specified IGMP profile. |

# ip igmp query-interval

To configure the frequency that the switch sends the IGMP host-query messages, use the **ip igmp query-interval** command. To return to the default frequency, use the **no** form of this command.

**ip igmp query-interval** *seconds*

**no ip igmp query-interval**

## Syntax Description

| | |
|---|---|
| *seconds* | Frequency, in seconds, at which the IGMP host-query messages are transmitted; valid values depend on the IGMP snooping mode. See the "Usage Guidelines" section for more information. |

## Defaults

The query interval is set to 60 seconds.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If you use the default IGMP snooping configuration, the valid query interval values are from 1 to 65535 seconds. If you have changed the default configuration to support CGMP as the IGMP snooping learning method, the valid query interval values are from 1 to 300 seconds.

The designated switch for a LAN is the only switch that sends the IGMP host-query messages. For IGMP version 1, the designated switch is elected according to the multicast routing protocol that runs on the LAN. For IGMP version 2, the designated querier is the lowest IP-addressed multicast switch on the subnet.

If no queries are heard for the timeout period (controlled by the **ip igmp query-timeout** command), the switch becomes the querier.

**Note** Changing the timeout period may severely impact multicast forwarding.

## Examples

This example shows how to change the frequency at which the designated switch sends the IGMP host-query messages:

```
Switch(config-if)# ip igmp query-interval 120
Switch(config-if)#
```

**Related Commands**

| Command | Description |
|---|---|
| **ip igmp querier-timeout** (refer to Cisco IOS documentation) | Configures the timeout period before the router takes over as the querier for the interface after the previous querier has stopped querying. |
| **ip pim query-interval** (refer to Cisco IOS documentation) | Configures the frequency of Protocol Independent Multicast (PIM) router query messages. |
| **show ip igmp groups** (refer to Cisco IOS documentation) | Displays the multicast groups with receivers that are directly connected to the router and that were learned through Internet Group Management Protocol (IGMP), use the **show ip igmp groups** command in EXEC mode. |

# ip igmp snooping

To enable IGMP snooping, use the **ip igmp snooping** command. To disable IGMP snooping, use the **no** form of this command.

**ip igmp snooping** [**tcn** {**flood query count** *count* | **query solicit**}]

**no ip igmp snooping** [**tcn** {**flood query count** *count* | **query solicit**}]

## Syntax Description

| | |
|---|---|
| **tcn** | (Optional) Specifies the topology change configurations. |
| **flood** | (Optional) Specifies to flood the spanning-tree table to the network when a topology change occurs. |
| **query** | (Optional) Specifies the TCN query configurations. |
| **count** *count* | (Optional) Specifies how often the spanning-tree table is flooded; valid values are from 1 to 10. |
| **solicit** | (Optional) Specifies an IGMP general query. |

## Defaults

IGMP snooping is enabled.

## Command Modes

Global configuration mode

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(11)EW | Support for flooding the spanning-tree table was added. |

## Usage Guidelines

The **tcn flood** option applies only to Layer 2 switch ports and EtherChannels; it does not apply to routed ports, VLAN interfaces, or Layer 3 channels.

The **ip igmp snooping command** is disabled by default on multicast routers.

**Note** You can use the **tcn flood** option in interface configuration mode.

## Examples

This example shows how to enable IGMP snooping:

```
Switch(config)# ip igmp snooping
Switch(config)#
```

This example shows how to disable IGMP snooping:

```
Switch(config)# no ip igmp snooping
Switch(config)#
```

This example shows how to enable the flooding of the spanning-tree table to the network after nine topology changes have occurred:

```
Switch(config)# ip igmp snooping tcn flood query count 9
Switch(config)#
```

This example shows how to disable the flooding of the spanning-tree table to the network:

```
Switch(config)# no ip igmp snooping tcn flood
Switch(config)#
```

This example shows how to enable an IGMP general query:

```
Switch(config)# ip igmp snooping tcn query solicit
Switch(config)#
```

This example shows how to disable an IGMP general query:

```
Switch(config)# no ip igmp snooping tcn query solicit
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| ip igmp snooping vlan immediate-leave | Enable IGMP immediate-leave processing. |
| ip igmp snooping vlan mrouter | Configures a Layer 2 interface as a multicast router interface for a VLAN. |
| ip igmp snooping vlan static | Configures a Layer 2 interface as a member of a group. |

# ip igmp snooping report-suppression

To enable report suppression, use the **ip igmp snooping report-suppression** command. To disable report suppression and forward the reports to the multicast devices, use the **no** form of this command.

**ip igmp snooping report-suppression**

**no igmp snooping report-suppression**

## Syntax Description

This command has no arguments or keywords.

## Defaults

IGMP snooping report-suppression is enabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If the **ip igmp snooping report-suppression** command is disabled, all the IGMP reports are forwarded to the multicast devices.

If the command is enabled, report suppression is done by IGMP snooping.

## Examples

This example shows how to enable report suppression:

```
Switch(config)# ip igmp snooping report-suppression
Switch(config)#
```

This example shows how to disable report suppression:

```
Switch(config)# no ip igmp snooping report-suppression
Switch(config)#
```

This example shows how to display the system status for report suppression:

```
Switch# show ip igmp snoop
vlan 1
----------
 IGMP snooping is globally enabled
 IGMP snooping TCN solicit query is globally disabled
 IGMP snooping global TCN flood query count is 2
 IGMP snooping is enabled on this Vlan
 IGMP snooping immediate-leave is disabled on this Vlan
 IGMP snooping mrouter learn mode is pim-dvmrp on this Vlan
 IGMP snooping is running in IGMP_ONLY mode on this Vlan
 IGMP snooping report suppression is enabled on this Vlan
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| ip igmp snooping vlan immediate-leave | Enable IGMP immediate-leave processing. |
| ip igmp snooping vlan mrouter | Configures a Layer 2 interface as a multicast router interface for a VLAN. |
| ip igmp snooping vlan static | Configures a Layer 2 interface as a member of a group. |

# ip igmp snooping vlan

To enable IGMP snooping for a VLAN, use the **ip igmp snooping vlan** command. To disable IGMP snooping, use the **no** form of this command.

**ip igmp snooping vlan** *vlan-id*

**no ip igmp snooping vlan** *vlan-id*

## Syntax Description

| | |
|---|---|
| *vlan-id* | Number of the VLAN; valid values are from 1 to 1001 and from 1006 to 4094. |

## Defaults

IGMP snooping is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended addressing was added. |

## Usage Guidelines

This command is entered in VLAN interface configuration mode only.

The **ip igmp snooping vlan** command is disabled by default on multicast routers.

## Examples

This example shows how to enable IGMP snooping on a VLAN:

```
Switch(config)# ip igmp snooping vlan 200
Switch(config)#
```

This example shows how to disable IGMP snooping on a VLAN:

```
Switch(config)# no ip igmp snooping vlan 200
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| ip igmp snooping vlan immediate-leave | Enable IGMP immediate-leave processing. |
| ip igmp snooping vlan mrouter | Configures a Layer 2 interface as a multicast router interface for a VLAN. |
| ip igmp snooping vlan static | Configures a Layer 2 interface as a member of a group. |

# ip igmp snooping vlan explicit-tracking

To enable per-VLAN explicit host tracking, use the **ip igmp snooping vlan explicit-tracking** command. To disable explicit host 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**

## Syntax Description

| | |
|---|---|
| *vlan_id* | (Optional) Specifies a VLAN; valid values are from 1 to 1001 and from 1006 to 4094. |

## Defaults

Explicit host tracking is enabled.

## Command Modes

Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(20)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to disable IGMP explicit host tracking on interface VLAN 200 and how to verify the configuration:

```
Switch(config)# no ip igmp snooping vlan 200 explicit-tracking
Switch(config)# end
Switch# show ip igmp snooping vlan 200 | include explicit tracking
Global IGMP Snooping configuration:
-----------------------------------
IGMP snooping             : Enabled
IGMPv3 snooping           : Enabled
Report suppression        : Enabled
TCN solicit query         : Disabled
TCN flood query count     : 2

Vlan 2:
--------
IGMP snooping                  : Enabled
IGMPv2 immediate leave         : Disabled
Explicit host tracking         : Disabled
Multicast router learning mode : pim-dvmrp
CGMP interoperability mode     : IGMP_ONLY
Explicit host tracking         : Disabled
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip igmp snooping vlan immediate-leave | Enable IGMP immediate-leave processing. |
| ip igmp snooping vlan mrouter | Configures a Layer 2 interface as a multicast router interface for a VLAN. |

| Command | Description |
|---|---|
| ip igmp snooping vlan static | Configures a Layer 2 interface as a member of a group. |
| show ip igmp snooping membership | Displays host membership information. |

# ip igmp snooping vlan immediate-leave

To enable IGMP immediate-leave processing, use the **ip igmp snooping vlan immediate-leave** command. To disable immediate-leave processing, use the **no** form of this command.

**ip igmp snooping vlan** *vlan_num* **immediate-leave**

**no ip igmp snooping vlan** *vlan_num* **immediate-leave**

## Syntax Description

| | |
|---|---|
| *vlan_num* | Number of the VLAN; valid values are from 1 to 4094. |
| **immediate-leave** | Enables immediate leave processing. |

## Defaults

Immediate leave processing is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended addressing was added. |

## Usage Guidelines

You enter this command in global configuration mode only.

Use the immediate-leave feature only when there is a single receiver for the MAC group for a specific VLAN.

The immediate-leave feature is supported only with IGMP version 2 hosts.

## Examples

This example shows how to enable IGMP immediate-leave processing on VLAN 4:

```
Switch(config)# ip igmp snooping vlan 4 immediate-leave
Switch(config)#
```

This example shows how to disable IGMP immediate-leave processing on VLAN 4:

```
Switch(config)# no ip igmp snooping vlan 4 immediate-leave
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| ip igmp snooping | Enable IGMP snooping. |
| ip igmp snooping vlan mrouter | Configures a Layer 2 interface as a multicast router interface for a VLAN. |
| ip igmp snooping vlan static | Configures a Layer 2 interface as a member of a group. |

| Command | Description |
|---|---|
| show ip igmp interface | Displays the information about the IGMP-interface status and configuration. |
| show mac-address-table multicast | Displays information about the multicast MAC address table. |

# ip igmp snooping vlan mrouter

To statically configure an Layer 2 interface as a multicast router interface for a VLAN, use the **ip igmp snooping vlan mrouter** command. To remove the configuration, use the **no** form of this command.

**ip igmp snooping vlan** *vlan-id* **mrouter** {**interface** {{**fastethernet** *slot/port*} | {**gigabitethernet** *slot/port*} | {**tengigabitethernet** *slot/port*} | {**port-channel** *number*}} | {**learn** {**cgmp** | **pim-dvmrp**}}

**noip igmp snooping vlan** *vlan-id* **mrouter** {**interface** {{**fastethernet** *slot/port*} | {**gigabitethernet** *slot/port*} | {**tengigabitethernet** *slot/port*} | {**port-channel** *number*}} | {**learn** {**cgmp** | **pim-dvmrp**}}

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-id* | Specifies the VLAN ID number to use in the command; valid values are from 1 to 4094. |
| **interface** | Specifies the next-hop interface to a multicast switch. |
| **fastethernet** *slot/port* | Specifies the Fast Ethernet interface; number of the slot and port. |
| **gigabitethernet** *slot/port* | Specifies the Gigabit Ethernet interface; number of the slot and port. |
| **tengigabitethernet** *slot/port* | Specifies the 10-Gigabit Ethernet interface; number of the slot and port. |
| **port-channel** *number* | Port-channel number; valid values are from 1 to 64. |
| **learn** | Specifies the multicast switch learning method. |
| **cgmp** | Specifies the multicast switch snooping CGMP packets. |
| **pim-dvmrp** | Specifies the multicast switch snooping PIM-DVMRP packets. |

## Defaults

Multicast switch snooping PIM-DVMRP packets are specified.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended addressing was added. |
| 12.2(25)EW | Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You enter this command in VLAN interface configuration mode only.

The interface to the switch must be in the VLAN where you are entering the command. It must be both administratively up and line protocol up.

The CGMP learning method can decrease control traffic.

The learning method that you configure is saved in NVRAM.

The static connections to multicast interfaces are supported only on switch interfaces.

## Examples

This example shows how to specify the next-hop interface to a multicast switch:

```
Switch(config-if)# ip igmp snooping 400 mrouter interface fastethernet 5/6
Switch(config-if)#
```

This example shows how to specify the multicast switch learning method:

```
Switch(config-if)# ip igmp snooping 400 mrouter learn cgmp
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **ip igmp snooping** | Enable IGMP snooping. |
| **ip igmp snooping vlan immediate-leave** | Enable IGMP immediate-leave processing. |
| **ip igmp snooping vlan static** | Configures a Layer 2 interface as a member of a group. |
| **show ip igmp snooping** | Displays information on dynamically learned and manually configured VLAN switch interfaces. |
| **show ip igmp snooping mrouter** | Displays information on the dynamically learned and manually configured multicast switch interfaces. |

# ip igmp snooping vlan static

To configure a Layer 2 interface as a member of a group, use the **ip igmp snooping vlan static** command. To remove the configuration, use the **no** form of this command.

**ip igmp snooping vlan** *vlan_num* **static** *mac-address* {**interface** {**fastethernet** *slot/port*} | {**gigabitethernet** *slot/port*} | {**tengigabitethernet** *slot/port*} | {**port-channel** *number*}}

**no ip igmp snooping vlan** *vlan_num* **static** *mac-address* {**interface** {**fastethernet** *slot/port*} | {**gigabitethernet** *slot/port*} | {**tengigabitethernet** *mod/interface-number*} | {**port-channel** *number*}}

## Syntax Description

| | |
|---|---|
| **vlan** *vlan_num* | Number of the VLAN. |
| **static** *mac-address* | Group MAC address. |
| **interface** | Specifies the next-hop interface to multicast switch. |
| **fastethernet** *slot/port* | Specifies the Fast Ethernet interface; number of the slot and port. |
| **gigabitethernet** *slot/port* | Specifies the Gigabit Ethernet interface; number of the slot and port. |
| **tengigabitethernet** *slot/port* | Specifies the 10-Gigabit Ethernet interface; number of the slot and port. |
| **port-channel** *number* | Port-channel number; valid values are from 1 through 64. |

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to configure a host statically on an interface:

```
Switch(config)# ip igmp snooping vlan 4 static 0100.5e02.0203 interface fastethernet 5/11
Configuring port FastEthernet5/11 on group 0100.5e02.0203 vlan 4
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **ip igmp snooping** | Enable IGMP snooping. |
| **ip igmp snooping vlan immediate-leave** | Enable IGMP immediate-leave processing. |

| Command | Description |
|---|---|
| ip igmp snooping vlan mrouter | Configures a Layer 2 interface as a multicast router interface for a VLAN. |
| show mac-address-table multicast | Displays information about the multicast MAC address table. |

# ip local-proxy-arp

To enable the local proxy ARP feature, use the **ip local-proxy-arp** command. To disable the local proxy ARP feature, use the **no** form of this command.

**ip local-proxy-arp**

**no ip local-proxy-arp**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Local proxy ARP is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Use this feature only on subnets where hosts are intentionally prevented from communicating directly to the switch on which they are connected.

ICMP redirect is disabled on interfaces where the local proxy ARP feature is enabled.

## Examples

This example shows how to enable the local proxy ARP feature:

```
Switch(config-if)# ip local-proxy-arp
Switch(config-if)#
```

# ip mfib fastdrop

To enable MFIB fast drop, use the **ip mfib fastdrop** command. To disable MFIB fast drop, use the **no** form of this command.

**ip mfib fastdrop**

**no ip mfib fastdrop**

## Syntax Description

This command has no arguments or keywords.

## Defaults

MFIB fast drop is enabled.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable MFIB fast drops:

```
Switch# ip mfib fastdrop
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| clear ip mfib fastdrop | Clears all the MFIB fast-drop entries. |
| show ip mfib fastdrop | Displays all currently active fast-drop entries and shows whether fast drop is enabled. |

# ip route-cache flow

To enable NetFlow statistics for IP routing, use the **ip route-cache flow** command. To disable NetFlow statistics, use the **no** form of this command.

**ip route-cache flow** [**infer-fields**]

**no ip route-cache flow** [**infer-fields**]

## Syntax Description

| | |
|---|---|
| **infer-fields** | (Optional) Includes the NetFlow fields as inferred by the software: Input identifier, Output identifier, and Routing information. |

## Defaults

NetFlow statistics is disabled.

Inferred information is excluded.

## Command Modes

Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switches. |
| 12.1(19)EW | Command enhanced to support infer fields. |

## Usage Guidelines

To use these commands, you need to install the Supervisor Engine IV and the NetFlow Service Card.

The NetFlow statistics feature captures a set of traffic statistics. These traffic statistics include the source IP address, destination IP address, Layer 4 port information, protocol, input and output identifiers, and other routing information that can be used for network analysis, planning, accounting, billing and identifying DoS attacks.

NetFlow switching is supported on IP and IP-encapsulated traffic over all interface types.

If you enter the **ip route-cache flow infer-fields** command after the **ip route-cache flow** command, you will purge the existing cache, and vice versa. This action is done to avoid having flows with and without inferred fields in the cache simultaneously.

For additional information on NetFlow switching, refer to the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide*.

**Note** NetFlow consumes additional memory and CPU resources compared to other switching modes. You need to know the resources required on your switch before enabling NetFlow.

## Examples

This example shows how to enable NetFlow switching on the switch:

```
Switch# config terminal
Switch(config)# ip route-cache flow
Switch(config)# exit
Switch#
```

**Note** This command does not work on individual interfaces.

# ip source binding

To add or delete a static IP source binding entry, use the **ip source binding** command. To delete the corresponding IP source binding entry, use the **no** form of this command.

**ip source binding** *ip-address mac-address* **vlan** *vlan-id* **interface** *interface-name*

**no ip source binding** *ip-address mac-address* **vlan** *vlan-id* **interface** *interface-name*

## Syntax Description

| | |
|---|---|
| *ip-address* | Binding IP address. |
| *mac-address* | Binding MAC address. |
| **vlan** *vlan-id* | VLAN number. |
| **interface** *interface-name* | Binding interface. |

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **ip source binding** command is used to add a static IP source binding entry only.

The **no** form of this command deletes the corresponding IP source binding entry. For the deletion to succeed, all required parameters must match.

Each static IP binding entry is keyed by a MAC address and VLAN number. If the CLI contains an existing MAC and VLAN, the existing binding entry will be updated with the new parameters; a separate binding entry will not be created.

## Examples

This example shows how to configure the static IP source binding:

```
Switch# config terminal
Switch(config)# ip source binding 11.0.0.1 0000.000A.000B vlan 10 interface
fastethernet6/10
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show ip source binding** | Displays IP source bindings that are configured on the system. |

# ip sticky-arp

To enable sticky ARP, use the **ip sticky-arp** command. Use the **no** form of this command to disable sticky ARP.

**ip sticky-arp**

**no ip sticky-arp**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Enabled

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is supported on PVLANs only.

ARP entries that are learned on Layer3 PVLAN interfaces are sticky ARP entries. (You should display and verify ARP entries on the PVLAN interface using the **show arp** command).

For security reasons, sticky ARP entries on the PVLAN interface do not age out. Connecting new equipment with the same IP address generates a message and the ARP entry is not created.

Because the ARP entries on the PVLAN interface do not age out, you must manually remove ARP entries on the PVLAN interface if a MAC address changes.

Unlike static entries, sticky-ARP entries are not stored and restored when you enter the **reboot** and **restart** commands.

## Examples

This example shows how to enable sticky ARP:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config) ip sticky-arp
Switch(config)# end
Switch#
```

This example shows how to disable sticky ARP:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config) no ip sticky-arp
Switch(config)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **arp** (refer to Cisco IOS documentation) | Enables Address Resolution Protocol (ARP) entries for static routing over the Switched Multimegabit Data Service (SMDS) network. |
| **show arp** (refer to Cisco IOS documentation) | Displays ARP information. |

# ip verify header vlan all

To enable IP header validation for Layer 2-switched IPv4 packets, use the **ip verify header vlan all** command. To disable the IP header validation, use the **no** form of this command.

**ip verify header vlan all**

**no ip verify header vlan all**

## Syntax Description

This command has no default settings.

## Defaults

The IP header is validated for bridged and routed IPv4 packets.

## Command Modes

Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(20)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command does not apply to Layer 3-switched (routed) packets.

The Catalyst 4500 series switch checks the validity of the following fields in the IPv4 header for all switched IPv4 packets:

- The version must be 4.
- The header length must be greater than or equal to 20 bytes.
- The total length must be greater than or equal to four times the header length and greater than the Layer 2 packet size minus the Layer 2 encapsulation size.

If an IPv4 packet fails the IP header validation, the packet is dropped. If you disable the header validation, the packets with the invalid IP headers are bridged but are not routed even if routing was intended. The IPv4 access lists also are not applied to the IP headers.

## Examples

This example shows how to disable the IP header validation for the Layer 2-switched IPv4 packets:

```
Switch# config terminal
Switch(config)# no ip verify header vlan all
Switch(config)# end
Switch#
```

# ip verify source

To enable IP source guard on untrusted Layer 2 interfaces, use the **ip verify source** command. To disable IP source guard on untrusted Layer 2 interfaces, use the **no** form of this command.

**ip verify source** {**vlan dhcp-snooping** | **tracking**} [**port-security**]

**no ip verify source** {**vlan dhcp-snooping** | **tracking**} [**port-security**]

## Syntax Description

| | |
|---|---|
| **vlan dhcp-snooping** | Enables IP source guard on untrusted Layer 2 DHCP snooping interfaces. |
| **tracking** | Enables IP port security to learn static IP address learning on a port. |
| **port-security** | (Optional) Filters both source IP and MAC addresses using the port security feature. |

## Defaults

IP source guard is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(37)SG | Added support for IP port security and tracking. |

## Examples

This example shows how to enable IP source guard on VLANs 10 through 20 on a per-port basis:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip dhcp snooping
Switch(config)# ip dhcp snooping vlan 10 20
Switch(config)# interface fastethernet6/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# switchport trunk native vlan 10
Switch(config-if)# switchport trunk allowed vlan 11-20
Switch(config-if)# no ip dhcp snooping trust
Switch(config-if)# ip verify source vlan dhcp-snooping
Switch(config)# end
Switch# show ip verify source interface f6/1
Interface  Filter-type  Filter-mode  IP-address       Mac-address        Vlan
---------  -----------  -----------  ---------------  -----------------  ----------
Fa6/1      ip-mac       active       10.0.0.1                            10
Fa6/1      ip-mac       active       deny-all                            11-20
Switch#
```

This example shows how to enable IP Port Security with IP-Mac filters on a Layer 2 access port:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip device tracking
Switch(config)# interface fastEthernet 4/3
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 1
Switch(config-if)# ip device tracking maximum 5
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security maximum 5
Switch(config-if)# ip verify source tracking port-security
Switch(config-if)# end
```

You can verify your settings by entering the **show ip verify source** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **ip device tracking maximum** | Enables IP port security binding tracking on a Layer 2 port. |
| **ip dhcp snooping** | Globally enables DHCP snooping. |
| **ip dhcp snooping limit rate** | Configures the number of the DHCP messages that an interface can receive per second. |
| **ip dhcp snooping information option** | Enables DHCP option 82 data insertion. |
| **ip dhcp snooping trust** | Enables DHCP snooping on a trusted VLAN. |
| **ip source binding** | Adds or delete a static IP source binding entry. |
| **show ip dhcp snooping** | Displays the DHCP snooping configuration. |
| **show ip dhcp snooping binding** | Displays the DHCP snooping binding entries. |
| **show ip verify source** | Displays the IP source guard configuration and filters on a particular interface. |
| **show ip source binding** | Displays IP source bindings that are configured on the system. |

# ip verify unicast source reachable-via

To enable and configure unicast RPF checks on a Supervisor Engine 6-E and Catalyst 4900M chassis IPv4 interface, use the **ip verify unicast source reachable-via** command. To disable unicast RPF, use the **no** form of this command.

**ip verify unicast source reachable-via rx allow-default**

**no ip verify unicast source reachable-via**

## Syntax Description

| | |
|---|---|
| **rx** | Verifies that the source address is reachable on the interface where the packet was received. |
| **allow-default** | Verifies that the default route matches the source address. |

## Defaults

Disabled

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | Support for this command was introduced on the Catalyst 4500 with a Supervisor Engine 6-E and the Catalyst 4900M chassis. |

## Usage Guidelines

In basic RX mode, unicast RPF ensures a source address must be reachable on the arrived interface. For example, the source must be reachable without load balancing.

**Note** Unicast RPF is an input function and is applied only on the input interface of a router at the upstream end of a connection.

Do not use unicast RPF on internal network interfaces. Internal interfaces might have routing asymmetry, which means that there are multiple routes to the source of a packet. Apply unicast RPF only where there is natural or configured symmetry.

## Examples

This example shows how to enable unicast RPF exist-only checking mode:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# ip verify unicast source reachable-via rx allow-default
Switch(config-if)# end
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| **ip cef** (refer to Cisco IOS documentation) | Enables Cisco Express Forwarding (CEF) on the switch. |
| **show running-config** | Displays the current running configuration for a switch. |

# ipv6 mld snooping

To enable IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping globally or on the specified VLAN, use the **ipv6 mld snooping** command without keywords. To disable MLD snooping on a switch or the VLAN, use the **no** form of this command.

**ipv6 mld snooping** [**vlan** *vlan-id*]

**no ipv6 mld snooping** [**vlan** *vlan-id*]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-id* | (Optional) Enables or disables IPv6 MLD snooping on the specified VLAN. The VLAN ID range is 1 to 1001 and 1006 to 4094. |

## Defaults

MLD snooping is globally disabled on the switch.

MLD snooping is enabled on all VLANs. However, MLD snooping must be globally enabled before VLAN snooping can take place.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500. |

## Usage Guidelines

When MLD snooping is globally disabled, it is disabled on all the existing VLAN interfaces. When you globally enable MLD snooping, it is enabled on all VLAN interfaces that are in the default state (enabled). VLAN configuration overrides global configuration on interfaces on which MLD snooping has been disabled.

If MLD snooping is globally disabled, you cannot enable it on a VLAN. If MLD snooping is globally enabled, you can disable it on individual VLANs.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

## Examples

This example shows how to globally enable MLD snooping:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping
Switch(config)#end
Switch#
```

This example shows how to disable MLD snooping on a VLAN:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#no ipv6 mld snooping vlan 11
Switch(config)#end
```

```
Switch#
```

You can verify your settings by entering the **show ipv6 mld snooping** user EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **show ipv6 mld snooping** | Displays IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping configuration of the switch or the VLAN. |

# ipv6 mld snooping last-listener-query-count

To configure IP version 6 (IPv6) Multicast Listener Discovery Mulitcast Address Specific Queries (MASQs) that will be sent before aging out a client, use the **ipv6 mld snooping last-listener-query-count** command. To reset the query count to the default settings, use the **no** form of this command.

**ipv6 mld snooping** [**vlan** *vlan-id*] **last-listener-query-count** *integer_value*

**no ipv6 mld snooping** [**vlan** *vlan-id*] **last-listener-query-count**

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-id* | (Optional) Configure last-listener query count on the specified VLAN. The VLAN ID range is 1 to 1001 and 1006 to 4094. |
| *integer_value* | The range is 1 to 7. |

## Command Default

The default global count is 2.

The default VLAN count is 0 (the global count is used).

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500. |

## Usage Guidelines

In MLD snooping, the IPv6 multicast switch periodically sends out queries to hosts belonging to the multicast group. If a host wants to leave a multicast group, it can silently leave or it can respond to the query with a Multicast Listener Done message (equivalent to an IGMP Leave message). When Immediate Leave is not configured (it should not be configured if multiple clients for a group exist on the same port), the configured last-listener query count determines the number of MASQs that are sent before an MLD client is aged out.

When the last-listener query count is set for a VLAN, this count overrides the value configured globally. When the VLAN count is not configured (set to the default of 0), the global count is used.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

## Examples

This example shows how to globally set the last-listener query count:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping last-listener-query-count 1
Switch(config)#end
Switch#
```

This example shows how to set the last-listener query count for VLAN 10:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping vlan 10 last-listener-query-count 3
Switch(config)#end
Switch#
```

You can verify your settings by entering the **show ipv6 mld snooping** [**vlan** *vlan-id*] user EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **ipv6 mld snooping last-listener-query-interval** | Configures IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping last-listener query interval on the switch or on a VLAN. |
| **show ipv6 mld snooping** | Displays IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping configuration of the switch or the VLAN. |
| **show ipv6 mld snooping querier** | Displays IP version 6 (IPv6) MLD snooping querier-related information most recently received by the switch or the VLAN. |

# ipv6 mld snooping last-listener-query-interval

To configure IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping last-listener query interval on the switch or on a VLAN, use the **ipv6 mld snooping last-listener-query-interval** command. To reset the query time to the default settings, use the **no** form of this command.

**ipv6 mld snooping** [**vlan** *vlan-id*] **last-listener-query-interval** *integer_value*

**no ipv6 mld snooping** [**vlan** *vlan-id*] **last-listener-query-interval**

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-id* | (Optional) Configure last-listener query interval on the specified VLAN. The VLAN ID range is 1 to 1001 and 1006 to 4094. |
| *integer_value* | Set the time period (in thousandths of a second) that a multicast switch must wait after issuing a MASQ before deleting a port from the multicast group. The range is 100 to 32,768. The default is 1000 (1 second), |

## Command Default

The default global query interval (maximum response time) is 1000 (1 second).

The default VLAN query interval (maximum response time) is 0 (the global count is used).

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500. |

## Usage Guidelines

The last-listener-query-interval time is the maximum time that a multicast switch waits after issuing a Mulitcast Address Specific Query (MASQ) before deleting a port from the multicast group.

In MLD snooping, when the IPv6 multicast switch receives an MLD leave message, it sends out queries to hosts belonging to the multicast group. If there are no responses from a port to a MASQ for a length of time, the switch deletes the port from the membership database of the multicast address. The last listener query interval is the maximum time that the switch waits before deleting a nonresponsive port from the multicast group.

When a VLAN query interval is set, the global query interval is overridden. When the VLAN interval is set at 0, the global value is used.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

## Examples

This example shows how to globally set the last-listener query interval to 2 seconds:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping last-listener-query-interval 2000
Switch(config)#end
```

```
Switch#
```

This example shows how to set the last-listener query interval for VLAN 1 to 5.5 seconds:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping vlan 1 last-listener-query-interval 5500
Switch(config)#end
Switch#
```

You can verify your settings by entering the **show ipv6 MLD snooping** [**vlan** *vlan-id*] user EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **ipv6 mld snooping last-listener-query-count** | Configures IP version 6 (IPv6) Multicast Listener Discovery Mulitcast Address Specific Queries (MASQs) that will be sent before aging out a client. |
| **show ipv6 mld snooping querier** | Displays IP version 6 (IPv6) MLD snooping querier-related information most recently received by the switch or the VLAN. |

# ipv6 mld snooping listener-message-suppression

To enable IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping listener message suppression, use the **ipv6 mld snooping listener-message-suppression** command. To disable MLD snooping listener message suppression, use the **no** form of this command.

**ipv6 mld snooping listener-message-suppression**

**no ipv6 mld snooping listener-message-suppression**

## Command Default

The default is for MLD snooping listener message suppression to be disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500. |

## Usage Guidelines

MLD snooping listener message suppression is equivalent to IGMP snooping report suppression. When it is enabled, received MLDv1 reports to a group are forwarded to IPv6 multicast switchs only once in every report-forward time. This prevents the forwarding of duplicate reports.

## Examples

This example shows how to enable MLD snooping listener message suppression:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping listener-message-suppression
Switch(config)#end
Switch#
```

This example shows how to disable MLD snooping listener message suppression:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#no ipv6 mld snooping listener-message-suppression
Switch(config)#end
Switch#
```

You can verify your settings by entering the **show ipv6 mld snooping** [**vlan** *vlan-id*] user EXEC command.

## Related Commands

| Command | Description |
|---|---|
| ipv6 mld snooping | Enables IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping globally or on the specified VLAN. |
| show ipv6 mld snooping | Displays IP version 6 (IPv6) MLD snooping configuration of the switch or the VLAN. |

# ipv6 mld snooping robustness-variable

To configure the number of IP version 6 (IPv6) Multicast Listener Discovery (MLD) queries that the switch sends before deleting a listener that does not respond, or to enter a VLAN ID to configure the number of queries per VLAN, use the **ipv6 mld snooping robustness-variable** command. To reset the variable to the default settings, use the **no** form of this command.

**ipv6 mld snooping** [**vlan** *vlan-id*] **robustness-variable** *integer_value*

**no ipv6 mld snooping** [**vlan** *vlan-id*] **robustness-variable**

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-id* | (Optional) Configure the robustness variable on the specified VLAN. The VLAN ID range is 1 to 1001 and 1006 to 4094. |
| *integer_value* | The range is 1 to 3. |

## Command Default

The default global robustness variable (number of queries before deleting a listener) is 2.

The default VLAN robustness variable (number of queries before aging out a multicast address) is 0, which means that the system uses the global robustness variable for aging out the listener.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500. |

## Usage Guidelines

Robustness is measured by the number of MLDv1 queries sent with no response before a port is removed from a multicast group. A port is deleted when there are no MLDv1 reports received for the configured number of MLDv1 queries. The global value determines the number of queries that the switch waits before deleting a listener that does not respond, and it applies to all VLANs that do not have a VLAN value set.

The robustness value configured for a VLAN overrides the global value. If the VLAN robustness value is 0 (the default), the global value is used.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

## Examples

This example shows how to configure the global robustness variable so that the switch sends out three queries before it deletes a listener port that does not respond:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping robustness-variable 3
Switch(config)#end
Switch#
```

This example shows how to configure the robustness variable for VLAN 1. This value overrides the global configuration for the VLAN:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping vlan 1 robustness-variable 1
Switch(config)#end
Switch#
```

You can verify your settings by entering the **show ipv6 MLD snooping** [**vlan** *vlan-id*] user EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **ipv6 mld snooping last-listener-query-count** | Configures IP version 6 (IPv6) Multicast Listener Discovery Mulitcast Address Specific Queries (MASQs) that will be sent before aging out a client. |
| **show ipv6 mld snooping** | Displays IP version 6 (IPv6) MLD snooping configuration of the switch or the VLAN. |

# ipv6 mld snooping tcn

To configure IP version 6 (IPv6) Multicast Listener Discovery (MLD) Topology Change Notifications (TCNs), use the **ipv6 mld snooping tcn** commands. To reset the default settings, use the **no** form of the commands.

**ipv6 mld snooping tcn** {**flood query count** *integer_value* | **query solicit**}

**no ipv6 mld snooping tcn** {**flood query count** *integer_value* | **query solicit**}

## Syntax Description

| | |
|---|---|
| **flood query count** *integer_value* | Set the flood query count, which is the number of queries that are sent before forwarding multicast data to only those ports requesting it. The range is 1 to 10. |
| **query solicit** | Enable soliciting of TCN queries. |

## Command Default

TCN query soliciting is disabled.

When enabled, the default flood query count is 2.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | This command was introduced on the Catalyst 4500. |

## Examples

This example shows how to enable TCN query soliciting:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping tcn query solicit.
Switch(config)#end
Switch#
```

This example shows how to set the flood query count to 5:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping tcn flood query count 5.
Switch(config)#end
Switch#
```

You can verify your settings by entering the **show ipv6 MLD snooping** [**vlan** *vlan-id*] user EXEC command.

## Related Commands

| Command | Description |
|---|---|
| show ipv6 mld snooping | Displays IP version 6 (IPv6) MLD snooping configuration of the switch or the VLAN. |

# ipv6 mld snooping vlan

To configure IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping parameters on the VLAN interface, use the **ipv6 mld snooping vlan** command. To reset the parameters to the default settings, use the **no** form of this command.

**ipv6 mld snooping vlan** *vlan-id* [**immediate-leave** | **mrouter interface** *interface-id* | **static** *ipv6-multicast-address* **interface** *interface-id*]

**no ipv6 mld snooping vlan** *vlan-id* [**immediate-leave** | **mrouter interface** *interface-id* | **static** *ip-address* **interface** *interface-id*]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-id* | Specify a VLAN number. The range is 1 to 1001 and 1006 to 4094. |
| **immediate-leave** | (Optional) Enable MLD Immediate-Leave processing on a VLAN interface. Use the **no** form of the command to disable the Immediate Leave feature on the interface. |
| **mrouter interface** | (Optional) Configure a multicast switch port. The **no** form of the command removes the configuration. |
| **static** *ipv6-multicast-address* | (Optional) Configure a multicast group with the specified IPv6 multicast address. |
| **interface** *interface-id* | Add a Layer 2 port to the group. The mrouter or static interface can be a physical port or a **port-channel** interface ranging from 1 to 48. |

## Command Default

MLD snooping Immediate-Leave processing is disabled.

By default, there are no static IPv6 multicast groups.

By default, there are no multicast switch ports.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500. |

## Usage Guidelines

You should only configure the Immediate-Leave feature when there is only one receiver on every port in the VLAN. The configuration is saved in NVRAM.

The **static** keyword is used for configuring the MLD member ports statically.

The configuration and the static ports and groups are saved in NVRAM.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

## Examples

This example shows how to enable MLD Immediate-Leave processing on VLAN 1:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping vlan 1 immediate-leave
Switch(config)#end
Switch#
```

This example shows how to disable MLD Immediate-Leave processing on VLAN 1:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#no ipv6 mld snooping vlan 1 immediate-leave
Switch(config)#end
Switch#
```

This example shows how to configure a port as a multicast switch port:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping vlan 1 mrouter interface gigabitethernet1/0/2
Switch(config)#end
Switch#
```

This example shows how to configure a static multicast group:

```
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ipv6 mld snooping vlan 2 static FF12::34 interface gigabitethernet1/0/2
Switch(config)#end
Switch#
```

You can verify your settings by entering the **show ipv6 mld snooping vlan** *vlan-id* user EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **ipv6 mld snooping** | Enables IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping globally or on the specified VLAN. |
| **show ipv6 mld snooping** | Displays IP version 6 (IPv6) MLD snooping configuration of the switch or the VLAN. |

# issu abortversion

To cancel the ISSU upgrade or the downgrade process in progress and to restore the Catalyst 4500 series switch to its state before the start of the process, use the **issue abortversion** command.

**issu abortversion** *active-slot* [*active-image-new*]

## Syntax Description

| | |
|---|---|
| *active-slot* | Specifies the slot number for the current standby supervisor engine. |
| *active-image-new* | (Optional) Name of the new image present in the current standby supervisor engine. |

## Defaults

There are no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You can use the **issu abortversion** command at any time to stop the ISSU process. To complete the process enter the **issu commitversion** command. Before any action is taken, a check ensures that both supervisor engines are either in the run version (RV) or load version (LV) state.

When the **issu abortversion** command is entered before the **issu runversion** command, the standby supervisor engine is reset and reloaded with the old image. When the **issu abortversion** command is entered after the **issu runversion** command, a change takes place and the new standby supervisor engine is reset and reloaded with the old image.

## Examples

This example shows how you can reset and reload the standby supervisor engine:

```
Switch# issu abortversion 2
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| issu acceptversion | Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process. |
| issu commitversion | Loads the new Cisco IOS software image into the new standby supervisor engine. |
| issu loadversion | Starts the ISSU process. |

| Command | Description |
|---|---|
| issu runversion | Forces a change from the active supervisor engine to the standby supervisor engine and causes the newly active supervisor engine to run the new image specified. |
| show issu state | Displays the ISSU state and current booted image name during the ISSU process. |

# issu acceptversion

To halt the rollback timer and to ensure that the new Cisco IOS software image is not automatically stopped during the ISSU process, use the **issu acceptversion** command.

**issu acceptversion** *active-slot* [*active-image-new*]

## Syntax Description

| | |
|---|---|
| *active-slot* | Specifies the slot number for the currently active supervisor engine. |
| *active-image-new* | (Optional) Name of the new image on the current lyactive supervisor engine. |

## Defaults

Rollback timer resets automatically 45 minutes after you issue the **issu runversion** command.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

After you are satisfied with the new image and have confirmed the new supervisor engine is reachable by both the console and the network, enter the **issu acceptversion** command to halt the rollback timer. If the **issu acceptversion** command is not entered within 45 minutes from the time the **issu runversion** command is entered, the entire ISSU process is automatically rolled back to the previous version of the software. The rollback timer starts immediately after you issue the **issu runversion** command.

If the rollback timer expires before the standby supervisor engine goes to a hot standby state, the timer is automatically extended by up to 15 minutes. If the standby state goes to a hot-standby state within this extension time or the 15 minute extension expires, the switch aborts the ISSU process. A warning message that requires your intervention is displayed every 1 minute of the timer extension.

If the rollback timer is set to a long period of time, such as the default of 45 minutes, and the standby supervisor engine goes into the hot standby state in 7 minutes, you have 38 minutes (45 minus 7) to roll back if necessary.

Use the **issu set rollback-timer** to configure the rollback timer.

## Examples

This example shows how to halt the rollback timer and allow the ISSU process to continue:

```
Switch# issu acceptversion 2
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| issu abortversion | Cancels the ISSU upgrade or the downgrade process in progress and restores the switch to its state before the start of the process. |
| issu commitversion | Loads the new Cisco IOS software image into the new standby supervisor engine. |
| issu loadversion | Starts the ISSU process. |
| issu runversion | Forces a change from the active supervisor engine to the standby supervisor engine and causes the newly active supervisor engine to run the new image specified. |
| issu set rollback-timer | Configures the In Service Software Upgrade (ISSU) rollback timer value. |
| show issu state | Displays the ISSU state and current booted image name during the ISSU process. |

# issu commitversion

To load the new Cisco IOS software image into the new standby supervisor engine, use the **issu commitversion** command.

**issu commitversion** *standby-slot standby-image-new*

## Syntax Description

| | |
|---|---|
| *standby-slot* | Specifies the slot number for the currently active supervisor engine. |
| *active-image-new* | (Optional) Name of the new image on the currently active supervisor engine. |

## Defaults

Enabled by default.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **issu commitversion** command verifies that the standby supervisor engine has the new Cisco IOS software image in its file system and that both supervisor engines are in the run version (RV) state. If these conditions are met, the following actions take place:

- The standby supervisor engine is reset and booted with the new version of Cisco IOS software.
- The standby supervisor engine moves into the Stateful Switchover (SSO) mode and is fully stateful for all clients and applications with which the standby supervisor engine is compatible.
- The supervisor engines are moved into final state, which is the same as initial state.

Entering the **issu commitversion** command completes the In Service Software Upgrade (ISSU) process. This process cannot be stopped or reverted to its original state without starting a new ISSU process.

Entering the **issu commitversion** command without entering the **issu acceptversion** command is equivalent to entering both the **issu acceptversion** and the **issu commitversion** commands. Use the **issu commitversion** command if you do not intend to run in the current state for an extended period of time and are satisfied with the new software version.

## Examples

This example shows how you can configure the standby supervisor engine to be reset and reloaded with the new Cisco IOS software version:

```
Switch# issu commitversion 1
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| issu acceptversion | Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process. |
| issu commitversion | Loads the new Cisco IOS software image into the new standby supervisor engine. |
| issu loadversion | Starts the ISSU process. |
| issu runversion | Forces a change from the active supervisor engine to the standby supervisor engine and causes the newly active supervisor engine to run the new image specified. |
| show issu state | Displays the ISSU state and current booted image name during the ISSU process. |

# issu loadversion

To start the ISSU process, use the **issu loadversion** command.

**issu loadversion** *active-slot active-image-new standby-slot standby-image-new* [**force**]

## Syntax Description

| | |
|---|---|
| *active-slot* | Specifies the slot number for the currently active supervisor engine. |
| *active-image-new* | Specifies the name of the new image on the currently active supervisor engine. |
| *standby-slot* | Specifies the standby slot on the networking device. |
| *standby-image-new* | Specifies the name of the new image on the standby supervisor engine. |
| **force** | (Optional) Overrides the automatic rollback when the new Cisco IOS software version is detected to be incompatible. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **issu loadversion** command causes the standby supervisor engine to be reset and booted with the new Cisco IOS software image specified by the command. If both the old image and the new image are ISSU capable, ISSU compatible, and have no configuration mismatches, the standby supervisor engine moves into Stateful Switchover (SSO) mode, and both supervisor engines move into the load version (LV) state.

It will take several seconds after the **issu loadversion** command is entered for Cisco IOS software to load onto the standby supervisor engine and the standby supervisor engine to transition to SSO mode.

## Examples

This example shows how to initiate the ISSU process:

```
Switch# issu loadversion 1 bootflash:new-image 2 slavebootflash:new-image
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **issu abortversion** | Cancels the ISSU upgrade or the downgrade process in progress and restores the switch to its state before the start of the process. |
| **issu acceptversion** | Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process. |

| Command | Description |
|---|---|
| issu commitversion | Loads the new Cisco IOS software image into the new standby supervisor engine. |
| issu runversion | Forces a change from the active supervisor engine to the standby supervisor engine and causes the newly active supervisor engine to run the new image specified. |
| show issu state | Displays the ISSU state and current booted image name during the ISSU process. |

# issu runversion

To force a change from the active supervisor engine to the standby supervisor engine and to cause the newly active supervisor engine to run the new image specified in the **issu loadversion** command, use the **issu runversion** command.

**issu runversion** *standby-slot* [*standby-image-new*]

## Syntax Description

| | |
|---|---|
| *standby-slot* | Specifies the standby slot on the networking device. |
| *standby-image-new* | Specifies the name of the new image on the standby supervisor engine. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **issu runversion** command changes the currently active-supervisor engine to standby-supervisor engine and the real standby-supervisor engine is booted with the old image version following and resets the switch. As soon as the standby-supervisor engine moves into the standby state, the rollback timer is started.

## Examples

This example shows how to force a change of the active-supervisor engine to standby-supervisor engine:

```
Switch# issu runversion 2
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **issu abortversion** | Cancels the ISSU upgrade or the downgrade process in progress and restores the switch to its state before the start of the process. |
| **issu acceptversion** | Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process. |
| **issu commitversion** | Loads the new Cisco IOS software image into the new standby supervisor engine. |
| **issu loadversion** | Starts the ISSU process. |
| **show issu state** | Displays the ISSU state and current booted image name during the ISSU process. |

# issu set rollback-timer

To configure the In Service Software Upgrade (ISSU) rollback timer value, use the **issu set rollback-timer** command.

**issu set rollback-timer** *seconds*

## Syntax Description

| | |
|---|---|
| *seconds* | Specfies the rollback timer value, in seconds. The valid timer value range is from 0 to 7200 seconds (2 hours). A value of 0 seconds disables the rollback timer. |

## Defaults

Rollback timer value is 2700 seconds.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Use the **issue set rollback-timer** command to configure the rollback timer value. You can only enable this command when the supervisor engines are in the init state.

## Examples

This example shows how you can set the rollback timer value to 3600 seconds, or 1 hour:

```
Switch# configure terminal
Switch(config)# issu set rollback-timer 3600
Switch(config)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **issu acceptversion** | Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process. |
| **issu set rollback-timer** | Configures the In Service Software Upgrade (ISSU) rollback timer value. |

# l2protocol-tunnel

To enable protocol tunneling on an interface, use the **l2protocol-tunnel** command. You can enable tunneling for the Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunking Protocol (VTP) packets. To disable tunneling on the interface, use the **no** form of this command.

**l2protocol-tunnel** [**cdp** | **stp** | **vtp**]

**no l2protocol-tunnel** [**cdp** | **stp** | **vtp**]

## Syntax Description

| | |
|---|---|
| **cdp** | (Optional) Enables tunneling of CDP. |
| **stp** | (Optional) Enables tunneling of STP. |
| **vtp** | (Optional) Enables tunneling of VTP. |

## Defaults

The default is that no Layer 2 protocol packets are tunneled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You must enter this command, with or without protocol types, to tunnel Layer 2 packets.

Layer 2 protocol tunneling across a service-provider network ensures that Layer 2 information is propagated across the network to all customer locations. When protocol tunneling is enabled, protocol packets are encapsulated with a well-known Cisco multicast address for transmission across the network. When the packets reach their destination, the well-known MAC address is replaced by the Layer 2 protocol MAC address.

You can enable Layer 2 protocol tunneling for CDP, STP, and VTP individually or for all three protocols.

## Examples

This example shows how to enable protocol tunneling for the CDP packets:

```
Switch(config-if)# l2protocol-tunnel cdp
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| l2protocol-tunnel cos | Configures the class of service (CoS) value for all tunneled Layer 2 protocol packets. |

| Command | Description |
|---|---|
| l2protocol-tunnel drop-threshold | Sets a drop threshold for the maximum rate of Layer 2 protocol packets per second to be received before an interface drops packets. |
| l2protocol-tunnel shutdown-threshold | Configures the protocol tunneling encapsulation rate. |

# l2protocol-tunnel cos

To configure the class of service (CoS) value for all tunneled Layer 2 protocol packets, use the **l2protocol-tunnel cos** command. To return to the default value of zero, use the **no** form of this command.

**l2protocol-tunnel cos** *value*

**no l2protocol-tunnel cos**

## Syntax Description

| | |
|---|---|
| *value* | Specifies the CoS priority value for tunneled Layer 2 protocol packets. The range is 0 to 7, with 7 being the highest priority. |

## Defaults

The default is to use the CoS value that is configured for data on the interface. If no CoS value is configured, the default is 5 for all tunneled Layer 2 protocol packets.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | This command was first introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

When enabled, the tunneled Layer 2 protocol packets use this CoS value.

The value is saved in NVRAM.

## Examples

This example shows how to configure a Layer 2 protocol tunnel CoS value of 7:

```
Switch(config)# l2protocol-tunnel cos 7
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| l2protocol-tunnel | Enables protocol tunneling on an interface. |
| l2protocol-tunnel drop-threshold | Sets a drop threshold for the maximum rate of Layer 2 protocol packets per second to be received before an interface drops packets. |
| l2protocol-tunnel shutdown-threshold | Configures the protocol tunneling encapsulation rate. |

# l2protocol-tunnel drop-threshold

To set a drop threshold for the maximum rate of Layer 2 protocol packets per second to be received before an interface drops packets, use the **l2protocol-tunnel drop-threshold** command. You can set the drop threshold for the Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunking Protocol (VTP) packets. To disable the drop threshold on the interface, use the **no** form of this command.

**l2protocol-tunnel** drop**-threshold** [**cdp | stp | vtp**] *value*

**no l2protocol-tunnel** drop**-threshold** [**cdp | stp | vtp**] *value*

## Syntax Description

| | |
|---|---|
| **cdp** | (Optional) Specifies a drop threshold for CDP. |
| **stp** | (Optional) Specifies a drop threshold for STP. |
| **vtp** | (Optional) Specifies a drop threshold for VTP. |
| *value* | Specifies a threshold in packets per second to be received for encapsulation before the interface shuts down, or specifies the threshold before the interface drops packets. The range is 1 to 4096. The default is no threshold. |

## Defaults

The default is no drop threshold for the number of the Layer 2 protocol packets.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **l2protocol-tunnel drop-threshold** command controls the number of protocol packets per second that are received on an interface before it drops packets. When no protocol option is specified with a keyword, the threshold is applied to each of the tunneled Layer 2 protocol types. If you also set a shutdown threshold on the interface, the drop-threshold value must be less than or equal to the shutdown-threshold value.

When the drop threshold is reached, the interface drops the Layer 2 protocol packets until the rate at which they are received is below the drop threshold.

## Examples

This example shows how to configure the drop threshold rate:

```
Switch(config-if)# l2protocol-tunnel drop-threshold cdp 50
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| l2protocol-tunnel | Enables protocol tunneling on an interface. |
| l2protocol-tunnel cos | Configures the class of service (CoS) value for all tunneled Layer 2 protocol packets. |
| l2protocol-tunnel shutdown-threshold | Configures the protocol tunneling encapsulation rate. |

# l2protocol-tunnel shutdown-threshold

To configure the protocol tunneling encapsulation rate, use the **l2protocol-tunnel shutdown-threshold** command. You can set the encapsulation rate for the Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunking Protocol (VTP) packets. To disable the encapsulation rate on the interface, use the **no** form of this command.

**l2protocol-tunnel shutdown-threshold** [**cdp | stp | vtp**] *value*

**no l2protocol-tunnel shutdown-threshold** [**cdp | stp | vtp**] *value*

## Syntax Description

| | |
|---|---|
| **cdp** | (Optional) Specifies a shutdown threshold for CDP. |
| **stp** | (Optional) Specifies a shutdown threshold for STP. |
| **vtp** | (Optional) Specifies a shutdown threshold for VTP. |
| *value* | Specifies a threshold in packets per second to be received for encapsulation before the interface shuts down. The range is 1 to 4096. The default is no threshold. |

## Defaults

The default is no shutdown threshold for the number of Layer 2 protocol packets.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **l2-protocol-tunnel shutdown-threshold** command controls the number of protocol packets per second that are received on an interface before it shuts down. When no protocol option is specified with the keyword, the threshold is applied to each of the tunneled Layer 2 protocol types. If you also set a drop threshold on the interface, the shutdown-threshold value must be greater than or equal to the drop-threshold value.

When the shutdown threshold is reached, the interface is error disabled. If you enable error recovery by entering the **errdisable recovery cause l2ptguard** command, the interface is brought out of the error-disabled state and allowed to retry the operation again when all the causes have timed out. If the error recovery feature generation is not enabled for **l2ptguard**, the interface stays in the error-disabled state until you enter the **shutdown** and **no shutdown** commands.

## Examples

This example shows how to configure the maximum rate:

```
Switch(config-if)# l2protocol-tunnel shutdown-threshold cdp 50
Switch(config-if)#
```

**Related Commands**

| Command | Description |
|---|---|
| l2protocol-tunnel | Enables protocol tunneling on an interface. |
| l2protocol-tunnel cos | Configures the class of service (CoS) value for all tunneled Layer 2 protocol packets. |
| l2protocol-tunnel drop-threshold | Sets a drop threshold for the maximum rate of Layer 2 protocol packets per second to be received before an interface drops packets. |

# lacp port-priority

To set the LACP priority for the physical interfaces, use the **lacp port-priority** command.

**lacp port-priority** *priority*

## Syntax Description

| | |
|---|---|
| *priority* | Priority for the physical interfaces; valid values are from 1 to 65535. |

## Defaults

Priority is set to 32768.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | This command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

This command is not supported on the systems that are configured with a Supervisor Engine I.

You must assign each port in the switch a port priority that can be specified automatically or by entering the **lacp port-priority** command. The port priority is used with the port number to form the port identifier. The port priority is used to decide which ports should be put in standby mode when there is a hardware limitation that prevents all compatible ports from aggregating.

Although this command is a global configuration command, the *priority* value is supported only on port channels with LACP-enabled physical interfaces.This command is supported on LACP-enabled interfaces.

When setting the priority, the higher numbers indicate lower priorities.

## Examples

This example shows how to set the priority for the interface:

```
Switch(config-if)# lacp port-priority 23748
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **channel-group** | Assigns and configure an EtherChannel interface to an EtherChannel group. |
| **channel-protocol** | Enables LACP or PAgP on an interface. |
| **lacp system-priority** | Sets the priority of the system for LACP. |
| **show lacp** | Displays LACP information. |

# lacp system-priority

To set the priority of the system for LACP, use the **lacp system-priority** command.

**lacp system-priority** *priority*

## Syntax Description

| | |
|---|---|
| *priority* | Priority of the system; valid values are from 1 to 65535. |

## Defaults

Priority is set to 32768.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | This command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

This command is not supported on systems that are configured with a Supervisor Engine I.

You must assign each switch that is running LACP a system priority that can be specified automatically or by entering the **lacp system-priority** command. The system priority is used with the switch MAC address to form the system ID and is also used during negotiation with other systems.

Although this command is a global configuration command, the *priority* value is supported on port channels with LACP-enabled physical interfaces.

When setting the priority, tthe higher numbers indicate lower priorities.

You can also enter the **lacp system-priority** command in interface configuration mode. After you enter the command, the system defaults to global configuration mode.

## Examples

This example shows how to set the system priority:

```
Switch(config)# lacp system-priority 23748
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **channel-group** | Assigns and configure an EtherChannel interface to an EtherChannel group. |
| **channel-protocol** | Enables LACP or PAgP on an interface. |
| **lacp system-priority** | Sets the priority of the system for LACP. |
| **show lacp** | Displays LACP information. |

# logging event link-status global (global configuration)

To change the default switch-wide global link-status event messaging settings, use the **logging event link-status global** command. Use the **no** form of this command to disable the link-status event messaging.

**logging event link-status global**

**no logging event link-status global**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The global link-status messaging is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If link-status logging event is not configured at the interface level, this global link-status setting takes effect for each interface.

## Examples

This example shows how to globally enable link status message on each interface:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# logging event link-status global
Switch(config)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| logging event link-status (interface configuration) | Enables the link-status event messaging on an interface. |

# logging event link-status (interface configuration)

To enable the link-status event messaging on an interface, use the **logging event link-status** command. Use the **no** form of this command to disable link-status event messaging. Use the **logging event link-status use-global** command to apply the global link-status setting.

**logging event link-status**

**no logging event link-status**

**logging event link-status use-global**

## Defaults

Global link-status messaging is enabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

To enable system logging of interface state-change events on a specific interface, enter the **logging event link-status** command in interface configuration mode.

To enable system logging of interface state-change events on all interfaces in the system, enter the **logging event link-status global** command in global configuration mode. All interfaces without the state change event configuration use the global setting.

## Examples

This example shows how to enable logging event state-change events on interface gi11/1:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# logging event link-status
Switch(config-if)# end
Switch#
```

This example shows how to turn off logging event link status regardless of the global setting:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# no logging event link-status
Switch(config-if)# end
Switch#
```

This example shows how to enable the global event link-status setting on interface gi11/1:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# logging event link-status use-global
Switch(config-if)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| logging event link-status global (global configuration) | Changes the default switch-wide global link-status event messaging settings. |

# logging event trunk-status global (global configuration)

To enable the trunk-status event messaging globally, use the **logging event trunk-status global** command. Use the **no** form of this command to disable trunk-status event messaging.

**logging event trunk-status global**

**no logging event trunk-status global**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Global trunk-status messaging is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If trunk-status logging event is not configured at the interface level, the global trunk-status setting takes effect for each interface.

## Examples

This example shows how to globally enable link status messaging on each interface:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# logging event trunk-status global
Switch(config)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| logging event trunk-status global (global configuration) | Enables the trunk-status event messaging on an interface. |

# logging event trunk-status (interface configuration)

To enable the trunk-status event messaging on an interface, use the **logging event trunk-status** command. Use the **no** form of this command to disable the trunk-status event messaging. Use the **logging event trunk-status use-global** command to apply the global trunk-status setting.

**logging event trunk-status**

**no logging event trunk-status**

**logging event trunk-status use-global**

## Defaults

Global trunk-status messaging is enabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

To enable system logging of interface state-change events on a specific interface, enter the **logging event trunk-status** command in interface configuration mode.

To enable system logging of interface state-change events on all interfaces in the system, enter the **logging event trunk-status use-global** command in global configuration mode. All interfaces without the state change event configuration use the global setting.

## Examples

This example shows how to enable logging event state-change events on interface gi11/1:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# logging event trunk-status
Switch(config-if)# end
Switch#
```

This example shows how to turn off logging event trunk status regardless of the global setting:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# no logging event trunk-status
Switch(config-if)# end
Switch#
```

This example shows how to enable the global event trunk-status setting on interface gi11/1:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# logging event trunk-status use-global
Switch(config-if)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| logging event trunk-status global (global configuration) | Enables the trunk-status event messaging on an interface. |

# mac access-list extended

To define the extended MAC access lists, use the **mac access-list extended** command. To remove the MAC access lists, use the **no** form of this command.

**mac access-list extended** *name*

**no mac access-list extended** *name*

## Syntax Description

| | |
|---|---|
| *name* | ACL to which the entry belongs. |

## Defaults

MAC access lists are not defined.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

When you enter the ACL name, follow these naming conventions:

- Maximum of 31 characters long and can include a-z, A-Z, 0-9, the dash character (-), the underscore character (_), and the period character (.)
- Must start with an alpha character and must be unique across all ACLs of all types
- Case sensitive
- Cannot be a number
- Must not be a keyword; keywords to avoid are all, default-action, map, help, and editbuffer

When you enter the **mac access-list extended** *name* command, you use the [**no**] {**permit** | **deny**} {{*src-mac mask* | **any**} [*dest-mac mask*]} [**protocol-family** {**appletalk** | **arp-non-ipv4** | **decnet** | **ipx** | **ipv6** | **rarp-ipv4** | **rarp-non-ipv4** | **vines** | **xns**}] subset to create or delete entries in a MAC layer access list.

Table 2-7 describes the syntax of the **mac access-list extended** subcommands.

***Table 2-7 mac access-list extended Subcommands***

| Subcommand | Description |
|---|---|
| **deny** | Prevents access if the conditions are matched. |
| **no** | (Optional) Deletes a statement from an access list. |
| **permit** | Allows access if the conditions are matched. |
| *src-mac mask* | Source MAC address in the form: *source-mac-address source-mac-address-mask*. |
| **any** | Specifies any protocol type. |

*Table 2-7 mac access-list extended Subcommands (continued)*

| Subcommand | Description |
|---|---|
| *dest-mac mask* | (Optional) Destination MAC address in the form: *dest-mac-address dest-mac-address-mask*. |
| *protocol-family* | (Optional) Name of the protocol family. Table 2-8 lists which packets are mapped to a particular protocol family. |

Table 2-8 describes mapping an Ethernet packet to a protocol family.

*Table 2-8 Mapping an Ethernet Packet to a Protocol Family*

| Protocol Family | Ethertype in Packet Header |
|---|---|
| Appletalk | 0x809B, 0x80F3 |
| Arp-Non-Ipv4 | 0x0806 and protocol header of Arp is a non-Ip protocol family |
| Decnet | 0x6000-0x6009, 0x8038-0x8042 |
| Ipx | 0x8137-0x8138 |
| Ipv6 | 0x86DD |
| Rarp-Ipv4 | 0x8035 and protocol header of Rarp is Ipv4 |
| Rarp-Non-Ipv4 | 0x8035 and protocol header of Rarp is a non-Ipv4 protocol family |
| Vines | 0x0BAD, 0x0BAE, 0x0BAF |
| Xns | 0x0600, 0x0807 |

When you enter the *src-mac mask* or *dest-mac mask* value, follow these guidelines:

- Enter the MAC addresses as three 4-byte values in dotted hexadecimal format such as 0030.9629.9f84.
- Enter the MAC address masks as three 4-byte values in dotted hexadecimal format. Use 1 bit as a wildcard. For example, to match an address exactly, use 0000.0000.0000 (can be entered as 0.0.0).
- For the optional *protocol* parameter, you can enter either the EtherType or the keyword.
- Entries without a *protocol* parameter match any protocol.
- The access list entries are scanned in the order that you enter them. The first matching entry is used. To improve performance, place the most commonly used entries near the beginning of the access list.
- An implicit **deny any any** entry exists at the end of an access list unless you include an explicit **permit any any** entry at the end of the list.
- All new entries to an existing list are placed at the end of the list. You cannot add entries to the middle of a list.

## Examples

This example shows how to create a MAC layer access list named mac_layer that denies traffic from 0000.4700.0001, which is going to 0000.4700.0009, and permits all other traffic:

```
Switch(config)# mac access-list extended mac_layer
Switch(config-ext-macl)# deny 0000.4700.0001 0.0.0 0000.4700.0009 0.0.0 protocol-family appletalk
Switch(config-ext-macl)# permit any any
Switch(config-ext-macl)# end
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| show vlan access-map | Displays VLAN access map information. |

# mac-address-table aging-time

To configure the aging time for the entries in the Layer 2 table, use the **mac-address-table aging-time** command. To reset the *seconds* value to the default setting, use the **no** form of this command.

**mac-address-table aging-time** *seconds* [**vlan** *vlan_id*]

**no mac-address-table aging-time** *seconds* [**vlan** *vlan_id*]

## Syntax Description

| | |
|---|---|
| *seconds* | Aging time in seconds; valid values are 0 and from 10 to 1000000 seconds. |
| **vlan** *vlan_id* | (Optional) Single VLAN number or a range of VLANs; valid values are from 1 to 4094. |

## Defaults

Aging time is set to 300 seconds.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended addressing was added. |

## Usage Guidelines

If you do not enter a VLAN, the change is applied to all routed-port VLANs.

Enter 0 seconds to disable aging.

## Examples

This example shows how to configure the aging time to 400 seconds:

```
Switch(config)# mac-address-table aging-time 400
Switch(config)#
```

This example shows how to disable aging:

```
Switch(config)# mac-address-table aging-time 0
Switch(config)
```

## Related Commands

| Command | Description |
|---|---|
| **show mac-address-table aging-time** | Displays MAC address table aging information. |

# mac-address-table dynamic group protocols

To enable the learning of MAC addresses in both the "ip" and "other" protocol buckets, even though the incoming packet may belong to only one of the protocol buckets, use the **mac-address-table dynamic group protocols** command. To disable grouped learning, use the **no** form of this command.

**mac-address-table dynamic group protocols** {**ip** | **other**} {**ip** | **other**}

[**no**] **mac-address-table dynamic group protocols** {**ip** | **other**} {**ip** | **other**}

## Syntax Description

| | |
|---|---|
| **ip** | Specifies the "ip" protocol bucket. |
| **other** | Specifies the "other" protocol bucket. |

## Defaults

The group learning feature is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The entries within the "ip" and "other" protocol buckets are created according to the protocol of the incoming traffic.

When you use the **mac-address-table dynamic group protocols** command, an incoming MAC address that might belong to either the "ip" or the "other" protocol bucket, is learned on both protocol buckets. Therefore, any traffic destined to this MAC address and belonging to any of the protocol buckets is unicasted to that MAC address, rather than flooded. This reduces the unicast Layer 2 flooding that might be caused if the incoming traffic from a host belongs to a different protocol bucket than the traffic that is destined to the sending host.

## Examples

This example shows that the MAC addresses are initially assigned to either the "ip" or the "other" protocol bucket:

```
Switch# show mac-address-table dynamic
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0000.0000.5000   dynamic other                 GigabitEthernet1/1
   1    0001.0234.6616   dynamic ip                    GigabitEthernet3/1
   1    0003.3178.ec0a   dynamic assigned              GigabitEthernet3/1
   1    0003.4700.24c3   dynamic ip                    GigabitEthernet3/1
   1    0003.4716.f475   dynamic ip                    GigabitEthernet3/1
   1    0003.4748.75c5   dynamic ip                    GigabitEthernet3/1
   1    0003.47f0.d6a3   dynamic ip                    GigabitEthernet3/1
   1    0003.47f6.a91a   dynamic ip                    GigabitEthernet3/1
```

```
   1    0003.ba06.4538   dynamic ip                    GigabitEthernet3/1
   1    0003.fd63.3eb4   dynamic ip                    GigabitEthernet3/1
   1    0004.2326.18a1   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5d.de53   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5e.6ecc   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5e.f60e   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5f.06f7   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5f.072f   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5f.08f6   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5f.090b   dynamic ip                    GigabitEthernet3/1
   1    0004.5a88.b075   dynamic ip                    GigabitEthernet3/1
   1    0004.c1bd.1b40   dynamic ip                    GigabitEthernet3/1
   1    0004.c1d8.b3c0   dynamic ip                    GigabitEthernet3/1
   1    0004.c1d8.bd00   dynamic ip                    GigabitEthernet3/1
   1    0007.e997.74dd   dynamic ip                    GigabitEthernet3/1
   1    0007.e997.7e8f   dynamic ip                    GigabitEthernet3/1
   1    0007.e9ad.5e24   dynamic ip                    GigabitEthernet3/1
   1    000b.5f0a.f1d8   dynamic ip                    GigabitEthernet3/1
   1    000b.fdf3.c498   dynamic ip                    GigabitEthernet3/1
   1    0010.7be8.3794   dynamic assigned              GigabitEthernet3/1
   1    0012.436f.c07f   dynamic ip                    GigabitEthernet3/1
   1    0050.0407.5fe1   dynamic ip                    GigabitEthernet3/1
   1    0050.6901.65af   dynamic ip                    GigabitEthernet3/1
   1    0050.da6c.81cb   dynamic ip                    GigabitEthernet3/1
   1    0050.dad0.af07   dynamic ip                    GigabitEthernet3/1
   1    00a0.ccd7.20ac   dynamic ip                    GigabitEthernet3/1
   1    00b0.64fd.1c23   dynamic ip                    GigabitEthernet3/1
   1    00b0.64fd.2d8f   dynamic assigned              GigabitEthernet3/1
   1    00d0.b775.c8bc   dynamic ip                    GigabitEthernet3/1
   1    00d0.b79e.de1d   dynamic ip                    GigabitEthernet3/1
   1    00e0.4c79.1939   dynamic ip                    GigabitEthernet3/1
   1    00e0.4c7b.d765   dynamic ip                    GigabitEthernet3/1
   1    00e0.4c82.66b7   dynamic ip                    GigabitEthernet3/1
   1    00e0.4c8b.f83e   dynamic ip                    GigabitEthernet3/1
   1    00e0.4cbc.a04f   dynamic ip                    GigabitEthernet3/1
   1    0800.20cf.8977   dynamic ip                    GigabitEthernet3/1
   1    0800.20f2.82e5   dynamic ip                    GigabitEthernet3/1
Switch#
```

This example shows how to assign MAC addresses that belong to either the “ip” or the “other” bucket to both buckets:

```
Switch(config)# mac-address-table dynamic group protocols ip other
Switch(config)# exit
Switch# show mac address-table dynamic
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0000.0000.5000   dynamic ip,other              GigabitEthernet1/1
   1    0001.0234.6616   dynamic ip,other              GigabitEthernet3/1
   1    0003.4700.24c3   dynamic ip,other              GigabitEthernet3/1
   1    0003.4716.f475   dynamic ip,other              GigabitEthernet3/1
   1    0003.4748.75c5   dynamic ip,other              GigabitEthernet3/1
   1    0003.47c4.06c1   dynamic ip,other              GigabitEthernet3/1
   1    0003.47f0.d6a3   dynamic ip,other              GigabitEthernet3/1
   1    0003.47f6.a91a   dynamic ip,other              GigabitEthernet3/1
   1    0003.ba0e.24a1   dynamic ip,other              GigabitEthernet3/1
   1    0003.fd63.3eb4   dynamic ip,other              GigabitEthernet3/1
   1    0004.2326.18a1   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a5d.de53   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a5d.de55   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a5e.6ecc   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a5e.f60e   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a5f.08f6   dynamic ip,other              GigabitEthernet3/1
```

```
   1    0004.5a5f.090b   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a64.f813   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a66.1a77   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a6b.56b2   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a6c.6a07   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a88.b075   dynamic ip,other              GigabitEthernet3/1
   1    0004.c1bd.1b40   dynamic ip,other              GigabitEthernet3/1
   1    0004.c1d8.b3c0   dynamic ip,other              GigabitEthernet3/1
   1    0004.c1d8.bd00   dynamic ip,other              GigabitEthernet3/1
   1    0005.dce0.7c0a   dynamic assigned             GigabitEthernet3/1
   1    0007.e997.74dd   dynamic ip,other              GigabitEthernet3/1
   1    0007.e997.7e8f   dynamic ip,other              GigabitEthernet3/1
   1    0007.e9ad.5e24   dynamic ip,other              GigabitEthernet3/1
   1    0007.e9c9.0bc9   dynamic ip,other              GigabitEthernet3/1
   1    000b.5f0a.f1d8   dynamic ip,other              GigabitEthernet3/1
   1    000b.fdf3.c498   dynamic ip,other              GigabitEthernet3/1
   1    0012.436f.c07f   dynamic ip,other              GigabitEthernet3/1
   1    0050.0407.5fe1   dynamic ip,other              GigabitEthernet3/1
   1    0050.6901.65af   dynamic ip,other              GigabitEthernet3/1
   1    0050.da6c.81cb   dynamic ip,other              GigabitEthernet3/1
   1    0050.dad0.af07   dynamic ip,other              GigabitEthernet3/1
   1    00a0.ccd7.20ac   dynamic ip,other              GigabitEthernet3/1
   1    00b0.64fd.1b84   dynamic assigned             GigabitEthernet3/1
   1    00d0.b775.c8bc   dynamic ip,other              GigabitEthernet3/1
   1    00d0.b775.c8ee   dynamic ip,other              GigabitEthernet3/1
   1    00d0.b79e.de1d   dynamic ip,other              GigabitEthernet3/1
   1    00e0.4c79.1939   dynamic ip,other              GigabitEthernet3/1
   1    00e0.4c7b.d765   dynamic ip,other              GigabitEthernet3/1
   1    00e0.4c82.66b7   dynamic ip,other              GigabitEthernet3/1
   1    00e0.4c8b.f83e   dynamic ip,other              GigabitEthernet3/1
   1    00e0.4c8c.0861   dynamic ip,other              GigabitEthernet3/1
   1    0800.20d1.bf09   dynamic ip,other              GigabitEthernet3/1
Switch#
```

# mac-address-table notification

To enable MAC address notification on a switch, use the **mac-address-table notification** command. To return to the default setting, use the **no** form of this command

**mac-address-table notification** {**change** [**history-size** *hs_value*] | [**interval** *intv_value*]] | [**mac-move**] | [**threshold** [**limit** *percentage*] | [**interval** *time*]}

**no mac-address-table notification** {**change** [**history-size** *hs_value*] | [**interval** *intv_value*]] | [**mac-move**] | [**threshold** [**limit** *percentage*] | [**interval** *time*]}

## Syntax Description

| | |
|---|---|
| **change** | (Optional) Specifies enabling MAC change notification. |
| **history-size** *hs_value* | (Optional) Maximum number of entries in the MAC change notification history table. The range is 0 to 500 entries. |
| **interval** *intv_value* | (Optional) Notification trap interval, set interval time between two consecutive traps. The range is 0 to 2,147,483,647 seconds. |
| **mac-move** | (Optional) Specifies enabling MAC move notification. |
| **threshold** | (Optional) Specifies enabling MAC threshold notification. |
| **limit** *percentage* | (Optional) Specifies the percentage of MAT utilization threshold; valid values are from 1 to 100 percent. |
| **interval** *time* | (Optional) Specifies the time between MAC threshold notifications; valid values are greater than or equal to 120 seconds. |

## Defaults

MAC address notification feature is disabled.

The default MAC change trap interval value is 1 second.

The default number of entries in the history table is 1.

MAC move notification is disabled.

MAC threshold monitoring feature is disabled.

The default limit is 50 percent.

The default time is 120 seconds.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

We can enable the MAC change notification feature by using the **mac address-table notification change** command. We must also enable MAC notification traps on an interface by using the **snmp trap mac-notification change interface** configuration command and configure the switch to send MAC change traps to the NMS by using the **snmp-server enable traps mac-notification** global configuration command.

When the *history-size* option is configured, the existing MAC change history table is deleted, and a new table is created.

## Examples

This example shows how to set the MAC address notification history table size to 300 entries:

```
Switch(config)# mac-address-table notification change history-size 300
Switch(config)#
```

This example shows how to set the MAC address notification interval time to 1250 seconds:

```
Switch(config)# mac-address-table notification change interval 1250
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| clear mac-address-table | Clears the global counter entries from the Layer 2 MAC address table. |
| mac-address-table notification | Enables MAC address notification on a switch. |
| snmp-server enable traps | Enables SNMP notifications. |
| snmp trap mac-notification change | Enables SNMP MAC address notifications. |

# mac-address-table static

To configure the static MAC addresses for a VLAN interface or drop unicast traffic for a MAC address for a VLAN interface, use the **mac-address-table static** command. To remove the static MAC address configurations, use the **no** form of this command.

**mac-address-table static** *mac-addr* {**vlan** *vlan-id*} {**interface** *type* | **drop**}

**no mac-address-table static** *mac-addr* {**vlan** *vlan-id*} {**interface** *type*} {**drop**}

## Syntax Description

| | |
|---|---|
| *mac-addr* | MAC address; optional when using the **no** form of this command. |
| **vlan** *vlan-id* | VLAN and valid VLAN number; valid values are from 1 to 4094. |
| **interface** *type* | Interface type and number; valid options are **FastEthernet** and **GigabitEthernet**. |
| **drop** | Drops all traffic received from and going to the configured MAC address in the specified VLAN. |

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

When a static MAC address is installed, it is associated with a port.

The output interface specified must be a Layer 2 interface and not an SVI.

If you do not enter a protocol type, an entry is automatically created for each of the four protocol types.

Entering the **no** form of this command does not remove the system MAC addresses.

When removing a MAC address, entering **interface** *int* is optional. For unicast entries, the entry is removed automatically. For multicast entries, if you do not specify an interface, the entire entry is removed. You can specify the selected ports to be removed by specifying the interface.

## Examples

This example shows how to add the static entries to the MAC address table:

```
Switch(config)# mac-address-table static 0050.3e8d.6400 vlan 100 interface fastethernet5/7
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show mac-address-table static** | Displays the static MAC address table entries only. |

# macro apply cisco-desktop

To enable the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop, use the **macro apply cisco-desktop c**ommand.

**macro apply cisco-desktop $AVID** *access_vlanid*

## Syntax Description

| | |
|---|---|
| **$AVID access_vlanid** | Specifies an access VLAN ID. |

## Defaults

This command has no default settings.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command can only be viewed and applied; it cannot be modified.

Ensure that the existing configuration on the interface does not conflict with the intended macro configuration. Before you apply the macro, clear the configuration on the interface with the **default interface** command.

## Examples

This example shows how to enable the Cisco-recommended features and settings on port fa2/1:

```
Switch(config)# interface FastEthernet2/1
Switch(config-if)# macro apply cisco-desktop $AVID 50
Switch(config-if)#
```

The contents of this macro are as follows:

```
# Basic interface - Enable data VLAN only
# Recommended value for access vlan (AVID) should not be 1
switchport access vlan $AVID [access_vlanid]
switchport mode access
# Enable port security limiting port to a single
# MAC address -- that of desktop
switchport port-security
# Ensure port-security age is greater than one minute
# and use inactivity timer
# "Port-security maximum 1" is the default and will not
# Show up in the config
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
```

## Related Commands

| Command | Description |
|---|---|
| macro apply cisco-phone | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop and a Cisco IP phone. |
| macro apply cisco-router | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a router. |
| macro apply cisco-switch | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to another switch. |

# macro apply cisco-phone

To enable the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop and a Cisco IP phone, use the **macro apply cisco-phone** command.

**macro apply cisco-phone $AVID** ***access_vlanid*** **$VVID** ***voice_vlanid***

## Syntax Description

| | |
|---|---|
| **$AVID** ***access_vlanid*** | Specifies an access VLAN ID. |
| **$VVID** ***voice_vlanid*** | Specifies a voice VLAN ID. |

## Defaults

This command has no default settings.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command can only be viewed and applied; it cannot be modified.

Ensure that the existing configuration on the interface does not conflict with the intended macro configuration. Before you apply the macro, clear the configuration on the interface with the **default interface** command.

## Examples

This example shows how to enable the Cisco-recommended features and settings on port fa2/1:

```
Switch(config)# interface FastEthernet2/1
Switch(config-if)# macro apply cisco-phone $AVID 10 $VVID 50
Switch(config-if)#
```

The contents of this macro are as follows:

```
# VoIP enabled interface - Enable data VLAN
# and voice VLAN (VVID)
# Recommended value for access vlan (AVID) should not be 1\
switchport access vlan $AVID [access_vlan_id]
switchport mode access
# Update the Voice VLAN (VVID) value which should be
# different from data VLAN
# Recommended value for voice vlan (VVID) should not be 1
switchport voice vlan $VVID [voice_vlan_id]
# Enable port security limiting port to a 3 MAC
# addressees -- One for desktop and two for phone
switchport port-security
switchport port-security maximum 3
# 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
# Enable auto-qos to extend trust to attached Cisco phone
auto qos voip cisco-phone
# Configure port as an edge network port
spanning-tree portfast
spanning-tree bpduguard enable@
```

## Related Commands

| Command | Description |
|---|---|
| **macro apply cisco-desktop** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop. |
| **macro apply cisco-router** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a router. |
| **macro apply cisco-switch** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to another switch. |

# macro apply cisco-router

To enable the Cisco-recommended features and settings that are suitable for connecting a switch port to a router, use the **macro apply cisco-router** command.

**macro apply cisco-router $NVID** ***native_vlanid***

## Syntax Description

| | |
|---|---|
| **$NVID** ***native_vlanid*** | Specifies a native VLAN ID. |

## Defaults

This command has no default settings.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command can only be viewed and applied; it cannot be modified.

Ensure that the existing configuration on the interface does not conflict with the intended macro configuration. Before you applythe **macro apply cisco-router** command, clear the configuration on the interface with the **default interface** command.

## Examples

This example shows how to enable the Cisco-recommended features and settings on port fa2/1:

```
Switch(config)# interface FastEthernet2/1
Switch(config-if)# macro apply cisco-router $NVID 80
Switch(config-if)#
```

The contents of this macro are as follows:

```
# Access Uplink to Distribution
switchport trunk encapsulation dot1q
# Define unique Native VLAN on trunk ports
# Recommended value for native vlan (NVID) should not be 1
switchport trunk native vlan $NVID [native_vlan_id]
# Update the allowed VLAN range (VRANGE) such that it
# includes data, voice and native VLANs
# switchport trunk allowed vlan $VRANGE [vlan_range]
# Hardcode trunk and disable negotiation to
# speed up convergence
# Hardcode speed and duplex to router
switchport mode trunk
switchport nonegotiate
speed 100
duplex full
# Configure qos to trust this interface
auto qos voip trust
qos trust dscp
```

```
# Ensure fast access to the network when enabling the interface.
# Ensure that switch devices cannot become active on the interface.
spanning-tree portfast
spanning-tree bpduguard enable
```

## Related Commands

| Command | Description |
|---|---|
| **macro apply cisco-desktop** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop. |
| **macro apply cisco-phone** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop and a Cisco IP phone. |
| **macro apply cisco-router** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a router. |
| **macro apply cisco-switch** | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to another switch. |

# macro apply cisco-switch

To enable the Cisco-recommended features and settings that are suitable for connecting a switch port to another switch, use the **macro apply cisco-switch** command.

**macro apply cisco-switch $NVID** ***native_vlanid***

## Syntax Description

| | |
|---|---|
| **$NVID** ***native_vlanid*** | Specifies a native VLAN ID. |

## Defaults

This command has no default settings.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command can only be viewed and applied; it cannot be modified.

Ensure that the existing configuration on the interface does not conflict with the intended macro configuration. Before you apply this macro, clear the configuration on the interface with the **default interface** command.

## Examples

This example shows how to enable the Cisco-recommended features and settings on port fa2/1:

```
Switch(config)# interface FastEthernet2/1
Switch(config-if)# macro apply cisco-switch $NVID 45
Switch(config-if)#
```

The contents of this macro are as follows:

```
# Access Uplink to Distribution
switchport trunk encapsulation dot1q
# Define unique Native VLAN on trunk ports
# Recommended value for native vlan (NVID) should not be 1
switchport trunk native vlan $NVID [native_vlan_id]
# Update the allowed VLAN range (VRANGE) such that it
# includes data, voice and native VLANs
# switchport trunk allowed vlan $VRANGE
# Hardcode trunk and disable negotiation to
# speed up convergence
switchport mode trunk
switchport nonegotiate
# Configure qos to trust this interface
auto qos voip trust
# 802.1w defines the link as pt-pt for rapid convergence
spanning-tree link-type point-to-point
```

## Related Commands

| Command | Description |
|---|---|
| macro apply cisco-desktop | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop. |
| macro apply cisco-phone | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop and a Cisco IP phone. |
| macro apply cisco-router | Enables the Cisco-recommended features and settings that are suitable for connecting a switch port to a router. |

# macro global apply cisco-global

To apply the system-defined default template to the switch, use the **macro global apply cisco-global** global configuration command on the switch stack or on a standalone switch.

**macro global apply cisco-global**

## Syntax Description

This command has no keywords or variables.

## Defaults

This command has no default setting.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

These examples show how to apply the system-defined default to the switch:

```
Switch(config)#macro global apply cisco-global
Changing VTP domain name from gsg-vtp to [smartports] Device mode already VTP TRANSPARENT.
Switch(config)#
```

# macro global apply system-cpp

To apply the control plane policing default template to the switch, use the **macro global apply system-cpp** global configuration command on the switch stack or on a standalone switch.

**macro global apply system-cpp**

## Syntax Description

This command has no keywords or variables.

## Defaults

This command has no default setting.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

## Examples

These examples show how to apply the system-defined default to the switch:

```
Switch (config)# macro global apply system-cpp
Switch (config)#
```

## Related Commands

| Command | Description |
|---|---|
| **macro global apply cisco-global** | Applies the system-defined default template to the switch. |
| **macro global description** | Enters a description about the macros that are applied to the switch. |

# macro global description

To enter a description about the macros that are applied to the switch, use the **macro global description** global configuration command on the switch stack or on a standalone switch. Use the no form of this command to remove the description.

**macro global description** *text*

**no macro global description** *text*

## Syntax Description

| | |
|---|---|
| **description** *text* | Enter a description about the macros that are applied to the switch. |

## Defaults

This command has no default setting.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Use the **description** keyword to associate comment text, or the macro name, with a switch. When multiple macros are applied on a switch, the description text will be from the last applied macro.

This example shows how to add a description to a switch:

```
Switch(config)# macro global description udld aggressive mode enabled
```

You can verify your settings by entering the **show parser macro description** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **macro global apply cisco-global** | Applies the system-defined default template to the switch. |

# main-cpu

To enter the main CPU submode and manually synchronize the configurations on the two supervisor engines, use the **main-cpu** command.

**main-cpu**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Redundancy

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. (Catalyst 4507R only). |

## Usage Guidelines

The main CPU submode is used to manually synchronize the configurations on the two supervisor engines.

From the main CPU submode, use the **auto-sync** command to enable automatic synchronization of the configuration files in NVRAM.

**Note** After you enter the main CPU submode, you can use the **auto-sync** command to automatically synchronize the configuration between the primary and secondary route processors based on the primary configuration. In addition, you can use all of the redundancy commands that are applicable to the main CPU.

## Examples

This example shows how to reenable the default automatic synchronization feature using the auto-sync standard command to synchronize the startup-config and config-register configuration of the active supervisor engine with the standby supervisor engine. The updates for the boot variables are automatic and cannot be disabled.

```
Switch(config)# redundancy
Switch(config-red)# main-cpu
Switch(config-r-mc)# auto-sync standard
Switch(config-r-mc)# end
Switch# copy running-config startup-config
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| auto-sync | Enables automatic synchronization of the configuration files in NVRAM. |

# match

To specify a match clause by selecting one or more ACLs for a VLAN access-map sequence, use the **match** subcommand. To remove the match clause, use the **no** form of this command.

**match** {**ip address** {*acl-number* | *acl-name*}} | {**mac address** *acl-name*}

**no match** {**ip address** {*acl-number* | *acl-name*}} | {**mac address** *acl-name*}

**Note** If a match clause is not specified, the action for the VLAN access-map sequence is applied to all packets. All packets are matched against that sequence in the access map.

## Syntax Description

| | |
|---|---|
| **ip address** *acl-number* | Selects one or more IP ACLs for a VLAN access-map sequence; valid values are from 1 to 199 and from 1300 to 2699. |
| **ip address** *acl-name* | Selects an IP ACL by name. |
| **mac address** *acl-name* | Selects one or more MAC ACLs for a VLAN access-map sequence. |

## Defaults

This command has no default settings.

## Command Modes

VLAN access-map

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The match clause specifies the IP or MAC ACL for traffic filtering.

The MAC sequence is not effective for IP packets. IP packets should be access controlled by IP match clauses.

Refer to the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide* for additional configuration guidelines and restrictions.

Refer to the *Cisco IOS Command Reference* publication for additional **match** command information.

## Examples

This example shows how to define a match clause for a VLAN access map:

```
Switch(config)# vlan access-map ganymede 10
Switch(config-access-map)# match ip address 13
Switch(config-access-map)#
```

**Related Commands**

| Command | Description |
|---|---|
| **show vlan access-map** | Displays the contents of a VLAN access map. |
| **vlan access-map** | Enters VLAN access-map command mode to create a VLAN access map. |

# match (class-map configuration)

To define the match criteria for a class map, use the **match** class-map configuration command. To remove the match criteria, use the **no** form of this command.

### Non-Supervisor Engine 6-E

**match** {**access-group** *acl-index-or-name* | **cos** *cos-list* | [**lp**] **dscp** *dscp-list* | [**lp**] **precedence** *ip-precedence-list*

**no match** {**access-group** *acl-index-or-name* | **cos** *cos-list* | [**lp**] **dscp** *dscp-list* | [**lp**] **precedence** *ip-precedence-list*

### Supervisor Engine 6-E and Catalyst 4900M chassis

**match** {**access-group** *acl-index-or-name* | **cos** *cos-list* | [**lp**] **dscp** *dscp-list* | [**lp**] **precedence** *ip-precedence-list* | **qos-group** *value* | **protocol** [**ip** | **ipv6** | **arp**]

**no match** {**access-group** *acl-index-or-name* | **cos** *cos-list* | [**lp**] **dscp** *dscp-list* | [**lp**] **precedence** *ip-precedence-list* | **qos-group** *value* | **protocol** [**ip** | **ipv6** | **arp**]

## Syntax Description

| | |
|---|---|
| **access-group** *acl-index-or-name* | Number or name 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. |
| **cos** *cos-list* | List of up to four Layer 2 class of service (CoS) values to match against a packet. Separate each value with a space. The range is 0 to 7. |
| [**lp**] **dscp** *dscp-list* | (Optional) IP keyword. It specifies that the match is for IPv4 packets only. If not used, the match is for both IPv4 and IPv6 packets.<br>List of up to eight IP Differentiated Services Code Point (DSCP) values to match against a packet. Separate each value with a space. The range is 0 to 63. You also can enter a mnemonic name for a commonly used value. |
| [**lp**] **precedence** *ip-precedence-list* | (Optional) IP keyword. It specifies that the match is for IPv4 packets only. If not used, the match is for both IPv4 and IPv6 packets.<br>List of up to eight IP-precedence values to match against a packet. Separate each value with a space. The range is 0 to 7. You also can enter a mnemonic name for a commonly used value. |
| **qos-group** *value* | Specifies the internally generated qos-group value assigned to a packet on the input qos classification. |
| **protocol ip** | Specifies IP in the Ethernet header. The match criteria are supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. Though visible in the command-line help strings the only protocol types supported are IP, IPv6, and ARP. |

| | |
|---|---|
| **protocol ipv6** | Specifies IPv6 in the Ethernet header. The match criteria are supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. Though visible in the command-line help strings the only protocol types supported are IP, IPv6, and ARP. |
| **protocol arp** | Specifies ARP in the Ethernet header. The match criteria are supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. Though visible in the command-line help strings the only protocol types supported are IP, IPv6, and ARP. |

## Defaults

No match criteria are defined.

## Command Modes

Class-map configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switches. |
| 12.2(40)SG | Added support for the Supervisor Engine 6-E and Catalyst 4900M chassis. |
| 12.2(46)SG | Added support for the **match protocol arp** command on the Supervisor Engine 6-E and Catalyst 4900M chassis. |

## Usage Guidelines

Before entering the **match** command, you must first enter the **class-map** global configuration command to specify the name of the class whose match criteria you want to establish. The **match** command is used to specify which fields in the packets are examined to classify the packets. If a packet matches the specified criteria, the packet is considered a member of the class and is forwarded according to the quality of service (QoS) specifications set in the traffic policy.

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.

To match only IPv6 packets, you must use the **match protocol ipv6** command. To match only IPv4 packets you can use either the **ip** prefix or the protocol **ip** keyword.

To match only ARP packets, you must use the **match protocol arp** command.

You can configure the **match cos** *cos-list*, **match ip dscp** *dscp-list*, **match ip precedence** *ip-precedence-list* command in a class map within a policy map.

The **match cos** *cos-list* command applies only to Ethernet frames that carry a VLAN tag.

The **match qos-group** command is used by the class-map to identify a specific QoS group value assigned to a packet. The QoS group value is local to the switch and is associated with a packet on the input Qos classification.

Packets that do not meet any of the matching criteria are classified as members of the default traffic class. You configure it by specifying **class-default** as the class name in the **class** policy-map configuration command. For more information, see the "class" section on page 2-29.

## Examples

This example shows how to create a class map called *class2*, which matches all the inbound traffic with DSCP values of 10, 11, and 12:

```
Switch# configure terminal
Switch(config)# class-map class2
Switch(config-cmap)# match ip dscp 10 11 12
Switch(config-cmap)# exit
Switch#
```

This example shows how to create a class map called *class3*, which matches all the inbound traffic with IP-precedence values of 5, 6, and 7 for both IPv4 and IPv6 traffic:

```
Switch# configure terminal
Switch(config)# class-map class3
Switch(config-cmap)# match ip precedence 5 6 7
Switch(config-cmap)# exit
Switch#
```

This example shows how to delete the IP-precedence match criteria and to classify traffic using *acl1*:

```
Switch# configure terminal
Switch(config)# class-map class2
Switch(config-cmap)# match ip precedence 5 6 7
Switch(config-cmap)# no match ip precedence
Switch(config-cmap)# match access-group acl1
Switch(config-cmap)# exit
Switch#
```

This example shows how to specify a class-map that applies only to IPv6 traffic on a Supervisor Engine 6-E:

```
Switch# configure terminal
Switch(config)# class-map match all ipv6 only
Switch(config-cmap)# match dscp af21
Switch(config-cmap)# match protocol ipv6
Switch(config-cmap)# exit
Switch#
```

You can verify your settings by entering the **show class-map** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **class-map** | Creates a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode. |
| **show class-map** | Displays class map information. |

# match flow ip

To specify match criteria to treat flows with a unique source or destination address as new flows, use the **match flow ip** command. To disable this function, use the **no** form of this command.

**match flow ip** {**source-address** [**ip destination-address ip protocol L4 source-address L4 destination-address**] | **destination-address**}

**no match flow ip** {**source-address** [**ip destination-address ip protocol L4 source-address L4 destination-address**] | **destination-address**}

## Syntax Description

| | |
|---|---|
| **source-address** | Establishes a new flow from a flow with a unique IP source address. |
| **ip destination-address ip protocol L4 source-address L4 destination-address** | Comprises the full flow keyword; treats each flow with unique IP source, destination, protocol, and Layer 4 source and destination address as a new flow. |
| **destination-address** | Establishes a new flow from a flow with a unique IP destination address. |

## Defaults

None.

## Command Modes

class-map configuration submode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)SG | Support for the full flow option was added. |

## Usage Guidelines

When you specify the source-address keyword, each flow with a unique source address is treated as a new flow.

When you specify the destination-address keyword, each flow with a unique destination address is treated as a new flow.

A policy map is called a *flow-based* policy map when you configure the flow keywords on the class map that it uses. To attach a flow-based policy map as a child to an aggregate policy map, use the **service-policy** command.

**Note** The **match flow** command is available on the Catalyst 4500 series switch only when Supervisor Engine VI (WS-X4516-10GE) is present.

## Examples

This example shows how to create a flow-based class map associated with a source address:

```
Switch(config)# class-map match-all c1
Switch(config-cmap)# match flow ip source-address
Switch(config-cmap)# end
Switch#
Switch# show class-map c1
Class Map match-all c1 (id 2)
  Match flow  ip source-address
Switch#
```

This example shows how to create a flow-based class map associated with a destination address:

```
Switch(config)# class-map match-all c1
Switch(config-cmap)# match flow ip destination-address
Switch(config-cmap)# end
Switch#

Switch# show class-map c1
 Class Map match-all c1 (id 2)
   Match flow  ip destination-address
Switch#
```

Assume there are two active flows on the Fast Ethernet interface 6/1 with source addresses 192.168.10.20 and 192.168.10.21. The following example shows how to maintain each flow to 1 Mbps with an allowed burst value of 9000 bytes:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# class-map c1
Switch(config-cmap)# match flow ip source-address
Switch(config-cmap)# exit
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# police 1000000 9000
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface fastethernet6/1
Switch(config-if)# service-policy input p1
Switch(config-if)# end
Switch# write memory

Switch# show policy-map interface
FastEthernet6/1

 Service-policy input: p1

   Class-map: c1 (match-all)
     15432182 packets
     Match: flow  ip source-address
     police: Per-interface
       Conform: 64995654 bytes Exceed: 2376965424 bytes

   Class-map: class-default (match-any)
     0 packets
     Match: any
       0 packets
Switch#
```

This example shows two active flows on the Fast Ethernet interface 6/1 with destination addresses of 192.168.20.20 and 192.168.20.21. The following example shows how to maintain each flow to 1 Mbps with an allowed burst value of 9000 bytes:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# class-map c1
Switch(config-cmap)# match flow ip destination-address
Switch(config-cmap)# exit
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# police 1000000 9000
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface fastethernet6/1
Switch(config-if)# service-policy input p1
Switch(config-if)# end
Switch# write memory

Switch# show policy-map interface
 FastEthernet6/1

  Service-policy input: p1

    Class-map: c1 (match-all)
      2965072 packets
      Match: flow  ip destination-address
      police: Per-interface
        Conform: 6105636 bytes Exceed: 476652528 bytes

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
Switch#
```

Assume there are two active flows as shown below on the Fast Ethernet interface 6/1:

```
SrcIp          DstIp          IpProt SrcL4Port DstL4Port
-------------------------------------------------------
192.168.10.10  192.168.20.20  20     6789       81
192.168.10.10  192.168.20.20  20     6789       21
```

With the following configuration, each flow is policed to a 1000000 bps with an allowed 9000-byte burst value.

**Note** If you use the **match flow ip source-address|destination-address** command, these two flows are consolidated into one flow because they have the same source and destination address.

```
Switch# conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# class-map c1
Switch(config-cmap)# match flow ip source-address ip destination-address ip protocol l4
source-port l4 destination-port
Switch(config-cmap)# exit
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# police 1000000 9000
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface fastEthernet 6/1
```

```
Switch(config-if)# service-policy input p1
Switch(config-if)# end
Switch# write memory
Switch# show policy-map interface
FastEthernet6/1

class-map c1
   match flow  ip source-address ip destination-address ip protocol l4 source-port l4
destination-port
!
 policy-map p1
    class c1
       police 1000000 bps 9000 byte conform-action transmit exceed-action drop
!
interface FastEthernet 6/1
  service-policy input p1

Switch# show class-map c1
 Class Map match-all c1 (id 2)
   Match flow  ip source-address ip destination-address ip protocol l4 source-port l4
destination-port

Switch# show policy-map p1
  Policy Map p1
    Class c1
      police 1000000 bps 9000 byte conform-action transmit exceed-action drop

Switch# show policy-map interface
 FastEthernet6/1

  Service-policy input: p1

    Class-map: c1 (match-all)
      15432182 packets
      Match: flow  ip source-address ip destination-address ip protocol l4 source-port l4
destination-port
      police: Per-interface
        Conform: 64995654 bytes Exceed: 2376965424 bytes


    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| service-policy (interface configuration) | Attaches a policy map to an interface. |
| show class-map | Displays class map information. |
| show policy-map | Displays information about the policy map. |
| show policy-map interface | Displays the statistics and configurations of the input and output policies that are attached to an interface. |

# mdix auto

To enable the automatic medium-dependent interface crossover (auto-MDIX) feature on the interface, use the **mdix auto** command. When auto-MDIX is enabled, the interface automatically detects the required cable connection type (straight-through or crossover) and configures the connection appropriately. Use the no form of this command to disable auto-MDIX.

**mdix auto**

**no mdix auto**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Auto-MDIX is enabled.

## Command Modes

interface configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(46)SG | Added supported and unsupported linecard information to the usage guidelines. |

## Usage Guidelines

Linecards that support auto-MDIX configuration on their copper media ports include: WS-X4124-RJ45, WS-X4148-RJ with hardware revision 3.0 or later, WS-X4232-GB-RJ with hardware revision 3.0 or later, WS-X4920-GE-RJ45 and WS-4648-RJ45V+E.

Linecards that support auto-MDIX by default when port auto-negotiation enabled and cannot be turned off using an **mdix** CLI command include: WS-X4448-GB-RJ45, WS-X4548-GB-RJ45, WS-X4424-GB-RJ45, and WS-X4412-2GB-T.

Linecards that cannot support auto-MDIX functionality, either by default or CLI commands, include: WS-X4548-GB-RJ45V, WS-X4524-GB-RJ45V, WS-X4506-GB-T, WS-X4148-RJ, WS-X4248-RJ21V, WS-X4248-RJ45V, WS-X4224-RJ45V, and WS-X4232-GB-RJ.

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

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

## Examples

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

```
Switch# configure terminal
Switch(config)# interface FastEthernet6/3
Switch(config-if)# speed auto
Switch(config-if)# mdix auto
Switch(config-if)# end
```

## Related Commands

| Command | Description |
|---|---|
| **speed** | Configures the interface speed. |
| **show interfaces** | Displays traffic on a specific interface. |
| **show interfaces capabilities** | Displays the interface capabilities for an interface or for all the interfaces on a switch. |
| **show interfaces status** | Displays the interface status. |

# media-type

To select the connector for a dual-mode capable port, use the **media-type** command.

**media-type** {**rj45** | **sfp**}

## Syntax Description

| | |
|---|---|
| **rj45** | Uses the RJ-45 connector. |
| **sfp** | Uses the SFP connector. |

## Defaults

**sfp**

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(20)EWA | Support for this command was introduced for the WS-X4306-GB-T module and the WS-X4948 chassis. |

## Usage Guidelines

This command is supported on all ports on the WS-X4306-GB-T module and ports 1/45-48 on the WS-X4948 chassis.

Entering the **show interface capabilities** command provides the Multiple Media Types field, which displays the value **no** if a port is not dual-mode capable and lists the media types (**sfp** and **rj45**) for dual-mode capable ports.

## Examples

This example shows how to configure port 5/45 on a WS-X4948 chassis to use the RJ-45 connector:

```
Switch(config)# interface gigabitethernet 5/45
Switch(config-if)# media-type rj45
```

# mode

To set the redundancy mode, use the **mode** command.

**mode** {**rpr** | **sso**}

## Syntax Description

| | |
|---|---|
| **rpr** | Specifies RPR mode. |
| **sso** | Specifies SSO mode. |

## Defaults

For Catalyst 4500 series switches that are configured with Supervisor Engine II+, Supervisor Engine IV, and Supervisor Engine V, the defaults are as follows:

- SSO, if the supervisor engine is using Cisco IOS Release 12.2(20)EWA.
- RPR, if the supervisor engine is using Cisco IOS Release 12.1(12c)EW through 12.2(18)EW, as well as 12.1(*xx*)E.

**Note** If you are upgrading the current supervisor engine from Cisco IOS Release 12.2(18)EW or an earlier release to 12.2(20)EWA, and the RPR mode has been saved to the startup configuration, both supervisor engines will continue to operate in RPR mode after the software upgrade. To use SSO mode, you must manually change the redundancy mode to SSO.

## Command Modes

Redundancy configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(20)EWA | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

RPR and SSO mode are not supported on Catalyst 4500 series switches that are configured with Supervisor Engine 2.

The **mode** command can be entered only from within redundancy configuration mode.

Follow these guidelines when configuring your system to RPR or SSO mode:

- You must use identical Cisco IOS images and supervisor engines to support RPR and SSO mode. Redundancy may not work due to differences between the Cisco IOS release and supervisor engine capabilities.
- Any modules that are not online at the time of a switchover are reset and reloaded on a switchover.
- If you perform an OIR of the module within 60 seconds before a stateful switchover, the module resets during the stateful switchover and the port states are restarted.
- The FIB tables are cleared on a switchover. Routed traffic is interrupted until route tables reconverge.

The redundant supervisor engine reloads on any mode change and begins to work in the current mode.

## Examples

This example shows how to set the redundancy mode to SSO:

```
Switch(config)# redundancy
Switch(config-red)# mode sso
Switch(config-red)#
```

## Related Commands

| Command | Description |
|---|---|
| **redundancy** | Enters the redundancy configuration mode. |
| **redundancy force-switchover** | Forces a switchover from the active to the standby supervisor engine. |
| **show redundancy** | Displays redundancy facility information. |
| **show running-config** | Displays the running configuration of a switch. |

# monitor session

To enable the SPAN sessions on interfaces or VLANs, use the **monitor session** command. To remove one or more source or destination interfaces from a SPAN session, or a source VLAN from a SPAN session, use the **no** form of this command.

**monitor session** *session* {**destination interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number*} [**encapsulation** {**isl** | **dot1q**}] [**ingress** [**vlan** *vlan_id*] [**learning**]]} | {**remote vlan** *vlan_id*} | {**source** {**interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number* | **Port-channel** *interface-number*}} | [**vlan** *vlan_id*] |{**remote vlan** *vlan_id*} | {**cpu** [**queue** *queue_id* | **acl** {**input** {**error** {**rx**} | **log** {**rx**} | **punt** {**rx**} | **rx**}} | **output** {**error** {**rx**} | **forward** {**rx**} | **log** {**rx**} | **punt** {**rx**} | **rx**} | **adj-same-if** {**rx**} | **all** {**rx**} | **bridged** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4** {**rx**} | **rx**} | **control-packet** {**rx**} | **mtu-exceeded** {**rx**} | **routed** {**forward** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4** {**rx**} | **rx**} | **received** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4**{**rx**} | **rx**} | **rx**] | **rpf-failure** {**rx**} | **unknown-sa** {**rx**}]}]} [ **,** | **-** | **rx** | **tx** | **both**]} | {**filter** {**ip access-group** [**name** | **id**]}{**vlan** *vlan_id* [ **,** | **-** ]} | {**packet-type** {**good** | **bad**}} | {**address-type** {**unicast** | **multicast** | **broadcast**} [**rx** | **tx** | **both**]}

**no monitor session** *session* {**destination interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number*} [**encapsulation** {**isl** | **dot1q**}] [**ingress** [**vlan** *vlan_id*] [**learning**]]} | {**remote vlan** *vlan_id*} | {**source** {**interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number* | **Port-channel** *interface-number*}} | [**vlan** *vlan_id*] |{**remote vlan** *vlan_id*} | {**cpu** [**queue** *queue_id* | **acl** {**input** {**error** {**rx**} | **log** {**rx**} | **punt** {**rx**} | **rx**}} | **output** {**error** {**rx**} | **forward** {**rx**} | **log** {**rx**} | **punt** {**rx**} | **rx**} | **adj-same-if** {**rx**} | **all** {**rx**} | **bridged** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4** {**rx**} | **rx**} | **control-packet** {**rx**} | **mtu-exceeded** {**rx**} | **routed** {**forward** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4** {**rx**} | **rx**} | **received** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4**{**rx**} | **rx**} | **rx**] | **rpf-failure** {**rx**} | **unknown-sa** {**rx**}]}]} [ **,** | **-** | **rx** | **tx** | **both**]} | {**filter** {**ip access-group** [**name** | **id**]}{**vlan** *vlan_id* [ **,** | **-** ]} | {**packet-type** {**good** | **bad**}} | {**address-type** {**unicast** | **multicast** | **broadcast**} [**rx** | **tx** | **both**]}

### Supervisor Engine 6-E and Catalyst 4900M chassis

**monitor session** *session* {**destination interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number*} [**encapsulation** {**isl** | **dot1q**}] [**ingress** [**vlan** *vlan_id*] [**learning**]]} | {**remote vlan** *vlan_id*} | {**source** { **interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number* | **Port-channel** *interface-number*}} | [**vlan** *vlan_id*] |{**remote vlan** *vlan_id*} | {**cpu** [**queue** *queue_id* | **acl** { **input** {**copy** {**rx**} | **error** {**rx**} | **forward** {**rx**} | **punt** {**rx**} | **rx**} } | **output** {**copy** {**rx**} | **error** {**rx**} | **forward** {**rx**} | **punt** {**rx**} | **rx**} | **all** {**rx**} | **control-packet** {**rx**} | **esmp** {**rx**} | **l2-forward** { **adj-same-if** {**rx**} | **bridge-cpu** {**rx**} | **ip-option** {**rx**} | **ipv6-scope-check-fail** {**rx**} | **l2-src-index-check-fail** {**rx**} | **mcast-rpf-fail** {**rx**} | **non-arpa** {**rx**} | **router-cpu** {**rx**} | **ttl-expired** {**rx**} | **ucast-rpf-fail** {**rx**} | **rx**} | **l3-forward** { **forward** {**rx**} | **glean** {**rx**} | **receive** {**rx**} | **rx**} **mtu-exceeded** {**rx**} | **unknown-port-vlan-mapping** {**rx**} | **unknown-sa** {**rx**}]} [ **,** | **-** | **rx** | **tx** | **both**]} | {**filter** {**ip access-group** [**name** | **id**]}{**vlan** *vlan_id* [ **,** | **-** ]} | {**packet-type** {**good** | **bad**}} | {**address-type** {**unicast** | **multicast** | **broadcast**} [**rx** | **tx** | **both**]}

**no monitor session** *session* {**destination interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number*} [**encapsulation** {**isl** | **dot1q**}] [**ingress** [**vlan** *vlan_id*] [**learning**]]} | {**remote vlan** *vlan_id*} | {**source** {**cpu**{**both** | **queue** | **rx** | **tx**} | **interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number* | **Port-channel** *interface-number*}} | [**vlan** *vlan_id*] |{**remote vlan** *vlan_id*} | {**cpu** [**queue** *queue_id* | **acl** {**input** {**copy** {**rx**} | **error** {**rx**} | **forward** {**rx**} | **punt** {**rx**} | **rx**} } | **output** {**copy** {**rx**} | **error** {**rx**} | **forward** {**rx**} | **punt** {**rx**} | **rx**} | **all** {**rx**} | **control-packet** {**rx**} | **esmp** {**rx**} | **l2-forward**

{ **adj-same-if** {rx} | **bridge-cpu** {**rx**} | **ip-option** {**rx**} | **ipv6-scope-check-fail** {**rx**} | **l2-src-index-check-fail** {**rx**} | **mcast-rpf-fail** {**rx**} | **non-arpa** {**rx**} | **router-cpu** {**rx**} | **ttl-expired** {**rx**} | **ucast-rpf-fail** {**rx**} | **rx**} | **l3-forward** {**forward** {**rx**} | **glean** {**rx**} | **receive** {**rx**} | **rx**} **mtu-exceeded** {**rx**} | **unknown-port-vlan-mapping** {**rx**} | **unknown-sa** {**rx**}]} [ **,** | **-** | **rx** | **tx** | **both**]} | {**filter** {**ip access-group** [**name** | **id**]}{**vlan** *vlan_id* [ **,** | **-** ]} | {**packet-type** {**good** | **bad**}} | {**address-type** {**unicast** | **multicast** | **broadcast**} [**rx** | **tx** | **both**]}

## Syntax Description

| | |
|---|---|
| *session* | Number of a SPAN session; valid values are from 1 to 6. |
| **destination** | Specifies a SPAN destination. |
| **interface** | Specifies an interface. |
| **FastEthernet** *interface-number* | Specifies a Fast Ethernet module and port number; valid values are from 1 to 6. |
| **GigabitEthernet** *interface-number* | Specifies a Gigabit Ethernet module and port number; valid values are from 1 to 6. |
| **encapsulation** | (Optional) Specifies the encapsulation type of the destination port. |
| **isl** | (Optional) Specifies ISL encapsulation. |
| **dot1q** | (Optional) Specifies dot1q encapsulation. |
| **ingress** | (Optional) Indicates whether the ingress option is enabled. |
| **vlan** *vlan_id* | (Optional) Specifies the VLAN; valid values are from 1 to 4094. |
| **learning** | (Optional) Enables host learning on ingress-enabled destination ports. |
| **remote vlan** *vlan_id* | Specifies an RSPAN source or destination session on a switch. |
| **source** | Specifies a SPAN source. |
| **Port-channel** *interface-number* | Specifies a port-channel interface; valid values are from 1 to 64. |
| **cpu** | Causes traffic received or sent from the CPU to be copied to the destination of the session. |
| **queue** *queue_id* | (Optional) Specifies that only traffic received on the specific CPU subqueue should be copied to the destination of the session. Valid values are from 1 to 64, or by the following names: all, control-packet, esmp, mtu-exceeded, unknown-port-vlan-mapping, unknown-sa, acl input, acl input copy, acl input error, acl input forward, acl input punt, acl output, acl output copy, acl output error, acl output forward, acl output punt, l2-forward, adj-same-if, bridge-cpu, ip-option, ipv6-scope-check-fail, l2-src-index-check-fail, mcast-rpf-fail, non-arpa, router-cpu, ttl-expired, ucast-rpf-fail, l3-forward, forward, glean, receive. |
| **acl** | (Optional) Specifies input and output ACLs; valid values are from 14 to 20. |
| **input** | Specifies input ACLs; valid values are from 14 to 16. |
| **error** | Specifies the ACL software errors. |
| **log/copy** | Specifies packets for ACL logging. |
| **punt** | Specifies packets punted due to overflows. |
| **rx** | Specifies monitoring received traffic only. |

| | |
|---|---|
| **output** | Specifies output ACLs; valid values are from 17 to 20. |
| **l2-forward** | (Optional) Layer 2 or Layer 3 exception packets. |
| **bridge-cpu** | Specifies packets bridged to CPU. |
| **ip-option** | Specifies packets with an IP option. |
| **ipv6-scope-check-fail** | Specifies IPv6 packets with scope-check failures. |
| **l2-src-index-check-fail** | Specifies IP packets with mismatched SRC MAC and SRC IP addresses. |
| **mcast-rpf-fail** | Specifies IPv4/IPv6 multicast RPF failures. |
| **non-arpa** | Specifies packets with non-ARPA encapsulation. |
| **router-cpu** | Specifies software routed packets. |
| **ttl-expired** | Specifies IPv4 routed pacekts exceed TTL. |
| **adj-same-if** | Specifies packets routed to the incoming interface. |
| **bridged** | Specifies Layer 2 bridged packets. |
| **1** | Specifies packets with the highest priority. |
| **2** | Specifies packets with the a high priority. |
| **3** | Specifies packets with the a medium priority. |
| **4** | Specifies packets with the a low priority. |
| **ucast-rpf-fail** | Specifies IPv4/IPv6 Unicast RPF failures. |
| **all** | (Optional) all queues. |
| **l3-forward** | (Optional) Layer 3 packets. |
| **forward** | Specifies special Layer 3 forwards tunnel encapsulation. |
| **glean** | Specifies special Layer 3 forwards glean. |
| **receive** | Specifies packets addressed to a port. |
| **control-packet** | (Optional) Layer 2 control packets. |
| **esmp** | (Optional) ESMP packets. |
| **mtu-exceeded** | (Optional) Output Layer 3 interface MTU exceeded. |
| **routed** | Specifies Layer 3 routed packets. |
| **received** | Specifies packets addressed to a port. |
| **rpf-failure** | Specifies Multicast RPF failed packets. |
| **unknown-port-vlan-mapping** | (Optional) Packets with missing port-VLAN mapping. |
| **unknown-sa** | (Optional) Packets with missing source-IP-addresses. |
| **,** | (Optional) Symbol to specify another range of SPAN VLANs; valid values are from 1 to 4094. |
| **-** | (Optional) Symbol to specify a range of SPAN VLANs. |
| **both** | (Optional) Monitors and filters received and transmitted traffic. |
| **rx** | (Optional) Monitors and filters received traffic only. |
| **tx** | (Optional) Monitors and filters transmitted traffic only. |
| **filter** | Limits SPAN source traffic to specific VLANs. |
| **ip access-group** | (Optional) Specifies an IP access group filter, either a name or a number. |
| **name** | (Optional) Specifies an IP access list name. |

| | |
|---|---|
| **id** | (Optional) Specifies an IP access list number. Valid values are 1 to 199 for an IP access list and 1300 to 2699 for an IP expanded access list. |
| **vlan** *vlan_id* | (Optional) Specifies the VLAN to be filtered. The number is entered as a single value or a range; valid values are from 1 to 4094. |
| **packet-type** | Limits SPAN source traffic to packets of a specified type. |
| **good** | Specifies a good packet type |
| **bad** | Specifies a bad packet type. |
| **address-type unicast \| multicast \| broadcast** | Limits SPAN source traffic to packets of a specified address type. Valid types are unicast, multicast, and broadcast. |

## Defaults

Received and transmitted traffic, as well as all VLANs, packet types, and address types are monitored on a trunking interface.

Packets are transmitted untagged out the destination port; ingress and learning are disabled.

All packets are permitted and forwarded "as is" on the destination port.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(11b)EW | Support for differing directions within a single-user session and extended VLAN addressing was added. |
| 12.1(19)EW | Support for ingress packets, encapsulation specification, packet and address type filtering, and CPU source sniffing enhancements was added. |
| 12.1(20)EW | Support for remote SPAN and host learning on ingress-enabled destination ports was added. |
| 12.2(20)EW | Support for an IP access group filter was added. |
| 12.2(40)SG | Support for Supervisor Engine 6-E and Catalyst 4900M chassisCPU queue options was added. |

## Usage Guidelines

Only one SPAN destination for a SPAN session is supported. If you attempt to add another destination interface to a session that already has a destination interface that is configured, you will get an error. You must first remove a SPAN destination interface before changing the SPAN destination to a different interface.

Beginning in Cisco IOS Release 12.1(12c)EW, you can configure sources from different directions within a single user session.

**Note** Beginning in Cisco IOS Release 12.1(12c)EW, SPAN is limited to two sessions containing ingress sources and four sessions containing egress sources. Bidirectional sources support both ingress and egress sources.

A particular SPAN session can either monitor VLANs or monitor individual interfaces: you cannot have a SPAN session that monitors both specific interfaces and specific VLANs. If you first configure a SPAN session with a source interface, and then try to add a source VLAN to the same SPAN session, you will receive an error. You will also receive an error message if you configure a SPAN session with a source VLAN, and then try to add a source interface to that session. You must first clear any sources for a SPAN session before switching to another type of source. CPU sources may be combined with source interfaces and source VLANs.

When configuring the **ingress** option on a destination port, you must specify an ingress VLAN if the configured encapsulation type is untagged (the default) or is 802.1Q. If the encapsulation type is ISL, then no ingress VLAN specification is necessary.

By default, when you enable ingress, no host learning is performed on destination ports. When you enter the **learning** keyword, host learning is performed on the destination port, and traffic to learned hosts is forwarded out the destination port.

If you enter the **filter** keyword on a monitored trunking interface, only traffic on the set of specified VLANs is monitored. Port-channel interfaces are displayed in the list of **interface** options if you have them configured. VLAN interfaces are not supported. However, you can span a particular VLAN by entering the **monitor session** *session* **source vlan** *vlan-id* command.

The packet-type filters are supported only in the Rx direction. You can specify both Rx- and Tx-type filters and multiple-type filters at the same time (for example, you can use **good** and **unicast** to only sniff nonerror unicast frames). As with VLAN filters, if you do not specify the type, the session will sniff all packet types.

The **queue** identifier allows sniffing for only traffic that is sent or received on the specified CPU queues. The queues may be identified either by number or by name. The queue names may contain multiple numbered queues for convenience.

## Examples

This example shows how to configure IP access group 100 on a SPAN session:

```
Switch# configure terminal
Switch(config)# monitor session 1 filter ip access-group 100
Switch(config)# end
Switch(config)#
```

This example shows how to add a source interface to a SPAN session:

```
Switch# configure terminal
Switch(config)# monitor session 1 source interface fa2/3
Switch(config)# end
Switch(config)#
Switch(config)#
Switch(config)#
```

This example shows how to configure the sources with different directions within a SPAN session:

```
Switch# configure terminal
Switch(config)# monitor session 1 source interface fa2/3 rx
Switch(config)# monitor session 1 source interface fa2/2 tx
Switch(config)# end
```

This example shows how to remove a source interface from a SPAN session:

```
Switch# configure terminal
Switch(config)# no monitor session 1 source interface fa2/3
Switch(config)# end
```

This example shows how to limit SPAN traffic to VLANs 100 through 304:

```
Switch# configure terminal
Switch(config)# monitor session 1 filter vlan 100 - 304
Switch(config)# end
```

This example shows how to configure RSPAN VLAN 20 as the destination:

```
Switch# configure terminal
Switch(config)# monitor session 2 destination remote vlan 20
Switch(config)# end
```

This example shows how to use queue names and queue number ranges for the CPU as a SPAN source on Supervisor Engine 6-E:

```
Switch# configure terminal
Switch(config)# monitor session 2 source cpu queue control-packet rx
Switch(config)# monitor session 3 source cpu queue 10 rx
Switch(config)# end
```

**Note** For Supervisor Engine 6-E and Catalyst 4900M chassis, control-packet is mapped to queue 10.

## Related Commands

| Command | Description |
|---|---|
| show monitor | Displays information about the SPAN session. |

# mtu

To enable jumbo frames on an interface by adjusting the maximum size of a packet or maximum transmission unit (MTU), use the **mtu** command. To return to the default setting, use the **no** form of this command.

**mtu** *bytes*

**no mtu**

## Syntax Description

| | |
|---|---|
| *bytes* | Byte size; valid values are from 1500 to 9198. |

## Defaults

The default settings are as follows:

- Jumbo frames are disabled
- 1500 bytes for all ports

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

Jumbo frames are supported on nonblocking Gigabit Ethernet ports, switch virtual interfaces (SVI), and EtherChannels. Jumbo frames are not available for stub-based ports.

The baby giants feature uses the global **system mtu** *size* command to set the global baby giant MTU. It allows all stub-based port interfaces to support an Ethernet payload size of up to 1552 bytes.

Both the **system mtu** command and the per-interface **mtu** command work on interfaces that can support jumbo frames, but the per-interface **mtu** command takes precedence.

## Examples

This example shows how to specify an MTU of 1800 bytes:

```
Switch(config)# interface GigabitEthernet 1/1
Switch(config-if)# mtu 1800
```

## Related Commands

| Command | Description |
|---|---|
| system mtu | Sets the maximum Layer 2 or Layer 3 payload size. |

# name

To set the MST region name, use the **name** command. To return to the default name, use the **no** form of this command.

**name** *name*

**no name** *name*

## Syntax Description

| | |
|---|---|
| *name* | Specifies the name of the MST region. The name can be any string with a maximum length of 32 characters. |

## Defaults

The MST region name is not set.

## Command Modes

MST configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Two or more Catalyst 4500 series switches with the same VLAN mapping and configuration version number are considered to be in different MST regions if the region names are different.

## Examples

This example shows how to name a region:

```
Switch(config-mst)# name Cisco
Switch(config-mst)#
```

## Related Commands

| Command | Description |
|---|---|
| **instance** | Maps a VLAN or a set of VLANs to an MST instance. |
| **revision** | Sets the MST configuration revision number. |
| **show spanning-tree mst** | Displays MST protocol information. |
| **spanning-tree mst configuration** | Enters the MST configuration submode. |

# pagp learn-method

To learn the input interface of the incoming packets, use the **pagp learn-method** command. To return to the default value, use the **no** form of this command.

**pagp learn-method** {**aggregation-port** | **physical-port**}

**no pagp learn-method**

## Syntax Description

| | |
|---|---|
| **aggregation-port** | Specifies learning the address on the port channel. |
| **physical-port** | Specifies learning the address on the physical port within the bundle. |

## Defaults

Aggregation port is enabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to enable physical port address learning within the bundle:

```
Switch(config-if)# pagp learn-method physical-port
Switch(config-if)#
```

This example shows how to enable aggregation port address learning within the bundle:

```
Switch(config-if)# pagp learn-method aggregation-port
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **show pagp** | Displays information about the port channel. |

# pagp port-priority

To select a port in hot standby mode, use the **pagp port-priority** command. To return to the default value, use the **no** form of this command.

**pagp port-priority** *priority*

**no pagp port-priority**

## Syntax Description

| | |
|---|---|
| *priority* | Port priority number; valid values are from 1 to 255. |

## Defaults

Port priority is set to 128.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The higher the priority, the better the chances are that the port will be selected in the hot standby mode.

## Examples

This example shows how to set the port priority:

```
Switch(config-if)# pagp port-priority 45
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| pagp learn-method | Learns the input interface of the incoming packets. |
| show pagp | Displays information about the port channel. |

# passive-interface

To disable sending routing updates on an interface, use the **passive-interface** command. To reenable the sending of routing updates, use the **no** form of this command.

**passive-interface** [[**default**] {*interface-type interface-number*}] | {**range** *interface-type interface-number-interface-type interface-number*}

**no passive-interface** [[**default**] {*interface-type interface-number*}] | {**range** *interface-type interface-number-interface-type interface-number*}

## Syntax Description

| | |
|---|---|
| **default** | (Optional) All interfaces become passive. |
| *interface-type* | Specifies the interface type. |
| *interface-number* | Specifies the interface number. |
| **range** range | Specifies the range of subinterfaces being configured; see the "Usage Guidelines" section. |

## Defaults

Routing updates are sent on the interface.

## Command Modes

Router configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You can use the **passive-interface range** command on the following interfaces: FastEthernet, GigabitEthernet, VLAN, Loopback, Port-channel, 10-GigabitEthernet, and Tunnel. When you use the **passive-interface range** command on a VLAN interface, the interface should be the existing VLAN SVIs. To display the VLAN SVIs, enter the **show running config** command. The VLANs that are not displayed cannot be used in the **passive-interface range** command.

The values that are entered with the **passive-interface range** command are applied to all the existing VLAN SVIs.

Before you can use a macro, you must define a range using the **define interface-range** command.

All configuration changes that are made to a port range through the **passive-interface range** command are retained in the running-configuration as individual passive-interface commands.

You can enter the **range** in two ways:

- Specifying up to five interface ranges
- Specifying a previously defined macro

You can either specify the interfaces or the name of an interface-range macro. An interface range must consist of the same interface type, and the interfaces within a range cannot span across the modules.

You can define up to five interface ranges on a single command; separate each range with a comma:

**interface range gigabitethernet 5/1-20, gigabitethernet4/5-20.**

Use this format when entering the *port-range*:

- *interface-type* {*mod*}/{*first-port*} - {*last-port*}

You cannot specify both a macro and an interface range in the same command. After creating a macro, you can enter additional ranges. If you have already entered an interface range, the CLI does not allow you to enter a macro.

You can specify a single interface in the **range** *range* value. This makes the command similar to the **passive-interface** *interface-number* command.

**Note** The **range** keyword is only supported in OSPF, EIGRP, RIP, and ISIS router mode.

If you disable the sending of routing updates on an interface, the particular subnet will continue to be advertised to other interfaces, and updates from other routers on that interface continue to be received and processed.

The **default** keyword sets all interfaces as passive by default. You can then configure individual interfaces where adjacencies are desired using the **no passive-interface** command. The **default** keyword is useful in Internet service provider (ISP) and large enterprise networks where many of the distribution routers have more than 200 interfaces.

For the Open Shortest Path First (OSPF) protocol, OSPF routing information is neither sent nor received through the specified router interface. The specified interface address appears as a stub network in the OSPF domain.

For the Intermediate System-to-Intermediate System (IS-IS) protocol, this command instructs IS-IS to advertise the IP addresses for the specified interface without actually running IS-IS on that interface. The **no** form of this command for IS-IS disables advertising IP addresses for the specified address.

**Note** For IS-IS you must keep at least one active interface and configure the interface with the **ip router isis** command.

Enhanced Interior Gateway Routing Protocol (EIGRP) is disabled on an interface that is configured as passive although it advertises the route.

## Examples

The following example sends EIGRP updates to all interfaces on network 10.108.0.0 except GigabitEthernet interface 1/1:

```
Switch(config)# interface gigabitethernet 1/1
Switch(config-if)# router eigrp 109
Switch(config-router)# network 10.108.0.0
Switch(config-router)# passive-interface gigabitethernet 1/1
Switch(config-router)#
```

The following configuration enables IS-IS on Ethernet interface 1 and serial interface 0 and advertises the IP addresses of Ethernet interface 0 in its link-state protocol data units (PDUs):

```
Switch(config-if)# router isis Finance
Switch(config-router)# passive-interface Ethernet 0
Switch(config-router)# interface Ethernet 1
Switch(config-router)# ip router isis Finance
Switch(config-router)# interface serial 0
Switch(config-router)# ip router isis Finance
Switch(config-router)#
```

The following example sets all interfaces as passive, then activates Ethernet interface 0:

```
Switch(config-if)# router ospf 100
Switch(config-router)# passive-interface default
Switch(config-router)# no passive-interface ethernet0
Switch(config-router)# network 10.108.0.1 0.0.0.255 area 0
Switch(config-router)#
```

The following configuration sets the Ethernet ports 3 through 4 on module 0 and GigabitEthernet ports 4 through 7 on module 1 as passive:

```
Switch(config-if)# router ospf 100
Switch(config-router)# passive-interface range ethernet0/3-4,gigabitethernet1/4-7
Switch(config-router)#
```

# permit

To permit an ARP packet based on matches against the DHCP bindings, use the **permit** command. To remove a specified ACE from an access list, use the **no** form of this command

**permit** {[**request**] **ip** {**any** | **host** *sender-ip* | *sender-ip sender-ip-mask*} **mac** {**any** | **host** *sender-mac* | *sender-mac sender-mac-mask*} | **response ip** {**any** | **host** *sender-ip* | *sender-ip sender-ip-mask*} [{**any** | **host** *target-ip* | *target-ip target-ip-mask*}] **mac** {**any** | **host** *sender-mac* | *sender-mac sender-mac-mask*} [{**any** | **host** *target-mac* | *target-mac target-mac-mask*}]} [**log**]

**no permit** {[**request**] **ip** {**any** | **host** *sender-ip* | *sender-ip sender-ip-mask*} **mac** {**any** | **host** *sender-mac* | *sender-mac sender-mac-mask*} | **response ip** {**any** | **host** *sender-ip* | *sender-ip sender-ip-mask*} [{**any** | **host** *target-ip* | *target-ip target-ip-mask*}] **mac** {**any** | **host** *sender-mac* | *sender-mac sender-mac-mask*} [{**any** | **host** *target-mac* | *target-mac target-mac-mask*}]} [**log**]

## Syntax Description

| | |
|---|---|
| **request** | (Optional) Requests a match for the ARP request. When **request** is not specified, matching is performed against all ARP packets. |
| **ip** | Specifies the sender IP address. |
| **any** | Specifies that any IP or MAC address will be accepted. |
| **host** *sender-ip* | Specifies that only a specific sender IP address will be accepted. |
| *sender-ip sender-ip-mask* | Specifies that a specific range of sender IP addresses will be accepted. |
| **mac** | Specifies the sender MAC address. |
| **host** *sender-mac* | Specifies that only a specific sender MAC address will be accepted. |
| *sender-mac sender-mac-mask* | Specifies that a specific range of sender MAC addresses will be accepted. |
| **response** | Specifies a match for the ARP responses. |
| **ip** | Specifies the IP address values for the ARP responses. |
| **host** *target-ip* | (Optional) Specifies that only a specific target IP address will be accepted. |
| *target-ip target-ip-mask* | (Optional) Specifies that a specific range of target IP addresses will be accepted. |
| **mac** | Specifies the MAC address values for the ARP responses. |
| **host** *target-mac* | (Optional) Specifies that only a specific target MAC address will be accepted. |
| *target-mac target-mac-mask* | (Optional) Specifies that a specific range of target MAC addresses will be accepted. |
| **log** | (Optional) Logs a packet when it matches the access control entry (ACE). |

## Defaults

This command has no default settings.

## Command Modes

arp-nacl configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Permit clauses can be added to forward or drop ARP packets based on some matching criteria.

## Examples

This example shows a host with a MAC address of 0000.0000.abcd and an IP address of 1.1.1.1. This example shows how to permit both requests and responses from this host:

```
Switch(config)# arp access-list static-hosts
Switch(config-arp-nacl)# permit ip host 1.1.1.1 mac host 0000.0000.abcd
Switch(config-arp-nacl)# end
Switch# show arp access-list

ARP access list static-hosts
    permit ip host 1.1.1.1 mac host 0000.0000.abcd
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| deny | Denies an ARP packet based on matches against the DHCP bindings. |
| ip arp inspection filter vlan | Permits ARPs from hosts that are configured for static IP when DAI is enabled and to define an ARP access list and applies it to a VLAN. |

# police

To configure the Traffic Policing feature, use the **police** QoS policy-map class configuration command. To remove the Traffic Policing feature from the configuration, use the **no** form of this command.

**police** {*bps* | *kbps* | *mbps* |*gbps*} [*burst-normal*] [*burst-max*] **conform-action** *action* **exceed-action** *action* [**violate-action** *action*]

**no police** {*bps* | *kbps* | *mbps* |*gbps*} [*burst-normal*] [*burst-max*] **conform-action** *action* **exceed-action** *action* [**violate-action** *action*]

## Syntax Description

| | |
|---|---|
| *bps* | Average rate, in bits per second. Valid values are 32,000 to 32,000,000,000. |
| *kbps* | Average rate, in kilobytes per second. Valid values are 32 to 32,000,000. |
| *mbps* | Average rate, in megabits per second. Valid values are 1 to 32,000. |
| *gbps* | Average rate, in gigabits per second. Valid values are 1 to 32. |
| *burst-normal* | (Optional) Normal burst size, in bytes. Valid values are 64 to 2,596,929,536. Burst value of up to four times the configured rate can be supported. |
| *burst-max* | (Optional) Excess burst size, in bytes. Valid values are 64 to 2,596,929,536. Burst value of upto four times the configured rate can be supported. |
| **conform-action** | Action to take on packets that conform to the rate limit. |
| **exceed-action** | Action to take on packets that exceed the rate limit. |
| **violate-action** | (Optional) Action to take on packets that violate the normal and maximum burst sizes. |
| *action* | Action to take on packets. Specify one of the following keywords:<br>• **drop**—Drops the packet.<br>• **set-cos-transmit** new-ios—Set the class of services (CoS) value to a new value and send the packet. The range is 0 to 7.<br>• **set-dscp-transmit** *value*—Sets the IP differentiated services code point (DSCP) value and transmits the packet with the new IP DSCP value setting.<br>• **set-prec-transmit** *value*—Sets the IP precedence and transmits the packet with the new IP precedence value setting.<br>• **transmit**—Transmits the packet. The packet is not altered. |

## Defaults

This command is disabled by default.

## Command Modes

Policy-map class configuration (when specifying a single action to be applied to a market packet)

Policy-map class police configuration (when specifying multiple actions to be applied to a marked packet)

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6E. |

## Usage Guidelines

Use the **police** command to mark a packet with different quality of service (QoS) values based on conformance to the service-level agreement.

Traffic policing will not be executed for traffic that passes through an interface.

### Specifying Multiple Actions

The **police** command allows you to specify multiple policing actions. When specifying multiple policing actions when configuring the **police** command, note the following points:

- You can specify a maximum of four actions at one time.
- You cannot specify contradictory actions such as **conform-action** *transmit* and **conform-action** *drop*.

### Using the Police Command with the Traffic Policing Feature

The **police** command can be used with Traffic Policing feature. The Traffic Policing feature works with a token bucket algorithm. Two types of token bucket algorithms are a single-token bucket algorithm and a two-token bucket algorithm. A single-token bucket system is used when the **violate-action** option is not specified, and a two-token bucket system is used when the **violate-action** option is specified.

### Token Bucket Algorithm with One Token Bucket

The one token bucket algorithm is used when the **violate-action** option is not specified in the **police** command of the command-line interface (CLI).

The conform bucket is initially set to the full size (the full size is the number of bytes specified as the normal burst size).

When a packet of a given size (for example, “B” bytes) arrives at specific time (time “T”) the following actions occur:

- Tokens are updated in the conform bucket. If the previous arrival of the packet was at T1 and the current time is T, the bucket is updated with (T - T1) worth of bits based on the token arrival rate. The token arrival rate is calculated as follows:

  (time between packets <which is equal to T - T1> * policer rate)/8 bytes
- If the number of bytes in the conform bucket B is greater than or equal to 0, the packet conforms and the conform action is taken on the packet. If the packet conforms, B bytes are removed from the conform bucket and the conform action is completed for the packet.
- If the number of bytes in the conform bucket B (minus the packet size to be limited) is fewer than 0, the exceed action is taken.

#### Token Bucket Algorithm with Two Token Buckets (Refer to RFC 2697)

The two-token bucket algorithm is used when the **violate-action** is specified in the **police** command CLI.

The conform bucket is initially full (the full size is the number of bytes specified as the normal burst size).

The exceed bucket is initially full (the full exceed bucket size is the number of bytes specified in the maximum burst size).

The tokens for both the conform and exceed token buckets are updated based on the token arrival rate, or committed information rate (CIR).

When a packet of given size (for example, “B” bytes) arrives at specific time (time “T”) the following actions occur:

- Tokens are updated in the conform bucket. If the previous arrival of the packet was at T1 and the current arrival of the packet is at t, the bucket is updated with T -T1 worth of bits based on the token arrival rate. The refill tokens are placed in the conform bucket. If the tokens overflow the conform bucket, the overflow tokens are placed in the exceed bucket.

  The token arrival rate is calculated as follows:

  (time between packets <which is equal to T-T1> * policer rate)/8 bytes

- If the number of bytes in the conform bucket - B is greater than or equal to 0, the packet conforms and the conform action is taken on the packet. If the packet conforms, B bytes are removed from the conform bucket and the conform action is taken. The exceed bucket is unaffected in this scenario.
- If the number of bytes in the conform bucket B is less than 0, the excess token bucket is checked for bytes by the packet. If the number of bytes in the exceed bucket B is greater than or equal to 0, the exceed action is taken and B bytes are removed from the exceed token bucket. No bytes are removed from the conform bucket.
- If the number bytes in the exceed bucket B is fewer than 0, the packet violates the rate and the violate action is taken. The action is complete for the packet.

## Examples

#### Token Bucket Algorithm with One Token Bucket

This example shows how to define a traffic class (using the **class-map** command) and associate the match criteria from the traffic class with the Traffic Policing configuration, which is configured in the service policy (using the **policy-map** command). The **service-policy** command is then used to attach this service policy to the interface.

In this particular example, Traffic Policing is configured with the average rate at 8000 bits per second and the normal burst size at 1000 bytes for all packets leaving Gigabit Ethernet interface 6/1:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# class-map access-match
Switch(config-cmap)# match access-group 1
Switch(config-cmap)# exit
Switch(config)# policy-map police-setting
Switch(config-pmap)# class access-match
Switch(config-pmap-c)# police 8000 1000 conform-action transmit exceed-action drop
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface gigabitethernet 6/1
Switch(config-if)# service-policy output police-setting
Switch(config-if)# end
```

In this example, the initial token buckets starts full at 1000 bytes. If a 450-byte packet arrives, the packet conforms because enough bytes are available in the conform token bucket. The conform action (send) is taken by the packet and 450 bytes are removed from the conform token bucket (leaving 550 bytes).

If the next packet arrives 0.25 seconds later, 250 bytes are added to the token bucket ((0.25 * 8000)/8), leaving 800 bytes in the token bucket. If the next packet is 900 bytes, the packet exceeds and the exceed action (drop) is taken. No bytes are taken from the token bucket.

#### Token Bucket Algorithm with Two Token Buckets Example (Refer to RFC 2697)

In this particular example, Traffic Policing is configured with the average rate at 8000 bits per second, the normal burst size at 1000 bytes, and the excess burst size at 1000 bytes for all packets leaving Gigabit Ethernet interface 6/1.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# class-map access-match
Switch(config-cmap)# match access-group 1
Switch(config-cmap)# exit
Switch(config)# policy-map police-setting
Switch(config-pmap)# class access-match
Switch(config-pmap-c)# police 8000 1000 1000 conform-action transmit exceed-action set-qos-transmit 1
violate-action drop
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface gigabitethernet 6/1
Switch(config-if)# service-policy output police-setting
Switch(config-if)# end
```

In this example, the initial token buckets starts full at 1000 bytes. If a 450-byte packet arrives, the packet conforms because enough bytes are available in the conform token bucket. The conform action (send) is taken by the packet and 450 bytes are removed from the conform token bucket (leaving 550 bytes).

If the next packet arrives 0.25 seconds later, 250 bytes are added to the conform token bucket ((0.25 * 8000)/8), leaving 800 bytes in the conform token bucket. If the next packet is 900 bytes, the packet does not conform because only 800 bytes are available in the conform token bucket.

The exceed token bucket, which starts full at 1000 bytes (as specified by the excess burst size) is then checked for available bytes. Because enough bytes are available in the exceed token bucket, the exceed action (set the QoS transmit value of 1) is taken and 900 bytes are taken from the exceed bucket (leaving 100 bytes in the exceed token bucket.

If the next packet arrives 0.40 seconds later, 400 bytes are added to the token buckets ((.40 * 8000)/8). Therefore, the conform token bucket now has 1000 bytes (the maximum number of tokens available in the conform bucket) and 200 bytes overflow the conform token bucket (because it only 200 bytes were needed to fill the conform token bucket to capacity). These overflow bytes are placed in the exceed token bucket, giving the exceed token bucket 300 bytes.

If the arriving packet is 1000 bytes, the packet conforms because enough bytes are available in the conform token bucket. The conform action (transmit) is taken by the packet and 1000 bytes are removed from the conform token bucket (leaving 0 bytes).

If the next packet arrives 0.20 seconds later, 200 bytes are added to the token bucket ((.20 * 8000)/8). Therefore, the conform bucket now has 200 bytes. If the arriving packet is 400 bytes, the packet does not conform because only 200 bytes are available in the conform bucket. Similarly, the packet does not exceed because only 300 bytes are available in the exceed bucket. Therefore, the packet violates and the violate action (drop) is taken.

## Related Commands

| Command | Description |
|---|---|
| **police (percent)** | Configures traffic policing on the basis of a percentage of bandwidth available on an interface. |
| **police (two rates)** | Configures traffic policing using two rates, the committed information rate (CIR) and the peak information rate (PIR). |
| **policy-map** | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **service-policy (policy-map class)** | Creates a service policy that is a quality of service (QoS) policy within a policy map. |
| **show policy-map** | Displays information about the policy map. |
| **show policy-map interface** | Displays the statistics and configurations of the input and output policies that are attached to an interface. |

# police (percent)

To configure traffic policing on the basis of a percentage of bandwidth available on an interface, use the **police** command in QoS policy-map class configuration mode. To remove traffic policing from the configuration, use the **no** form of this command.

**police cir percent** *percent* [**bc** *conform-burst-in-msec*] [**pir percent** *percentage*] [**be** *peak-burst-inmsec*]

**no police cir percent** *percent* [**bc** *conform-burst-in-msec*] [**pir percent** *percentage*] [**be** *peak-burst-inmsec*]

## Syntax Description

| | |
|---|---|
| **cir** | Committed information rate. Indicates that the CIR will be used for policing traffic. |
| **percent** | Specifies that a percentage of bandwidth will be used for calculating the CIR. |
| *percent* | Specifies the bandwidth percentage. Valid range is a number from 1 to 100. |
| **bc** | (Optional) Conform burst (bc) size used by the first token bucket for policing traffic. |
| *conform-burst-in-msec* | (Optional) Specifies the bc value in milliseconds. Valid range is a number from 1 to 2000. |
| **pir** | (Optional) Peak information rate (PIR). Indicates that the PIR will be used for policing traffic. |
| **percent** | (Optional) Specifies that a percentage of bandwidth will be used for calculating the PIR. |
| *percent* | (Optional) Specifies the bandwidth percentage. Valid range is a number from 1 to 100. |
| **be** | (Optional) Peak burst (be) size used by the second token bucket for policing traffic. |
| *peak-burst-in-msec* | (Optional) Specifies the be size in milliseconds. Valid range is a number from 1 to 2000. |
| *action* | Action to take on packets. Specify one of the following keywords:<br>• **drop**—Drops the packet.<br>• **set-cos-transmit** new-ios—Set the class of services (CoS) value to a new value and send the packet. The range is 0 to 7.<br>• **set-dscp-transmit** *value*—Sets the IP differentiated services code point (DSCP) value and transmits the packet with the new IP DSCP value setting.<br>• **set-prec-transmit** *value*—Sets the IP precedence and transmits the packet with the new IP precedence value setting.<br>• **transmit**—Transmits the packet. The packet is not altered. |

## Command Default

This command is disabled by default.

**Command Modes**

Policy-map class configuration

**Command History**

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6E. |

**Usage Guidelines**

This command calculates the cir and pir on the basis of a percentage of the maximum amount of bandwidth available on the interface. When a policy map is attached to the interface, the equivalent cir and pir values in bits per second (bps) are calculated on the basis of the interface bandwidth and the percent value entered with this command. The **show policy-map interface** command can then be used to verify the bps rate calculated.

The calculated cir and pir bps rates must be in the range of 32,000 and 32,000,000,000 bps. If the rates are outside this range, the associated policy map cannot be attached to the interface. If the interface bandwidth changes (for example, more is added), the bps values of the cir and the pir are recalculated on the basis of the revised amount of bandwidth. If the cir and pir percentages are changed after the policy map is attached to the interface, the bps values of the cir and pir are recalculated.

This command also allows you to specify the values for the conform burst size and the peak burst size in milliseconds. If you want bandwidth to be calculated as a percentage, the conform burst size and the peak burst size must be specified in milliseconds (ms).

**Examples**

This example shows how to configure traffic policing using a CIR and a PIR based on a percentage of bandwidth on Gigabit interface 6/2. In this example, a CIR of 20 percent and a PIR of 40 percent have been specified. Additionally, an optional bc value and be value (300 ms and 400 ms, respectively) have been specified.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# policy-map policy1
Switch(config-pmap)# class-map class1
Switch(config-pmap-c)# police cir percent 20 bc 3 ms pir percent 40 be 4 ms
Switch(config-pmap-c)# exit
Switch(config-pmap-c)# interface gigabitethernet 6/2
Switch(config-if)# service-policy output policy
Switch(config-if)# end
```

# police rate

To configure single or dual rate policer, use the **police rate** command in policy-map configuration mode. To remove traffic policing from the configuration, use the **no** form of this command.

### Syntax for Bytes Per Second

**police rate** *units* **bps** [**burst** *burst-in-bytes* **bytes**] [**peak-rate** *peak-rate-in-bps* **bps**] [**pack-burst** *peak-burst-in-bytes* **bytes**]

**no police rate** *units* **bps** [**burst** *burst-in-bytes* **bytes**] [**peak-rate** *peak-rate-in-bps* **bps**] [**pack-burst** *peak-burst-in-bytes* **bytes**]

### Syntax for Percent

**police rate percent** *percentage* [**burst** *ms* **ms**] [**peak-rate** *percent* **percentage**] [**pack-burst** *ms* **ms**]

**no police rate percent** *percentage* [**burst** *ms* **ms**] [**peak-rate** *percent* **percentage**] [**pack-burst** *ms* **ms**]

## Syntax Description

| | |
|---|---|
| *units* | Specifies the traffic police rate in bits per second. Valid range is 32,000 to 32,000,000,000. |
| **bps** | (Optional) Bits per second (bps) will be used to determine the rate at which traffic is policed.<br><br>**Note** If a rate is not specified, traffic is policed via bps. |
| **burst** *burst-in-bytes* **bytes** | (Optional) Specifies the burst rate, in bytes, will be used for policing traffic. Valid range is from 64 to 2,596,929,536. |
| **peak-rate** *peak-rate-in-bps* **bps** | (Optional) Specifies the peak burst value, in bytes, for the peak rate. Valid range is from 32,000 to 32,000,000,000. |
| **peak-burst** *peak-burst-in-bytes* **bytes** | (Optional) Specifies the peak burst value, in bytes, will be used for policing traffic. If the police rate is specified in bps, the valid range of values is 64 to 2,596,929,536. |
| **percent** | (Optional) A percentage of interface bandwidth will be used to determine the rate at which traffic is policed. |
| *percentage* | (Optional) Bandwidth percentage. Valid range is a number from 1 to 100. |
| **burst** *ms* **ms** | (Optional) Burst rate, in milliseconds, will be used for policing traffic. Valid range is a number from 1 to 2,000. |
| **peak-rate percent** *percentage* | (Optional) A percentage of interface bandwidth will be used to determine the PIR. Valid range is a number from 1 to 100. |
| **peak-burst** *ms* **ms** | (Optional) Peak burst rate, in milliseconds, will be used for policing traffic. Valid range is a number from 1 to 2,000. |

## Command Default

This command is disabled by default.

## Command Modes

Policy-map configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6E. |

## Usage Guidelines

Use the **police rate** command to limit traffic on the basis of pps, bps, or a percentage of interface bandwidth.

If the **police rate** command is issued, but the a rate is not specified, traffic that is destined will be policed on the basis of bps.

## Examples

This example shows how to configure policing on a class to limit traffic to an average rate of 1,500,000 bps:

```
Switch(config)# class-map c1
Switch(config-cmap)# match access-group 140
Switch(config-cmap)# exit
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# police rate 1500000  burst 500000
Switch(config-pmap-c)# exit
```

## Related Commands

| Command | Description |
|---|---|
| policy-map | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| show policy-map | Displays information about the policy map. |

# police (two rates)

To configure traffic policing using two rates, the committed information rate (CIR) and the peak information rate (PIR), use the **police** command in policy-map configuration mode. To remove two-rate traffic policing from the configuration, use the **no** form of this command.

**police cir** *cir* [**bc** *conform-burst*] **pir** *pir* [**be** *peak-burst*] [**conform-action** *action* [**exceed-action** *action* [**violate-action** *action*]]]

**no police cir** *cir* [**bc** *conform-burst*] **pir** *pir* [**be** *peak-burst*] [**conform-action** *action* [**exceed-action** *action* [**violate-action** *action*]]]

## Syntax Description

| | |
|---|---|
| **cir** | Committed information rate (CIR) at which the first token bucket is updated. |
| *cir* | Specifies the CIR value in bits per second. The value is a number from 32,000 to 32,000,000,000. |
| **bc** | (Optional) Conform burst (bc) size used by the first token bucket for policing. |
| *conform-burst* | (Optional) Specifies the bc value in bytes. The value is a number from 64 to 2,596,929,536. |
| **pir** | Peak information rate (PIR) at which the second token bucket is updated. |
| *pir* | Specifies the PIR value in bits per second. The value is a number from 32,000 to 32,000,000,000. |
| **be** | (Optional) Peak burst (be) size used by the second token bucket for policing. |
| *peak-burst* | (Optional) Specifies the peak burst (be) size in bytes. The value is a number from 64 to 2,596,929,536. |
| **conform-action** | (Optional) Action to take on packets that conform to the CIR and PIR. |
| **exceed-action** | (Optional) Action to take on packets that conform to the PIR but not the CIR. |
| **violate-action** | (Optional) Action to take on packets exceed the PIR. |
| *action* | (Optional) Action to take on packets. Specify one of the following keywords:<br>• **drop**—Drops the packet.<br>• **set-cos-transmit** new-ios—Set the class of services (CoS) value to a new value and send the packet. The range is 0 to 7.<br>• **set-dscp-transmit** *new-dscp*—Sets the IP differentiated services code point (DSCP) value and sends the packet with the new IP DSCP value setting.<br>• **set-prec-transmit** *new-prec*—Sets the IP precedence and sends the packet with the new IP precedence value setting.<br>• **transmit**—Sends the packet with no alteration. |

## Command Default

This command is disabled by default.

## Command Modes

Policy-map configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6E. |

## Usage Guidelines

Refer to RFC 2698-Two Rate Three Color Marker.

Two-rate traffic policing uses two token buckets—Tc and Tp—for policing traffic at two independent rates. Note the following points about the two token buckets:

- The Tc token bucket is updated at the CIR value each time a packet arrives at the two-rate policer. The Tc token bucket can contain up to the confirm burst (Bc) value.
- The Tp token bucket is updated at the PIR value each time a packet arrives at the two-rate policer. The Tp token bucket can contain up to the peak burst (Be) value.

### Updating Token Buckets

The following scenario illustrates how the token buckets are updated:

A packet of B bytes arrives at time t. The last packet arrived at time t1. The CIR and the PIR token buckets at time t are represented by Tc(t) and Tp(t), respectively. Using these values and in this scenario, the token buckets are updated as follows:

Tc(t) = min(CIR * (t-t1) + Tc(t1), Bc)

Tp(t) = min(PIR * (t-t1) + Tp(t1), Be)

### Marking Traffic

The two-rate policer marks packets as either conforming, exceeding, or violating a specified rate. The following points (using a packet of B bytes) illustrate how a packet is marked:

- If B > Tp(t), the packet is marked as violating the specified rate.
- If B > Tc(t), the packet is marked as exceeding the specified rate, and the Tp(t) token bucket is updated as Tp(t) = Tp(t) – B.

Otherwise, the packet is marked as conforming to the specified rate, and both token buckets—Tc(t) and Tp(t)—are updated as follows:

Tp(t) = Tp(t) – B

Tc(t) = Tc(t) – B

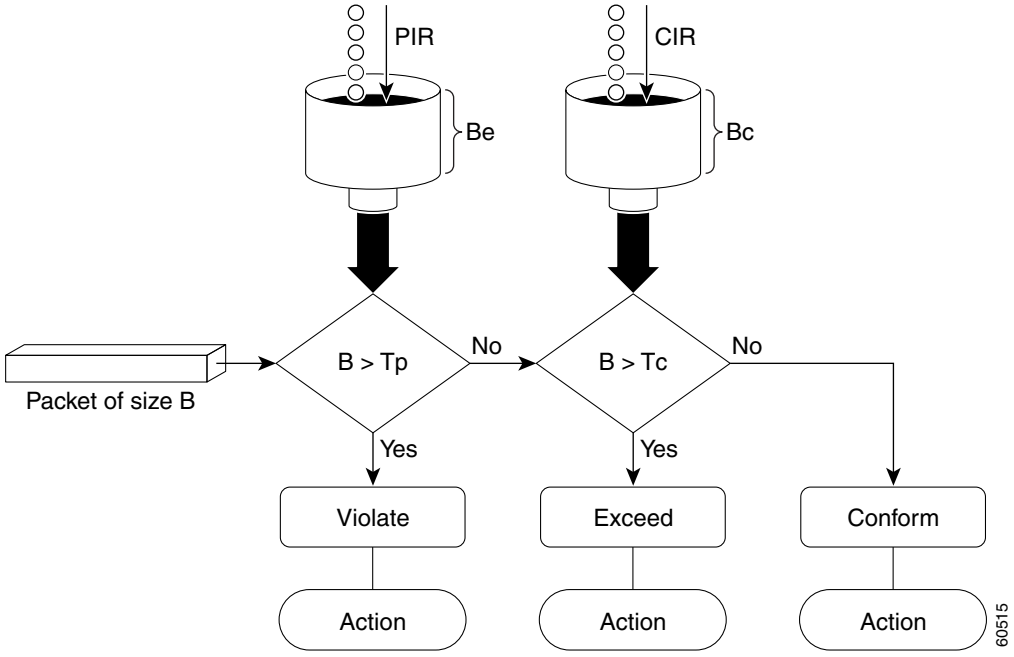
For example, if the CIR is 100 kbps, the PIR is 200 kbps, and a data stream with a rate of 250 kbps arrives at the two-rate policer, the packet would be marked as follows:

- 100 kbps would be marked as conforming to the rate.
- 100 kbps would be marked as exceeding the rate.
- 50 kbps would be marked as violating the rate.

### Marking Packets and Assigning Actions Flowchart

The flowchart in Figure 2-1 illustrates how the two-rate policer marks packets and assigns a corresponding action (that is, violate, exceed, or conform) to the packet.

*Figure 2-1 Marking Packets and Assigning Actions with the Two-Rate Policer*




## Examples

This example shows how to configure two-rate traffic policing on a class to limit traffic to an average committed rate of 500 kbps and a peak rate of 1 Mbps:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# class-map police
Switch(config-cmap)# match access-group 101
Switch(config-cmap)# policy-map policy1
Switch(config-pmap)# class police
Switch(config-pmap-c)# police cir 500000 bc 10000 pir 1000000 be 10000 conform-action
transmit exceed-action set-prec-transmit 2 violate-action drop
Switch(config-pmap-c)# interface gigabitethernet 6/1
Switch(config-if)# service-policy output policy1
Switch(config-if)# end
Switch# show policy-map policy1

 Policy Map policy1
  Class police
   police cir 500000 conform-burst 10000 pir 1000000 peak-burst 10000 conform-action
transmit exceed-action set-prec-transmit 2 violate-action drop
Switch#
```

Traffic marked as conforming to the average committed rate (500 kbps) will be sent as is. Traffic marked as exceeding 500 kbps, but not exceeding 1 Mbps, will be marked with IP Precedence 2 and then sent. All traffic marked as exceeding 1 Mbps will be dropped. The burst parameters are set to 10000 bytes.

In the following example, 1.25 Mbps of traffic is sent (“offered”) to a policer class:

```
Switch# show policy-map interface gigabitethernet 6/1

 GigabitEthernet6/1

  Service-policy output: policy1

   Class-map: police (match all)
    148803 packets, 36605538 bytes
    30 second offered rate 1249000 bps, drop rate 249000 bps
    Match: access-group 101
    police:
     cir 500000 bps, conform-burst 10000, pir 1000000, peak-burst 100000
     conformed 59538 packets, 14646348 bytes; action: transmit
     exceeded 59538 packets, 14646348 bytes; action: set-prec-transmit 2
     violated 29731 packets, 7313826 bytes; action: drop
     conformed 499000 bps, exceed 500000 bps violate 249000 bps

   Class-map: class-default (match-any)
    19 packets, 1990 bytes
    30 seconds offered rate 0 bps, drop rate 0 bps
    Match: any
Switch#
```

The two-rate policer marks 500 kbps of traffic as conforming, 500 kbps of traffic as exceeding, and 250 kbps of traffic as violating the specified rate. Packets marked as conforming to the rate will be sent as is, and packets marked as exceeding the rate will be marked with IP Precedence 2 and then sent. Packets marked as violating the rate are dropped.

# policy-map

To create or modify a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode, use the **policy-map** global configuration command. To delete an existing policy map and to return to global configuration mode, use the **no** form of this command.

**policy-map** *policy-map-name*

**no policy-map** *policy-map-name*

## Syntax Description

| | |
|---|---|
| *policy-map-name* | Name of the policy map. |

## Defaults

No policy maps are defined.

## Command Modes

Global configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(40)SG | Added support for the Supervisor Engine 6-E and Catalyst 4900M chassis. |

## Usage Guidelines

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 or modified. After you enter the **policy-map** command, the switch enters policy-map configuration mode. You can configure or modify the class policies for that policy map and decide how to treat the classified traffic.

These configuration commands are available in policy-map configuration mode:

- **class**: defines the classification match criteria for the specified class map. For more information, see the "class" section on page 2-29.
- **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.

To return to global configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

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.

## Examples

This example shows how to create a policy map called *policy1*. When attached to the ingress direction, it matches all the inbound traffic defined in *class1*, sets the IP DSCP to 10, and polices the traffic at an average rate of 1 Mbps and bursts at 20 KB. Traffic exceeding the profile is marked down to a DSCP value obtained from the policed-DSCP map and then sent. This policer action is applicable on all Catalyst 4500 Supervisors except the Supervisor Engine 6-E and Catalyst 4900M chassis.

```
Switch# configure terminal
Switch(config)# policy-map policy1
Switch(config-pmap)# class class1
Switch(config-pmap-c)# set ip dscp 10
Switch(config-pmap-c)# police 1000000 20000 exceed-action policed-dscp-transmit
Switch(config-pmap-c)# exit
Switch#
```

This example shows how to configure multiple classes in a policy map called "policymap2" on a Supervisor Engine 6-E:

```
Switch# configure terminal
Switch(config)# policy-map policymap2
Switch(config-pmap)# class class1
Switch(config-pmap-c)# police 100000 20000 exceed-action
Switch(config-pmap-c)# set-dscp-transmit cs3
Switch(config-pmap-c)# set-cos-transmit 3
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class2
Switch(config-pmap-c)# police cir 32000 pir 64000 conform-action transmit exceed-action
Switch(config-pmap-c)# set-dscp-transmit cs3 violate-action drop
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class3
Switch(config-pmap-c)# set dscp cs3
Switch(config-pmap-c)# exit
Switch#
```

This example shows how to delete the policy map called "policymap2":

```
Switch# configure terminal
Switch(config)# no policy-map policymap2
Switch#
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **class** | Specifies the name of the class whose traffic policy you want to create or change. |
| **class-map** | Creates a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode. |
| **policy-map** | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **service-policy (interface configuration)** | Attaches a policy map to an interface or applies different QoS policies on VLANs that an interface belongs to. |
| **show policy-map** | Displays information about the policy map. |

# port-channel load-balance

To set the load-distribution method among the ports in the bundle, use the **port-channel load-balance** command. To reset the load distribution to the default, use the **no** form of this command.

**port-channel load-balance** *method*

**no port-channel load-balance**

## Syntax Description

| | |
|---|---|
| *method* | Specifies the load distribution method. See the "Usage Guidelines" section for more information. |

## Defaults

Load distribution on the source XOR destination IP address is enabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The following values are valid for the load-distribution method:

- **dst-ip**—Load distribution on the destination IP address
- **dst-mac**—Load distribution on the destination MAC address
- **dst-port**—Load distribution on the destination TCP/UDP port
- **src-dst-ip**—Load distribution on the source XOR destination IP address
- **src-dst-mac**—Load distribution on the source XOR destination MAC address
- **src-dst-port**—Load distribution on the source XOR destination TCP/UDP port
- **src-ip**—Load distribution on the source IP address
- **src-mac**—Load distribution on the source MAC address
- **src-port**—Load distribution on the source port

## Examples

This example shows how to set the load-distribution method to the destination IP address:

```
Switch(config)# port-channel load-balance dst-ip
Switch(config)#
```

This example shows how to set the load-distribution method to the source XOR destination IP address:

```
Switch(config)# port-channel load-balance src-dst-port
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| interface port-channel | Accesses or creates a port-channel interface. |
| show etherchannel | Displays EtherChannel information for a channel. |

# power dc input

To configure the power DC input parameters on the switch, use the **power dc input** command. To return to the default power settings, use the **no** form of this command.

**power dc input** *watts*

**no power dc input**

## Syntax Description

| | |
|---|---|
| **dc input** | Specifies the external DC source for both power supply slots. |
| *watts* | Sets the total capacity of the external DC source in watts; valid values are from 300 to 8500. |

## Defaults

DC power input is 2500 W.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(11)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(13)EW | Support for **dc input** was added. |

## Usage Guidelines

If your interface is not capable of supporting Power over Ethernet, you will receive this message:

```
Power over Ethernet not supported on interface Admin
```

## Examples

This example shows how to set the total capacity of the external DC power source to 5000 W:

```
Switch(config)# power dc input 5000
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show power** | Displays information about the power status. |

# power inline

To set the inline-power state for the inline-power-capable interfaces, use the **power inline** command. To return to the default values, use the **no** form of this command.

**power inline** {**auto** [**max** *milliwatt*] | **never** | **static** [**max** *milliwatt*] | **consumption** *milliwatt*}

**no power inline**

## Syntax Description

| | |
|---|---|
| **auto** | Sets the Power over Ethernet state to auto mode for inline-power-capable interfaces. |
| **max** *milliwatt* | (Optional) Sets the maximum power that the equipment can consume; valid range is from 2000 to 15400 mW for classic modules. For the WS-X4648-RJ45V-E, the maximum is 20000. For the WS-X4648-RJ45V+E, the maximum is 30000. |
| **never** | Disables both the detection and power for the inline-power capable interfaces. |
| **static** | Allocates power statically. |
| **consumption** *milliwatt* | Sets power allocation per interface; valid range is from 4000 to 15400 for classic modules. Any non-default value disables automatic adjustment of power allocation. |

## Defaults

The default settings are as follows:

- Auto mode for Power over Ethernet is set.
- Maximum mW mode is set to 15400. For the WS-X4648-RJ45V-E, the maximum mW is set to 20000. For the WS-X4648-RJ45V+E, the maximum mW is set to 30000.
- Default allocation is set to 15400.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(11)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | Support added for static power allocation. |
| 12.1(20)EW | Support added for Power over Ethernet. |
| 12.2(44)SG | Maximum supported wattage increased beyond 15400 for the WS-X4648-RJ45V-E and the WS-X4648-RJ45V+E. |

## Usage Guidelines

If your interface is not capable of supporting Power over Ethernet, you will receive this message:

```
Power over Ethernet not supported on interface Admin
```

## Examples

This example shows how to set the inline-power detection and power for the inline-power-capable interfaces:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 4/1
Switch(config-if)# power inline auto
Switch(config-if)# end
Switch#
```

This example shows how to disable the inline-power detection and power for the inline-power-capable interfaces:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 4/1
Switch(config-if)# power inline never
Switch(config-if)# end
Switch#
```

This example shows how to set the permanent Power over Ethernet allocation to 8000 mW for Fast Ethernet interface 4/1 regardless what is mandated either by the 802.3af class of the discovered device or by any CDP packet that is received from the powered device:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 4/1
Switch(config-if)# power inline consumption 8000
Switch(config-if)# end
Switch#
```

This example shows how to pre-allocate Power over Ethernet to 16500 mW for Gigabit Ethernet interface 2/1 regardless of what is mandated either by the 802.3af class of the discovered device or by any CDP packet that is received from the powered device:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet 2/1
Switch(config-if)# power inline static max 16500
Switch(config-if)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show power | Displays information about the power status. |

# power inline consumption

To set the default power that is allocated to an interface for all the inline-power-capable interfaces on the switch, use the **power inline consumption** command. To return to the default values, use the **no** form of this command.

**power inline consumption default** *milliwatts*

**no power inline consumption default**

## Syntax Description

| | |
|---|---|
| **default** | Specifies the switch to use the default allocation. |
| *milliwatts* | Sets the default power allocation in milliwatts; the valid range is from 4000 to 15400. Any non-default value disables automatic adjustment of power allocation. |

## Defaults

Milliwatt mode is set to 15400.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(11)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(20)EW | Support added for Power over Ethernet. |

## Usage Guidelines

If your interface is not capable of supporting Power over Ethernet, you will receive this message:

```
Power over Ethernet not supported on interface Admin
```

## Examples

This example shows how to set the Power over Ethernet allocation to use 8000 mW, regardless of any CDP packet that is received from the powered device:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# power inline consumption default 8000
Switch(config)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| power inline | Sets the inline-power state for the inline-power-capable interfaces. |
| show power | Displays information about the power status. |

# power redundancy-mode

To configure the power settings for the chassis, use the **power redundancy-mode** command. To return to the default setting, use the **default** form of this command.

**power redundancy-mode** {**redundant** | **combined**}

**default power redundancy-mode**

## Syntax Description

| | |
|---|---|
| **redundant** | Configures the switch to redundant power management mode. |
| **combined** | Configures the switch to combined power management mode. |

## Defaults

Redundant power management mode

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. (Catalyst 4500 series switches only: 4503, 4506, and 4507). |

## Usage Guidelines

The two power supplies must be the same type and wattage.

**Caution** If you have power supplies with different types or wattages installed in your switch, the switch will not recognize one of the power supplies. A switch set to redundant mode will not have power redundancy. A switch set to combined mode will use only one power supply.

In redundant mode, the power from a single power supply must provide enough power to support the switch configuration.

Table 2-9 lists the maximum available power for chassis and Power over Ethernet for each power supply.

*Table 2-9 Available Power*

| Power Supply | Redundant Mode (W) | Combined Mode (W) |
|---|---|---|
| 1000 W AC | System[1] = 1000 | System = 1667 |
| | Inline = 0 | Inline = 0 |
| 2800 W AC | System = 1360 | System = 2473 |
| | Inline = 1400 | Inline = 2333 |

1. The system power includes power for the supervisor engines, all modules, and the fan tray.

## Examples

This example shows how to set the power management mode to combined:

```
Switch(config)# power redundancy-mode combined
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| show power | Displays information about the power status. |

# port-security mac-address

To configure a secure address on an interface for a specific VLAN or VLAN range, use the **port-security mac-address** command.

**port-security mac-address** *mac_address*

## Syntax Description

| | |
|---|---|
| *mac_address* | The MAC-address that needs to be secured. |

## Command Modes

VLAN-range interface submode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EWA | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Layer 2 interfaces can be part of multiple VLANs (for example, a typical trunk port). In conjunction with the **vlan** command, you can use the **port-security mac-address** command to specify different addresses on different VLANs.

## Examples

This example shows how to configure the secure address 1.1.1 on interface Gigabit Ethernet 1/1 for VLANs 2-3:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# vlan 2-3
Switch(config-if-vlan-range)# port-security mac-address 1.1.1
Switch(config-if-vlan-range)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **port-security mac-address sticky** | Configures a sticky address on an interface for a specific VLAN or VLAN range. |
| **port-security maximum** | Configures the maximum number of addresses on an interface for a specific VLAN or VLAN range. |

# port-security mac-address sticky

To configure a sticky address on an interface for a specific VLAN or VLAN range, use the **port-security mac-address sticky** command.

**port-security mac-address sticky** *mac_address*

## Syntax Description

| | |
|---|---|
| *mac_address* | The MAC-address that needs to be secured. |

## Command Modes

VLAN-range interface submode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EWA | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The Sticky feature must be enabled on an interface before you can configure the **port-security mac-address sticky** command.

## Usage Guidelines

Layer 2 interfaces can be part of multiple VLANs (for example, a typical trunk port). In conjunction with the **vlan** command, you can use the **port-security mac-address sticky** command to specify different sticky addresses on different VLANs.

The Sticky feature must be enabled on an interface before you can configure the **port-security mac-address sticky** command.

Sticky MAC addresses are addresses that persist across switch reboots and link flaps.

## Examples

This example shows how to configure the sticky address 1.1.1 on interface Gigabit Ethernet 1/1 for VLANs 2-3:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# vlan 2-3
Switch(config-if-vlan-range)# port-security mac-address sticky 1.1.1
Switch(config-if-vlan-range)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| port-security mac-address | Configures a secure address on an interface for a specific VLAN or VLAN range. |
| port-security maximum | Configures the maximum number of addresses on an interface for a specific VLAN or VLAN range. |

# port-security maximum

To configure the maximum number of addresses on an interface for a specific VLAN or VLAN range, use the **port-security maximum** command.

**port-security maximum** *max_value*

## Syntax Description

| | |
|---|---|
| *max_value* | The maximum number of MAC-addresses. |

## Command Modes

VLAN-range interface submode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EWA | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Layer 2 interfaces can be part of multiple VLANs (for example, a typical trunk port). In conjunction with the **vlan** command, you can use the **port-security maximum** command to specify the maximum number of secure addresses on different VLANs.

If a specific VLAN on a port is not configured with a maximum value, the maximum configured for the port is used for that VLAN. In this situation, the maximum number of addresses that can be secured on this VLAN is limited to the maximum value configured on the port.

Each VLAN can be configured with a maximum count that is greater than the value configured on the port. Also, the sum total of the maximum configured values for all the VLANs can exceed the maximum configured for the port. In either of these situations, the number of MAC addresses secured on each VLAN is limited to the lesser of the VLAN configuration maximum and the port configuration maximum.

## Examples

This example shows how to configure a maximum number of addresses (5) on interface Gigabit Ethernet 1/1 for VLANs 2-3:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface g1/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# vlan 2-3
Switch(config-if-vlan-range)# port-security maximum 5
Switch(config-if-vlan-range)# exit
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| port-security mac-address | Configures a secure address on an interface for a specific VLAN or VLAN range. |
| port-security mac-address sticky | Configures a sticky address on an interface for a specific VLAN or VLAN range. |

# priority

To enable the strict priority queue (low-latency queueing [LLQ]) and to give priority to a class of traffic belonging to a policy map attached to a physical port, use the **priority** policy-map class configuration command. To return to the default setting, use the **no** form of this command.

**priority**

**no priority**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The strict priority queue is disabled.

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6E. |

## Usage Guidelines

Use the **priority** command only in a policy map attached to a physical port. You can use this command only in class-level classes, you cannot use this command in class class-default.

This command configures LLQ and provides strict-priority queueing. Strict-priority queueing enables delay-sensitive data, such as voice, to be sent before packets in other queues are sent. The priority queue is serviced first until it is empty.

You cannot use the **bandwidth**, **dbl**, and the **shape** policy-map class configuration commands with the **priority** policy-map class configuration command in the same class within the same policy map. However, you can use these commands in the same policy map.

You can use police or set class configuration commands with the priority police-map class configuration command.

If the priority queuing class is not rate limited, you cannot use the bandwidth command, you can use the bandwidth remaining percent command instead.

## Examples

This example shows how to enable the LLQ for the policy map called *policy1*:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# policy-map policy1
Switch(config-pmap)# class voice
Switch(config-pmap-c)# priority
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **bandwidth** | Specifies or modifies the minimum bandwidth provided to a class belonging to a policy map attached to a physical port. |
| **class** | Specifies the name of the class whose traffic policy you want to create or change. |
| **policy-map** | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **dbl** | Enables dynamic buffer limiting for traffic hitting this class. |
| **service-policy (policy-map class)** | Creates a service policy that is a quality of service (QoS) policy within a policy map. |
| **shape (class-based queueing)** | Enables traffic shaping a class of traffic in a policy map attached to a physical port. |
| **show policy-map** | Displays information about the policy map. |

# private-vlan

To configure private VLANs and the association between a private VLAN and a secondary VLAN, use the **private-vlan** command. To return to the default value, use the **no** form of this command.

**private-vlan** {**isolated** | **community** | **primary**}

**private-vlan association** *secondary-vlan-list* [{**add** *secondary-vlan-list*} | {**remove** *secondary-vlan-list*}]

**no private-vlan** {**isolated** | **community** | **primary**}

**no private-vlan association**

## Syntax Description

| | |
|---|---|
| **isolated** | Designates the VLAN as an isolated private VLAN. |
| **community** | Designates the VLAN as the community private VLAN. |
| **primary** | Designates the VLAN as the primary private VLAN. |
| **association** | Creates an association between a secondary VLAN and a primary VLAN. |
| *secondary-vlan-list* | Specifies the number of the secondary VLAN. |
| **add** | (Optional) Associates a secondary VLAN to a primary VLAN. |
| **remove** | (Optional) Clears the association between a secondary VLAN and a primary VLAN. |

## Defaults

Private VLANs are not configured.

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended addressing was added. |
| 12.2(20)EW | Support for community VLAN was added. |

## Usage Guidelines

You cannot configure VLAN 1 or VLANs 1001 to 1005 as private VLANs.

VTP does not support private VLANs. You must configure private VLANs on each device where you want private VLAN ports.

The *secondary_vlan_list* parameter cannot contain spaces; it can contain multiple comma-separated items. Each item can be a single private VLAN ID or a range of private VLAN IDs separated by hyphens.

The *secondary_vlan_list* parameter can contain multiple community VLAN IDs.

The *secondary_vlan_list* parameter can contain only one isolated VLAN ID. A private VLAN is defined as a set of private ports characterized by a common set of VLAN number pairs: each pair is made up of at least two special unidirectional VLANs and is used by isolated ports or by a community of ports to communicate with the switches.

An isolated VLAN is a VLAN that is used by the isolated ports to communicate with the promiscuous ports. The isolated VLAN traffic is blocked on all other private ports in the same VLAN and can be received only by the standard trunking ports and the promiscuous ports that are assigned to the corresponding primary VLAN.

A community VLAN is the VLAN that carries the traffic among the community ports and from the community ports to the promiscuous ports on the corresponding primary VLAN. A community VLAN is not allowed on a private VLAN trunk.

A promiscuous port is a private port that is assigned to a primary VLAN.

A primary VLAN is a VLAN that is used to convey the traffic from the switches to the customer end stations on the private ports.

You can specify only one isolated *vlan-id* value, while multiple community VLANs are allowed. You can only associate isolated and community VLANs to one VLAN. The associated VLAN list may not contain primary VLANs. Similarly, a VLAN that is already associated to a primary VLAN cannot be configured as a primary VLAN.

The **private-vlan** commands do not take effect until you exit the config-VLAN submode.

If you delete either the primary or secondary VLAN, the ports that are associated with the VLAN become inactive.

Refer to the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide* for additional configuration guidelines.

## Examples

This example shows how to configure VLAN 202 as a primary VLAN and verify the configuration:

```
Switch# configure terminal
Switch(config)# vlan 202
Switch(config-vlan)# private-vlan primary
Switch(config-vlan)# end
Switch# show vlan private-vlan
Primary Secondary Type              Interfaces
------- --------- ----------------- ------------------------------------------
202               primary
```

This example shows how to configure VLAN 303 as a community VLAN and verify the configuration:

```
Switch# configure terminal
Switch(config)# vlan 303
Switch(config-vlan)# private-vlan community
Switch(config-vlan)# end
Switch# show vlan private-vlan

Primary Secondary Type              Interfaces
------- --------- ----------------- ------------------------------------------
202               primary
        303       community
```

This example shows how to configure VLAN 440 as an isolated VLAN and verify the configuration:

```
Switch# configure terminal
Switch(config)# vlan 440
Switch(config-vlan)# private-vlan isolated
Switch(config-vlan)# end
```

```
Switch# show vlan private-vlan

Primary Secondary Type              Interfaces
------- --------- ----------------- ------------------------------------------
202               primary
        303       community
        440       isolated
```

This example shows how to create a private VLAN relationship among the primary VLAN 14, the isolated VLAN 19, and community VLANs 20 and 21:

```
Switch(config)# vlan 19
Switch(config-vlan) # private-vlan isolated
Switch(config)# vlan 14
Switch(config-vlan)# private-vlan primary
Switch(config-vlan)# private-vlan association 19
```

This example shows how to remove a private VLAN relationship and delete the primary VLAN. The associated secondary VLANs are not deleted.

```
Switch(config-vlan)# no private-vlan 14
Switch(config-vlan)#
```

This example shows how to associate community VLANs 303 through 307 and 309 and isolated VLAN 440 with primary VLAN 202 and verify the configuration:

```
Switch# configure terminal
Switch(config)# vlan 202
Switch(config-vlan)# private-vlan association 303-307,309,440
Switch(config-vlan)# end
Switch# show vlan private-vlan

Primary Secondary Type              Interfaces
------- --------- ----------------- ------------------------------------------
202     303       community
202     304       community
202     305       community
202     306       community
202     307       community
202     309       community
202     440       isolated
        308       community
```

**Note** The secondary VLAN 308 has no associated primary VLAN.

This example shows how to remove an isolated VLAN from the private VLAN association:

```
Switch(config)# vlan 14
Switch(config-vlan)# private-vlan association remove 18
Switch(config-vlan)#
```

This example shows how to configure interface FastEthernet 5/1 as a PVLAN host port and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/1
Switch(config-if)# switchport mode private-vlan host
Switch(config-if)# switchport private-vlan host-association 202 440
Switch(config-if)# end

Switch# show interfaces fastethernet 5/1 switchport
Name: Fa5/1
Switchport: Enabled
Administrative Mode: private-vlan host
```

```
Operational Mode: private-vlan host
Administrative Trunking Encapsulation: negotiate
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Appliance trust: none
Administrative Private Vlan
  Host Association: 202 (VLAN0202) 440 (VLAN0440)
  Promiscuous Mapping: none
  Trunk encapsulation : dot1q
  Trunk vlans:
Operational private-vlan(s):
  202 (VLAN0202) 440 (VLAN0440)
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
```

## Related Commands

| Command | Description |
|---|---|
| **show vlan** | Displays VLAN information. |
| **show vlan private-vlan** | Displays private VLAN information. |

# private-vlan mapping

To create a mapping between the primary and the secondary VLANs so that both share the same primary VLAN SVI, use the **private-vlan mapping** command. To remove all PVLAN mappings from an SVI, use the **no** form of this command.

**private-vlan mapping** *primary-vlan-id* {[*secondary-vlan-list* | {**add** *secondary-vlan-list*} | {**remove** *secondary-vlan-list*}]}

**no private-vlan mapping**

## Syntax Description

| | |
|---|---|
| *primary-vlan-id* | VLAN ID of the primary VLAN of the PVLAN relationship. |
| *secondary-vlan-list* | (Optional) VLAN ID of the secondary VLANs to map to the primary VLAN. |
| **add** | (Optional) Maps the secondary VLAN to the primary VLAN. |
| **remove** | (Optional) Removes the mapping between the secondary VLAN and the primary VLAN. |

## Defaults

All PVLAN mappings are removed.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The *secondary_vlan_list* parameter cannot contain spaces. It can contain multiple, comma-separated items. Each item can be a single PVLAN ID or a range of PVLAN IDs separated by hyphens.

This command is valid in the interface configuration mode of the primary VLAN.

The SVI of the primary VLAN is created at Layer 3.

The traffic that is received on the secondary VLAN is routed by the SVI of the primary VLAN.

The SVIs of the existing secondary VLANs do not function and are considered down after this command is entered.

A secondary SVI can be mapped to only one primary SVI. If the configured PVLANs association is different from what is specified in this command (if the specified *primary-vlan-id* is configured as a secondary VLAN), all the SVIs that are specified in this command are brought down.

If you configure a mapping between two VLANs that do not have a valid Layer 2 association, the mapping configuration does not take effect.

## Examples

This example shows how to map the interface of VLAN 20 to the SVI of VLAN 18:

```
Switch(config)# interface vlan 18
Switch(config-if)# private-vlan mapping 18 20
Switch(config-if)#
```

This example shows how to permit the routing of the secondary VLAN ingress traffic from PVLANs 303 through 307, 309, and 440 and how to verify the configuration:

```
Switch# config terminal
Switch(config)# interface vlan 202
Switch(config-if)# private-vlan mapping add 303-307,309,440
Switch(config-if)# end
Switch# show interfaces private-vlan mapping
Interface Secondary VLAN Type
--------- -------------- -----------------
vlan202   303            isolated
vlan202   304            isolated
vlan202   305            isolated
vlan202   306            isolated
vlan202   307            isolated
vlan202   309            isolated
vlan202   440            isolated
Switch#
```

This example shows the displayed message that you will see if the VLAN that you are adding is already mapped to the SVI of VLAN 18. You must delete the mapping from the SVI of VLAN 18 first.

```
Switch(config)# interface vlan 19
Switch(config-if)# private-vlan mapping 19 add 21
    Command rejected: The interface for VLAN 21 is already mapped as s secondary.
Switch(config-if)#
```

This example shows how to remove all PVLAN mappings from the SVI of VLAN 19:

```
Switch(config)# interface vlan 19
Switch(config-if)# no private-vlan mapping
Switch(config-if)#


Switch# configure terminal
Switch(config)# interface vlan 202
Switch(config-if)# private-vlan mapping add 303-307,309,440
Switch(config-if)# end
Switch# show interfaces private-vlan mapping
Interface Secondary VLAN Type
--------- -------------- -----------------
vlan202   303            community
vlan202   304            community
vlan202   305            community
vlan202   306            community
vlan202   307            community
vlan202   309            community
vlan202   440            isolated

Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show interfaces private-vlan mapping** | Displays PVLAN mapping information for VLAN SVIs. |
| **show vlan** | Displays VLAN information. |
| **show vlan private-vlan** | Displays private VLAN information. |

# private-vlan synchronize

To map the secondary VLANs to the same instance as the primary VLAN, use the **private-vlan synchronize** command.

**private-vlan synchronize**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

MST configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If you do not map the VLANs to the same instance as the associated primary VLAN when you exit the MST configuration submode, a warning message displays and lists the secondary VLANs that are not mapped to the same instance as the associated primary VLAN. The **private-vlan synchronize** command automatically maps all secondary VLANs to the same instance as the associated primary VLANs.

## Examples

This example shows how to initialize PVLAN synchronization:

```
Switch(config-mst)# private-vlan synchronize
Switch(config-mst)#
```

This example assumes that a primary VLAN 2 and a secondary VLAN 3 are associated to VLAN 2, and that all VLANs are mapped to the CIST instance 1. This example also shows the output if you try to change the mapping for the primary VLAN 2 only:

```
Switch(config)# spanning-tree mst configuration
Switch(config-mst)# instance 1 vlan 2
Switch(config-mst)# exit
These secondary vlans are not mapped to the same instance as their primary:
->3
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| show spanning-tree mst | Displays MST protocol information. |

# qos (global configuration mode)

To globally enable QoS functionality on the switch, use the **qos** command. To globally disable QoS functionality, use the **no** form of this command.

**qos**

**no qos**

## Syntax Description

This command has no arguments or keywords.

## Defaults

QoS functionality is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. On the Supervisor Engine 6-E and Catalyst 4900M chassis QoS is always enabled without being configured.

If QoS functionality is globally enabled, it is enabled on all interfaces, except on the interfaces where QoS has been disabled. If QoS functionality is globally disabled, all traffic is passed in QoS pass-through mode.

## Examples

This example shows how to enable QoS functionality globally on the switch:

```
Switch(config)# qos
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| qos (interface configuration mode) | Enables QoS functionality on an interface. |
| show qos | Displays QoS information. |

# qos (interface configuration mode)

To enable QoS functionality on an interface, use the **qos** command. To disable QoS functionality on an interface, use the **no** form of this command.

**qos**

**no qos**

## Syntax Description

This command has no arguments or keywords.

## Defaults

QoS is enabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. On the Supervisor Engine 6-E and Catalyst 4900M chassis, attaching a service policy implicitly enables QoS on the supervisor engine and detaching a service policy implicitly disables QoS on the supervisor engine.

If QoS functionality is globally disabled, it is also disabled on all interfaces.

## Examples

This example shows how to enable QoS functionality on an interface:

```
Switch(config-if)# qos
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| qos (global configuration mode) | Enables QoS functionality on the switch. |
| qos (interface configuration mode) | Enables QoS functionality on an interface. |
| show qos | Displays QoS information. |

# qos account layer2 encapsulation

To include additional bytes to be accounted by the QoS features, use the **qos account layer2 encapsulation** command. To disable the use of additional bytes, use the **no** form of this command.

**qos account layer2 encapsulation** {**arpa** | **dot1q** | **isl** | **length** *len*}

**no qos account layer2 encapsulation** {**arpa** | **dot1q** | **isl** | **length** *len*}

## Syntax Description

| | |
|---|---|
| **arpa** | Specifies the account length of the Ethernet ARPA-encapsulated packet (18 bytes). |
| **dot1q** | Specifies the account length of the 802.1Q-encapsulated packet (22 bytes). |
| **isl** | Specifies the account length of the ISL-encapsulated packet (48 bytes). |
| **length** *len* | Specifies the a dditional packet length to account for; the valid range is from 0 to 64 bytes. |

## Defaults

On non-Supervisor Engine 6-Es only the length that is specified in the IP header for the IP packets and the length that is specified in the Ethernet header for non-IP packets are included.

On the Supervisor Engine 6-E and Catalyst 4900M chassis the length that is specified in the Ethernet header is taken into account for both IP and non-IP packets. The Layer 2 length includes the VLAN tag overhead too.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

In the Catalyst 4500 series switch, for non-Superviosr Engine 6-E supervisors the **qos account layer2 encapsulation** command indicates that the policing feature should consider the configured length in addition to the IP length of the packet when policing the IP packets.

Sharing and shaping always use the Ethernet ARPA length.

On Supervisor Engine 6-E and Catalyst 4900M chassis supervisors shaping and sharing always use Ethernet ARPA length to which 20 bytes of IPv6 overhead is always added for policing. However, only Layer 2 length, including VLAN tag overhead is taken into account.

**Note** The given length is included when policing all IP packets irrespective of the encapsulation with which it was received. When **qos account layer2 encapsulation isl** is configured, a fixed length of 48 bytes is included when policing all IP packets, not only those IP packets that are received with ISL encapsulation.

Sharing and shaping use the length that is specified in the Layer 2 headers.

## Examples

This example shows how to include an additional 18 bytes when policing IP packets:

```
Switch# config terminal
Switch(conf)# qos account layer2 encapsulation length 18
Switch (conf)# end
Switch#
```

This example shows how to disable the consistent accounting of the Layer 2 encapsulation by the QoS features:

```
Switch# config terminal
Switch(config)# no qos account layer2 encapsulation
Switch (config)# end
Switch #
```

## Related Commands

| Command | Description |
|---|---|
| **show interfaces** | Displays traffic on a specific interface. |
| **switchport** | Modifies the switching characteristics of a Layer 2 switch interface. |
| **switchport block** | Prevents the unknown multicast or unicast packets from being forwarded. |

# qos aggregate-policer

To define a named aggregate policer, use the **qos aggregate-policer** command. To delete a named aggregate policer, use the **no** form of this command.

**qos aggregate-policer** *name rate burst* [**conform-action** {**transmit** | **drop**} | **exceed-action** {**transmit** | **drop** | **policed-dscp-transmit**}]

**no qos aggregate-policer** *name*

## Syntax Description

| | |
|---|---|
| *name* | Name of the aggregate policer. |
| *rate* | Maximum bits per second; valid values are from 32000 to 32000000000. |
| *burst* | Burst bytes; valid values are from 1000 to 512000000. |
| **conform-action** | (Optional) Specifies the action to be taken when the rate is not exceeded. |
| **transmit** | (Optional) Transmits the package. |
| **drop** | (Optional) Drops the packet. |
| **exceed-action** | (Optional) Specifies action when the QoS values are exceeded. |
| **policed-dscp-transmit** | (Optional) Sends the DSCP per the policed-DSCP map. |

## Defaults

The default settings are as follows:

- Conform-action transmits
- Exceed-action drops

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

This policer can be shared by different policy map classes and on different interfaces.

The Catalyst 4506 switch supports up to 1000 aggregate input policers and 1000 output policers.

The **qos aggregate-policer** command allows you to configure an aggregate flow and a policing rule for that aggregate. When you enter your rate and burst parameters, the range for the average rate is 32 Kbps to 32 Gbps, and the range for the burst size is 1 KB to 512 MB.

A rate can be entered in bits-per-second without a suffix. In addition, the suffixes described in Table 2-10 are allowed.

*Table 2-10 Rate Suffix*

| Suffix | Description |
|---|---|
| k | 1000 bps |
| m | 1,000,000 bps |
| g | 1,000,000,000 bps |

Bursts can be entered in bytes without a suffix. In addition, the suffixes shown in Table 2-11 are allowed.

*Table 2-11 Burst Suffix*

| Suffix | Description |
|---|---|
| k | 1000 bytes |
| m | 1,000,000 bytes |
| g | 1,000,000,000 bytes |

**Note** Due to hardware granularity, the rate value is limited, so the burst that you configure might not be the value that is used.

Modifying an existing aggregate rate limit modifies that entry in NVRAM and in the switch if it is currently being used.

When you enter the aggregate policer name, follow these naming conventions:

- Maximum of 31 characters long and may include a-z, A-Z, 0-9, the dash (-), the underscore (_), and the period (.).
- Must start with an alphabetic character and must be unique across all ACLs of all types.
- Aggregate policer names are case sensitive.
- Cannot be a number.
- Must not be a keyword; keywords to avoid are **all**, **default-action**, **map**, **help**, and **editbuffer**.

An aggregate policer can be applied to one or more interfaces. However, if you apply the same policer to the input direction on one interface and to the output direction on a different interface, then you have created the equivalent of two different aggregate policers in the switching engine. Each policer has the same policing parameters, with one policing the ingress traffic on one interface and the other policing the egress traffic on another interface. If you apply an aggregate policer to multiple interfaces in the same direction, only one instance of the policer is created in the switching engine.

You can apply an aggregate policer to a physical interface or to a VLAN. If you apply the same aggregate policer to a physical interface and to a VLAN, then you have created the equivalent of two different aggregate policers in the switching engine. Each policer has the same policing parameters, with one policing the traffic on the configured physical interface and the other policing the traffic on the configured VLAN. If you apply an aggregate policer to only ports or only VLANs, then only one instance of the policer is created in the switching engine.

If you apply a single aggregate policer to the ports and the VLANs in different directions, then you have created the equivalent of four aggregate policers; one for all ports sharing the policer inthe input direction, one for all ports sharing the policer in the output direction, one for all VLANs sharing the policer in the input direction, and one for all VLANs sharing the policer in the output direction.

## Examples

This example shows how to configure a QoS aggregate policer to allow a maximum of 100,000 bits per second with a normal burst size of 10,000 bytes, to transmit when these rates are not exceeded, and to drop packets when these rates are exceeded:

```
Switch(config)# qos aggregate-policer micro-one 100000 10000 conform-action transmit exceed-action drop
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| show qos aggregate policer | Displays QoS aggregate policer information. |

# qos control-packets

To enable Layer 2 control packet QoS mode on control packets use the **qos control-packets** command. To disable Layer 2 control packet QoS mode on control packets, use the **no** form of this command.

**qos control-packets** {**bpdu-range** | **cdp-vtp** | **sstp**}

**no qos control-packets** {**bpdu-range** | **cdp-vtp** | **sstp**}

## Syntax Description

| | |
|---|---|
| **bpdu-range** | Specifies enabling QoS on BPDU-range packets. |
| **cdp-vtp** | Specifies enabling QoS on CDP and VTP packets. |
| **sstp** | Specifies enabling QoS on SSTP packets. |

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

The ranges of addresses that Layer 2 control packet QoS acts on when the relative command is entered is shown in Table 2-12:

***Table 2-12 Packet Type and Actionable Address Range***

| Type of Packet on Which Feature is Enabled | Range of address |
|---|---|
| BPDU-range | 0180.C200.0000 BPDU<br>0180.C200.0002 OAM, LACP<br>0180.C200.0003 Eapol |
| CDP-VTP | 0100.0CCC.CCCC |
| SSTP | 0100.0CCC.CCCD |

When Layer 2 control packet QoS is enabled, you need to configure policies to match the required Layer 2 packets and police them as desired. When the feature is enabled on a particular packet type, MACLs that match the desired control packets are automatically generated, if not already present. The corresponding class maps matching these MACLs are auto-generated as well. You can then use these class maps in the policy maps in order to police the control packets, applying them a per port, per VLAN, or per port per VLAN just like any other policy map. In addition, you can define your own MACLs/class maps to match the control packets. The only limitation is that the user-defined class maps have to begin with the prefix “system-control-packet-”.

## Examples

This example shows how to enable QoS on BDPU packets.

```
Switch#enable
Switch#configuration terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#qos control-packets bpdu-range
Switch(config)#
```

This example shows how to enable QoS on CDP and VTP packets.

```
Switch#enable
Switch#configuration terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#qos control-packets cdp-vtp
Switch(config)#
```

This example shows how to enable QoS on SSTP packets.

```
Switch#enable
Switch#configuration terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#qos control-packets sstp
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| show policy-map interface | Displays the statistics and configurations of the input and output policies that are attached to an interface. |
| show running-config | Displays the running-configuration for a switch. |

# qos cos

To define the default CoS value for an interface, use the **qos cos** command. To remove a prior entry, use the **no** form of this command.

**qos cos** *cos_value*

**no qos cos** *cos_value*

## Syntax Description

| | |
|---|---|
| *cos_value* | Default CoS value for the interface; valid values are from 0 to 7. |

## Defaults

On non-Supervisor Engine 6-E supervisors the default CoS value is 0.

On Supervisor Engine 6-E and Catalyst 4900M chassis supervisors the default CoS is implicitly set to 1.

**Note** CoS override is not configured.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

CoS values are configurable on physical LAN ports only.

## Examples

This example shows how to configure the default QoS CoS value as 6:

```
Switch(config-if)# qos cos 6
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show qos | Displays QoS information. |

# qos dbl

To enable Dynamic Buffer Limiting (DBL) globally on the switch, use the **qos dbl** command. To disable DBL, use the **no** form of this command.

**qos dbl** [**buffers** {**aggressive-flow** *buffers*} | **credits** {**aggressive-flow** *credits* | **maximum** *max*} | **dscp-based** {*value* | *value range*} | **exceed-action** {**ecn** | **probability** *percent*} | **flow** {**include** [**layer4-ports**] [**vlan**]}]

**no qos dbl** [**buffers** {**aggressive-flow** *buffers*} | **credits** {**aggressive-flow** *credits* | **maximum** *max*} | **dscp-based** {*value* | *value range*} | **exceed-action** {**ecn** | **probability** *percent*} | **flow** {**include** [**layer4-ports**] [**vlan**]}]

## Syntax Description

| | |
|---|---|
| **buffers** | (Optional) Specifies the buffer limit for aggressive flows. |
| **aggressive-flow** | (Optional) Specifies the aggressive flow. |
| *buffers* | (Optional) Number of buffers for aggressive flows; valid values are from 0 to 255. |
| **credits** | (Optional) Specifies the credit limit for aggressive flows and all flows. |
| *credits* | (Optional) Number of credits for aggressive flows; valid values are from 0 to 15. |
| **maximum** | (Optional) Specifies the maximum credit for all flows. |
| *max* | (Optional) Number of credits for all flows; valid values are from 0 to 15. |
| **dscp-based** | (Optional) Specifies the packets that belong to the list of internal DSCPs. |
| *value* | (Optional) A single DSCP value; valid values are from 0 to 63. |
| *value range* | (Optional) A range of DSCP values; valid values are from 0 to 63. Up to 8 command separated DSCP values can be specified. |
| **exceed-action** | (Optional) Specifies the packet marking when the limits are exceeded. |
| **ecn** | (Optional) Specifies the explicit congestion notification. |
| **probability** | (Optional) Specifies the probability of packet marking. |
| *percent* | (Optional) Probability number; valid values are from 0 to 100. |
| **flow** | (Optional) Specifies the flows for limiting. |
| **include** | (Optional) Allows the Layer 4 ports and VLANs to be included in the flows. |
| **layer4-ports** | (Optional) Includes the Layer 4 ports in flows. |
| **vlan** | (Optional) Includes the VLANs in flows. |

## Defaults

On non-Supervisor Engine 6-E supervisors the default settings are as follows:

- QoS DBL is disabled.
- Aggressive-flow buffers is set to 2.
- Aggressive-flow credits is set to 2, with a limit of 10.
- Layer 4 ports are included.
- VLANs are included.
- 15 maximum credits are allowed.
- 15% drop probability is set.
- DSCP values are included.

On Supervisor Engine 6-E and Catalyst 4900M chassis supervisors the default dbl values are implicitly set and cannot be changed. The settings are as follows:

- seven maximum credits allowed.
- Aggressive-flow credits is set to 4.
- Aggressive-flow buffers is set to 4.
- six percent drop probability is set.
- Hash function for Layer 2 packets uses source and destination MAC addresses as well as transmit VLAN identifiers.
- Hash function for IPv4 and IPv6 packets uses source and destination IP addresses source and destination Layer 4 ports as well as transmit VLAN identifiers.

## Command Modes

Global configuration mode

QoS policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(37)SG | Added support for DSCP-based flow management. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

## Examples

This example shows how to enable DBL globally on the switch:

```
Switch(config)# qos dbl
Global DBL enabled
Switch(config)#
```

This example shows how to enable DBL in the QoS policy-map class configuration mode:

```
Switch(config)# class-map c1
Switch(config-cmap)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# dbl
Switch(config-pmap-c)#
```

This example shows how to selectively enable DBL on DSCP values 1 through 10:

```
Switch# configure t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# qos dbl dscp-based 1-10
Switch(config)# end
Switch# show qos dbl
    DBL flow includes vlan
    DBL flow includes layer4-ports
    DBL does not use ecn to indicate congestion
    DBL exceed-action probability: 15%
    DBL max credits: 15
    DBL aggressive credit limit: 10
    DBL aggressive buffer limit: 2 packets
    DBL DSCPs with default drop probability:
```

```
        1-10
```

This example shows how to selectively disable DBL on DSCP values 1 through 10:

```
Switch# configure t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# no qos dbl dscp-based 1-5, 7
Switch(config)# end
Switch# show qos dbl
    DBL flow includes vlan
    DBL flow includes layer4-ports
    DBL does not use ecn to indicate congestion DBL exceed-action probability: 15% DBL max
    credits: 15 DBL aggressive credit limit: 10 DBL aggressive buffer limit: 2 packets DBL
    DSCPs with default drop probability:
         0,6,8-63
```

You can verify your settings by entering the **show qos dbl** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **show qos dbl** | Displays QoS Dynamic Buffer Limiting (DBL) information. |

# qos dscp

To define the default CoS value for an interface, use the **qos dscp** command. To remove a prior entry, use the **no** form of this command.

**qos dscp** *dscp_value*

**no qos dscp** *dscp_value*

## Syntax Description

| | |
|---|---|
| *dscp_value* | Default DSCP value for the interface; valid values are from 0 to 63. |

## Defaults

On non-Supervisor Engine 6-E supervisors the default DSCP value is 0.

On Supervisor Engine 6-E and Catalyst 4900M chassis supervisors the port DSCP value is always set to 0.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

## Examples

This example shows how to configure the default QoS DSCP value as 6:

```
Switch(config-if)# qos dscp 6
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **show qos interface** | Displays QoS information for an interface. |

# qos map cos

To define the ingress CoS-to-DSCP mapping for the trusted interfaces, use the **qos map cos to dscp** command. To remove a prior entry, use the **no** form of this command.

**Note** You cannot remove a single entry from the table.

**qos map cos** *cos_values* **to dscp** *dscp1*

**no qos map cos to dscp**

## Syntax Description

| | |
|---|---|
| *cos_values* | CoS values; list up to eight CoS values separated by spaces. |
| **to dscp** | Defines mapping and specifies DSCP value. |
| *dscp1* | DSCP value to map to the CoS values; valid values are from 0 to 63. |

## Defaults

The default CoS-to-DSCP configuration settings are shown in the following table:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CoS** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **DSCP** | 0 | 8 | 16 | 24 | 32 | 40 | 48 | 56 |

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. In place of this limited map capability, the Supervisor Engine 6-E and Catalyst 4900M chassis supports the setting of various marking fields in a packet within a policy map. Please refer to the **set** command for more details.

The CoS-to-DSCP map is used to map the packet CoS (on the interfaces that are configured to trust CoS) to the internal DSCP value. This map is a table of eight CoS values (0 through 7) and their corresponding DSCP values. The switch has one map.

## Examples

This example shows how to configure the ingress CoS-to-DSCP mapping for CoS 0:

```
Switch(config)# qos map cos 0 to dscp 20
Switch(config)#
```

This example shows how to clear the entire CoS-to-DSCP mapping table:

```
Switch(config)# no qos map cos 0 to dscp 20
```

```
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **qos map dscp** | Maps the DSCP values to selected transmit queues and to map the DSCP-to-CoS value. |
| **qos map dscp policed** | Sets the mapping of the policed DSCP values to the marked-down DSCP values. |
| **show qos** | Displays QoS information. |
| **tablemap** (refer to Cisco IOS documentation) | Modifies metric and tag values when the IP routing table is updated with BGP learned routes. |

# qos map dscp

To map the DSCP values to selected transmit queues and to map the DSCP-to-CoS value, use the **qos map dscp** command. To return to the default value, use the **no** form of this command.

**qos map dscp** *dscp-values* **to tx-queue** *queue-id*

**no qos map dscp** *dscp-values* **to cos** *cos-value*

## Syntax Description

| | |
|---|---|
| *dscp-values* | List of DSCP values to map to the queue ID; valid values are from 0 to 63. |
| **to** | Defines mapping. |
| **tx-queue** | Specifies a transmit queue. |
| *queue-id* | Transmit queue; valid values are from 1 to 4. |
| **cos** | Specifies the CoS value. |
| *cos-value* | Class of service; valid values are from 1 to 7. |

## Defaults

The default DSCP-to-CoS configuration settings are shown in the following table:

| **DSCP** | 0-7 | 8-15 | 16-23 | 24-31 | 32-39 | 40-47 | 48-55 | 56-63 |
|---|---|---|---|---|---|---|---|---|
| **CoS** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. In place of this command the Supervisor Engine 6-E and Catalyst 4900M chassis uses the **tablemap** command for QoS marking. Please refer to the **tablemap** command for details.

You use the DSCP-to-CoS map to map the final DSCP classification to a final CoS. The CoS map is written into the ISL header or 802.1Q tag of the transmitted packet on trunk interfaces and contains a table of 64 DSCP values and the corresponding CoS values. The switch has one map. You can enter up to eight DSCP values, separated by spaces, for a CoS value.

The DSCP-to-transmit-queue map is used to map the final DSCP classification to a transmit queue. You can enter up to eight DSCP values, separated by spaces, for a transmit queue.

## Examples

This example shows how to configure the egress DSCP-to-CoS mapping:

```
Switch(config)# qos map dscp 20 25 to cos 3
Switch(config)#
```

This example shows how to configure the egress DSCP-to-transmit queue:

```
Switch(config)# qos map dscp 20 25 to tx-queue 1
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **qos map cos** | Defines the ingress CoS-to-DSCP mapping for the trusted interfaces. |
| **show qos interface** | Displays queueing information. |
| **show qos** | Displays QoS information. |
| **tablemap** (refer to Cisco IOS documentation) | Modifies metric and tag values when the IP routing table is updated with BGP learned routes. |
| **tx-queue** | Configures the transmit queue parameters for an interface. |

# qos map dscp policed

To set the mapping of the policed DSCP values to the marked-down DSCP values, use the **qos map dscp policed** command. To remove a prior entry, use the **no** form of this command.

**qos map dscp policed** *dscp_list* **to dscp** *policed_dscp*

**no qos map dscp policed**

## Syntax Description

| | |
|---|---|
| *dscp_list* | DSCP values; valid values are from 0 to 63. |
| **to dscp** | Defines mapping. |
| *policed_dscp* | Marked-down DSCP values; valid values are from 0 to 63. |

## Defaults

Mapping of DSCP values is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. Various policer types are supported on the Supervisor Engine 6-E and Catalyst 4900M chassis that supports explicit QoS marking of DSCP, precedence, and CoS fields. Refer to the **police** command for details.

The DSCP-to-policed-DSCP map determines the marked-down DSCP value that is applied to the out-of-profile flows. The switch has one map.

You can enter up to eight DSCP values, separated by spaces.

You can enter only one policed DSCP value.

**Note** To avoid out-of-sequence packets, configure the DSCP-to-policed-DSCP map so that marked-down packets remain in the same queue as in-profile traffic.

## Examples

This example shows how to map multiple DSCPs to a single policed-DSCP value:

```
Switch(config)# qos map dscp policed 20 25 43 to dscp 4
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| qos map cos | Defines the ingress CoS-to-DSCP mapping for the trusted interfaces. |
| qos map dscp | Maps the DSCP values to selected transmit queues and to map the DSCP-to-CoS value. |
| show qos | Displays QoS information. |

# qos rewrite ip dscp

To enable DSCP rewrite for IP packets, use the **qos rewrite ip dscp** command. To disable IP DSCP rewrite, use the **no** form of this command.

**qos rewrite ip dscp**

**no qos rewrite ip dscp**

## Syntax Description

This command has no arguments or keywords.

## Defaults

IP DSCP rewrite is enabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

If you disable IP DSCP rewrite and enable QoS globally, the following events occur:

- The ToS byte on the IP packet is not modified.
- Marked and marked-down DSCP values are used for queueing.
- The internally derived DSCP (as per the trust configuration on the interface or VLAN policy) is used for transmit queue and Layer 2 CoS determination. The DSCP is not rewritten on the IP packet header.

If you disable QoS, the CoS and DSCP of the incoming packet are preserved and are not rewritten.

## Examples

This example shows how to disable IP DSCP rewrite:

```
Switch(config)# no qos rewrite ip dscp
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| qos (global configuration mode) | Enables QoS functionality on the switch. |
| show qos | Displays QoS information. |

# qos trust

To set the trusted state of an interface (for example, whether the packets arriving at an interface are trusted to carry the correct CoS, ToS, and DSCP classifications), use the **qos trust** command. To set an interface to the untrusted state, use the **no** form of this command.

**qos trust** {**cos** | *device cisco-phone* | **dscp** | **extend** [**cos** *priority*]}

**no qos trust** {**cos** | *device cisco-phone* | **dscp** | **extend** [**cos** *priority*]}

## Syntax Description

| | |
|---|---|
| **cos** | Specifies that the CoS bits in incoming frames are trusted and derives the internal DSCP value from the CoS bits. |
| *device cisco-phone* | Specifies the Cisco IP phone as the trust device for a port. |
| **dscp** | Specifies that the ToS bits in the incoming packets contain a DSCP value. |
| **extend** | Specifies to extend the trust to Port VLAN ID (PVID) packets coming from the PC. |
| **cos** *priority* | (Optional) Specifies that the CoS priority value is set to PVID packets; valid values are from 0 to 7. |

## Defaults

The default settings are as follows:

- If global QoS is enabled, trust is disabled on the port.
- If global QoS is disabled, trust DSCP is enabled on the port.
- The CoS priority level is 0.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(11)EW | Support for extending trust for voice was added. |
| 12.1(19)EW | Support for trust device Cisco IP phone was added. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

You can only configure the trusted state on physical LAN interfaces.

By default, the trust state of an interface when QoS is enabled is untrusted; when QoS is disabled on the interface, the trust state is reset to trust DSCP.

When the interface trust state is **qos trust cos**, the transmit CoS is always the incoming packet CoS (or the default CoS for the interface, if the packet is not tagged).

When the interface trust state is not **qos trust dscp**, the security and QoS ACL classification will always use the interface DSCP and not the incoming packet DSCP.

Trusted boundary should not be configured on the ports that are part of an EtherChannel (that is, a port channel).

## Examples

This example shows how to set the trusted state of an interface to CoS:

```
Switch(config-if)# qos trust cos
Switch(config-if)#
```

This example shows how to set the trusted state of an interface to DSCP:

```
Switch(config-if)# qos trust dscp
Switch(config-if)#
```

This example shows how to set the PVID CoS level to 6:

```
Switch(config-if)# qos trust extend cos 6
Switch(config-if)#
```

This example shows how to set the Cisco phone as the trust device:

```
Switch(config-if)# qos trust device cisco-phone
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| qos cos | Defines the default CoS value for an interface. |
| qos vlan-based | Defines per-VLAN QoS for a Layer 2 interface. |
| show qos interface | Displays QoS information for an interface. |

# qos vlan-based

To enable per-VLAN QoS for a Layer 2 interface, use the **qos vlan-based** command. To disable per-VLAN QoS for a Layer 2 interface, use the **no** form of this command.

**qos vlan-based**

**no qos vlan-based**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Per-VLAN QoS is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. On the Supervisor Engine 6-E and Catalyst 4900M chassis various QoS marking and policing actions at the interface and VLAN level are appropriately merged. For details, refer to the *Catalyst 4500 Series Switch Configuration Guide*.

In VLAN-based mode, the policy map that is attached to the Layer 2 interface is ignored, and QoS is driven by the policy map that is attached to the corresponding VLAN interface.

Per-VLAN QoS can be configured only on the Layer 2 interfaces.

If no input QoS policy is attached to a Layer 2 interface, then the input QoS policy that is attached to the VLAN (on which the packet is received), if any, is used even if the port is not configured as VLAN based.

If you do not want this default, attach a placeholder input QoS policy to the Layer 2 interface.

Similarly, if no output QoS policy is attached to a Layer 2 interface, then the output QoS policy that is attached to the VLAN (on which the packet is transmitted), if any, is used even if the port is not configured as VLAN based.

If you do not want this default, attach a placeholder output QoS policy to the Layer 2 interface.

Layer 3 interfaces are always in interface-based mode. Layer 3 VLAN interfaces are always in VLAN-based mode.

## Examples

This example shows how to enable per-VLAN QoS for a Layer 2 interface:

```
Switch(config-if)# qos vlan-based
Switch(config-if)#
```

**Related Commands**

| Command | Description |
|---|---|
| **qos cos** | Defines the default CoS value for an interface. |
| **show qos interface** | Displays QoS information for an interface. |

# 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** command. To remove the queue packet limit from a class, use the **no** form of this command.

**queue-limit** *number-of-packets*

**no queue-limit** *number-of-packets*

## Syntax Description

| | |
|---|---|
| *number-of-packets* | Number of packets that the queue for this class can accumulate; valid range is 16 to 8184. This number must be a multiple of 8. |

## Defaults

By default, each physical interface on a Catalyst 4500 switch has a default queue based on the number of slots in a chassis and the number of ports on the linecards.

## Command Modes

QoS policy-map class configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(44)SG | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This class-based queuing (CBQ) command applies only to the Supervisor 6E as part of the MQC support on the Catalyst 4500 supervisor.

By default, each physical interface on a Catalyst 4500 switch comes up with a default queue. The size of this queue is based on the number of slots in a chassis as well as the number of ports on the line card in each slot. The switch supports 512K queue entries of which 100K are set aside as a common sharable pool. The remaining 412K entries are equally distributed among the slots. Each slot further divides its allocated queue entries equally among its ports.

CBQ creates a queue for every class for which a class map is defined. Packets satisfying the match criterion 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 or, if DBL is configured for the class policy, packet drop to take effect.

**Note** The queue-limit command is supported only after you first configure a scheduling action, such as bandwidth, shape, or priority, except when you configure queue-limit in the class-default class of an output QoS policy-map.s

## Examples

This example shows how to configure a policy-map called *policy11* to contain policy for a class called *acl203*. Policy for this class is set so that the queue reserved for it has a maximum packet limit of 40:

```
Switch# configure terminal
Switch (config)# policy-map policy11
Switch (config-pmap)# class acl203
Switch (config-pmap-c)# bandwidth 2000
Switch (config-pmap-c)# queue-limit 40
Switch (config-pmap-c)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **bandwidth** | Specifies or modifies the minimum bandwidth provided to a class belonging to a policy map attached to a physical port. |
| **class** | Specifies the name of the class whose traffic policy you want to create or change. |
| **policy-map** | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **shape (class-based queueing)** | Enables traffic shaping a class of traffic in a policy map attached to a physical port. |

# redundancy

To enter the redundancy configuration mode, use the **redundancy** command in the global configuration mode.

**redundancy**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch (Catalyst 4507R only). |

## Usage Guidelines

The redundancy configuration mode is used to enter the main CPU submode.

To enter the main CPU submode, use the **main-cpu** command in the redundancy configuration mode.

The main CPU submode is used to manually synchronize the configurations on the two supervisor engines.

From the main CPU submode, use the **auto-sync** command to enable automatic synchronization of the configuration files in NVRAM.

Use the **no** command to disable redundancy. If you disable redundancy, then reenable redundancy, the switch returns to default redundancy settings.

Use the **exit** command to exit the redundancy configuration mode.

## Examples

This example shows how to enter redundancy mode:

```
Switch(config)# redundancy
Switch(config-red)#
```

This example shows how to enter the main CPU submode:

```
Switch(config)# redundancy
Switch(config-red)# main-cpu
Switch(config-r-mc)#
```

## Related Commands

| Command | Description |
|---|---|
| auto-sync | Enables automatic synchronization of the configuration files in NVRAM. |
| main-cpu | Enters the main CPU submode and manually synchronize the configurations on the two supervisor engines. |

# redundancy config-sync mismatched-commands

If your active and standby supervisors are running different versions of IOS, some of their CLIs will not be compatible. If such commands are already present in the running configuration of the active supervisor engine and the syntax-check for the command fails at the standby supervisor engine while it is booting, the **redundancy config-sync mismatched-commands** command moves the active supervisor engine into the Mismatched Command List (MCL) and resets the standby supervisor engine.

**redundancy config-sync** {**ignore** | **validate**} **mismatched-commands**

## Syntax Description

| | |
|---|---|
| **ignore** | Ignore the mismatched command list. |
| **validate** | Revalidate the mismatched command list with the modified running-configuration. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |
| 12.2(44)SG | Updated command syntax from issu config-sync to redundancy config-sync. |

## Usage Guidelines

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 11.0.0.1 255.0.0.0
 ! </submode> "interface"
```

To display all mismatched commands, use the **show redundancy config-sync failures mcl** command.

To clean the MCL, follow these steps:

**Step 1** Remove all mismatched commands from the active supervisor engine's running configuration.

**Step 2** Revalidate the MCL with a modified running configuration using the **redundancy config-sync validate mismatched-commands** command.

**Step 3** Reload the standby supervisor engine.

You could also ignore the MCL by doing the following:

**Step 1** Enter the **redundancy config-sync ignore mismatched-commands** command.

**Step 2** Reload the standby supervisor engine; the system changes to SSO mode.

**Note** If you ignore the mismatched commands, the *out-of-sync* configuration at the active supervisor engine and the standby supervisor engine still exists.

**Step 3** You can verify the ignored MCL with the **show redundancy config-sync ignored mcl** command.

## Examples

This example shows how you can validate removal of entries from the MCL:

```
Switch# redundancy config-sync validate mismatched-commands
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show redundancy config-sync | Displays an ISSU config-sync failure or the ignored mismatched command list (MCL). |

# redundancy force-switchover

To force a switchover from the active to the standby supervisor engine, use the **redundancy force-switchover** command.

**redundancy force-switchover**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch (Catalyst 4507R only). |

## Usage Guidelines

Before using this command, refer to the "Performing a Software Upgrade" section of the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide* for additional information.

The **redundancy force-switchover** command conducts a manual switchover to the redundant supervisor engine. The redundant supervisor engine becomes the new active supervisor engine running the Cisco IOS image. The modules are reset.

The old active supervisor engine reboots with the new image and becomes the standby supervisor engine.

## Examples

This example shows how to switch over manually from the active to the standby supervisor engine:

```
Switch# redundancy force-switchover
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| redundancy | Enters the redundancy configuration mode. |
| show redundancy | Displays redundancy facility information. |

# redundancy reload

To force a reload of one or both supervisor engines, use the **redundancy reload** command.

**redundancy reload** {**peer** | **shelf**}

## Syntax Description

| | |
|---|---|
| **peer** | Reloads the peer unit. |
| **shelf** | Reboots both supervisor engines. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch (Catalyst 4507R only). |

## Usage Guidelines

Before using this command, refer to the "Performing a Software Upgrade" section of the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide* for additional information.

The **redundancy reload shelf** command conducts a reboot of both supervisor engines. The modules are reset.

## Examples

This example shows how to manually reload one or both supervisor engines:

```
Switch# redundancy reload shelf
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **redundancy** | Enters the redundancy configuration mode. |
| **show redundancy** | Displays redundancy facility information. |

# remote login module

To remotely connect to a specific module, use the **remote login module** configuration command.

**remote login module** *mod*

## Syntax Description

| | |
|---|---|
| *mod* | Target module for the command. |

## Defaults

This command has no default settings.

## Command Modes

Privileged

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command applies only to the Access Gateway Module on Catalyst 4500 series switches.

The valid values for *mod* depends on the chassis used. For example, if you have a Catalyst 4506 chassis, valid values for the module are from 2 to 6. If you have a 4507R chassis, valid values are from 3 to 7.

When you execute the **remote login module** *mod* command, the prompt changes to Gateway#

The **remote login module** command is identical to the **session module** *mod* and the **attach module** *mod* commands.

## Examples

This example shows how to remotely log in to the Access Gateway Module:

```
Switch# remote login module 5
Attaching console to module 5
Type 'exit' at the remote prompt to end the session

Gateway>
```

## Related Commands

| Command | Description |
|---|---|
| attach module | Remotely connects to a specific module. |
| session module | Logs in to the standby supervisor engine using a virtual console. |

# remote-span

To convert a VLAN into an RSPAN VLAN, use the **remote-span** command. To convert an RSPAN VLAN to a VLAN, use the **no** form of this command.

**remote-span**

**no remote-span**

## Syntax Description

This command has no arguments or keywords.

## Defaults

RSPAN is disabled.

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(20)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to convert a VLAN into an RSPAN VLAN:

```
Switch# config terminal
Switch(config)# vlan 20
Switch(config-vlan)# remote-span
Switch(config-vlan)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| monitor session | Enables the SPAN sessions on interfaces or VLANs. |

# renew ip dhcp snooping database

To renew the DHCP binding database, use the **renew ip dhcp snooping database** command.

**renew ip dhcp snooping database** [**validation none**] [**url**]

## Syntax Description

| | |
|---|---|
| **validation none** | (Optional) Specifies that the checksum associated with the contents of the file specified by the URL is not verified. |
| **url** | (Optional) Specifies the file from which the read is performed. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If the URL is not provided, the switch tries to read the file from the configured URL.

## Examples

This example shows how to renew the DHCP binding database while bypassing the CRC checks:

```
Switch# renew ip dhcp snooping database validation none
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **ip dhcp snooping** | Globally enables DHCP snooping. |
| **ip dhcp snooping binding** | Sets up and generates a DHCP binding configuration to restore bindings across reboots. |
| **ip dhcp snooping information option** | Enables DHCP option 82 data insertion. |
| **ip dhcp snooping trust** | Enables DHCP snooping on a trusted VLAN. |
| **ip dhcp snooping vlan** | Enables DHCP snooping on a VLAN or a group of VLANs. |
| **show ip dhcp snooping** | Displays the DHCP snooping configuration. |
| **show ip dhcp snooping binding** | Displays the DHCP snooping binding entries. |

# reset

To leave the proposed new VLAN database but remain in VLAN configuration mode and reset the proposed new database to be identical to the VLAN database currently implemented, use the **reset** command.

**reset**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to reset the proposed new VLAN database to the current VLAN database:

```
Switch(vlan-config)# reset
RESET completed.
Switch(vlan-config)#
```

# revision

To set the MST configuration revision number, use the **revision** command. To return to the default settings, use the **no** form of this command.

**revision** *version*

**no revision**

## Syntax Description

| | |
|---|---|
| *version* | Configuration revision number; valid values are from 0 to 65535. |

## Defaults

Revision version is set to 0.

## Command Modes

MST configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If two Catalyst 4500 series switches have the same configuration but have different configuration revision numbers, they are considered to be part of two different regions.

**Caution** Be careful when using the **revision** command to set the MST configuration revision number because a mistake can put the switch in a different region.

## Examples

This example shows how to set the configuration revision number:

```
Switch(config-mst)# revision 5
Switch(config-mst)#
```

## Related Commands

| Command | Description |
|---|---|
| **instance** | Maps a VLAN or a set of VLANs to an MST instance. |
| **name** | Sets the MST region name. |
| **show spanning-tree mst** | Displays MST protocol information. |
| **spanning-tree mst configuration** | Enters the MST configuration submode. |

# service-policy (interface configuration)

To attach a policy map to an interface or to apply different QoS policies on VLANs that an interface belongs to, use the **service-policy** command. To remove a policy map from an interface, use the **no** form of this command.

**service-policy** {**input** | **output**} *policy-map name*

**no service-policy** {**input** | **output**} *policy-map name*

## Syntax Description

| | |
|---|---|
| **input** | Specifies the input policy maps. |
| **output** | Specifies the output policy maps. |
| *policy-map name* | Name of a previously configured policy map. |

## Defaults

A policy map is not attached to an interface or a VLAN.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EWA | Support for applying different QoS policies on VLANs was introduced. |

## Usage Guidelines

Layer 2 interfaces can be part of multiple VLANs (for example, a typical trunk port). In conjunction with the **vlan-range** command, you can use the **service-policy** command to specify different QoS policies on different VLANs.

**Note** This capability is restricted to Layer 2 interfaces.

### Non-Supervisor Engine 6-E

You cannot apply a policy map under an interface and a VLAN range at the same time.

To attach a service policy to a VLAN an SVI must be created for the VLAN and the policy must be applied to the SVI.

### Supervisor Engine 6-E and Catalyst 4900M chassis

You can apply a service policy under an interface as well as a VLAN range at the same time. However, this is allowed only when the interface policy has only queuing actions whereas a VLAN has only non-queueing actions (QoS marking and/or policing) actions.

To attach a service policy to a VLAN, the VLAN configuration mode has to be used.

## Examples

This example shows how to attach a policy map to Fast Ethernet interface 5/20:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 5/20
Switch(config-if)# service-policy input pmap1
Switch(config-if)# end
```

This example shows how to apply policy map p1 for traffic in VLANs 20 and 400, and policy map p2 for traffic in VLANs 300 through 301:

```
Switch# configure terminal
Switch(config)# interface gigabitEthernet 6/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# vlan-range 20,400
Switch(config-if-vlan-range)# service-policy input p1
Switch(config-if-vlan-range)# exit
Switch(config-if)# vlan-range 300-301
Switch(config-if-vlan-range)# service-policy output p2
Switch(config-if-vlan-range)# end
Switch# show policy-map interface gigabitEthernet 6/1 vlan 20
 GigabitEthernet6/1 vlan 20

  Service-policy input: p1

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes

Switch# show policy-map interface gigabitEthernet 6/1
 GigabitEthernet6/1 vlan 20

  Service-policy input: p1

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes

 GigabitEthernet6/1 vlan 300

  Service-policy output: p2

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes

 GigabitEthernet6/1 vlan 301

  Service-policy output: p2

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
```

```
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes

 GigabitEthernet6/1 vlan 400

  Service-policy input: p1

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes
```

This example shows how to attach a policy map to a VLAN using an SVI on a non-Supervisor Engine 6-E:

```
Switch# configure terminal
Switch(config)#interface vlan 10
Switch(config-if)#service-policy out policy-vlan
Switch(config-if)#end
Switch#
```

This example shows how to attach a policy map to a VLAN using a Supervisor Engine 6-E:

```
Switch# configure terminal
Switch(config)#vlan configuration 20
Switch(config-vlan-config)#service-policy out policy-vlan
Switch(config-vlan-config)#end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| class-map | Creates a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode. |
| policy-map | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| service-policy (interface configuration) | Attaches a policy map to an interface. |
| show policy-map interface vlan | Displays the QoS policy-map information applied to a specific VLAN on an interface. |

# service-policy (policy-map class)

To create a service policy that is a quality of service (QoS) policy within a policy map (called a hierarchical service policy), use the **service-policy** policy-map class configuration command. To disable the service policy within a policy map, use the **no** form of this command.

**service-policy** *policy-map-name*

**no service-policy** *policy-map-name*

## Syntax Description

| | |
|---|---|
| *policy-map-name* | Name of the policy map. |

## Defaults

No service policies maps are defined.

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(40)SG | Added support for Supervisor Engine 6-E and Catalyst 4900M chassis. |

## Usage Guidelines

Use the **service-policy** command only in a hierarchical policy map attached to a physical port. This command is valid in policy maps at level two of the hierarchy.

You can create a hierarchy by having the parent policy map specify marking and/or policing actions and having the child policy map specify the queueing actions.

If you enter this command in policy-map class configuration mode, you return to policy-map configuration mode by using the **exit** command. To return to privileged EXEC mode, use the **end** command.

## Examples

This example shows how to create a hierarchical service policy in the service policy called "parent":

```
Switch# configure terminal
Switch(config)# policy-map child
Switch(config-pmap)# class voice
Switch(config-pmap-c)# priority
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# policy-map parent
Switch(config-pmap)# class class1
Switch(config-pmap-c)# police 32k
Switch(config-pmap-c)# service-policy child
Switch#
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **bandwidth** | Creates a signaling class structure that can be referred to by its name. |
| **class** | Specifies the name of the class whose traffic policy you want to create or change. |
| **dbl** | Enables active queue management on a transmit queue used by a class of traffic. |
| **policy-map** | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **priority** | Enables the strict priority queue (low-latency queueing [LLQ]) and to give priority to a class of traffic belonging to a policy map attached to a physical port. |
| **random-detect** (refer to Cisco IOS documentation) | Enables Weighted Random Early Detection (WRED) or distributed WRED (DWRED). |
| **shape (class-based queueing)** | Enables traffic shaping a class of traffic in a policy map attached to a physical port. |
| **show policy-map** | Displays information about the policy map. |

# service-policy input (control-plane)

To attach a policy map to a control plane for aggregate control plane services, use the **service-policy input** command. Use the **no** form of this command to remove a service policy from a control plane.

**service-policy input** *policy-map-name*

## Syntax Description

| | |
|---|---|
| **input** | Applies the specified service policy to the packets that are entering the control plane. |
| *policy-map-name* | Name of a service policy map (created using the **policy-map** command) to be attached. |

## Defaults

No service policy is specified.

## Command Modes

Control-plane configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

In this release, the only policy-map accepted on the control-plane is system-cpp-policy. It is already attached to the control-plane at start up. If not (due to some error conditions), it is recommended to use the **global macro system-cpp** command to attach it to the control-plane. The system-cpp-policy created by the system contains system pre-defined classes. For these pre-defined classes, you can change the policing parameters but you should not make any other change to the classes.

You can define your own class-maps and append them to the end of the system-cpp-policy policy-map.

## Examples

This example shows how to configure trusted hosts with source addresses 10.1.1.1 and 10.1.1.2 to forward Telnet packets to the control plane without constraint, while allowing all remaining Telnet packets to be policed at the specified rate:

```
Switch(config)# access-list 140 deny tcp host 10.1.1.1 any eq telnet
! Allow 10.1.1.2 trusted host traffic.
Switch(config)# access-list 140 deny tcp host 10.1.1.2 any eq telnet
! Rate limit all other Telnet traffic.
Switch(config)# access-list 140 permit tcp any any eq telnet
! Define class-map "telnet-class."
Switch(config)# class-map telnet-class
Switch(config-cmap)# match access-group 140
Switch(config-cmap)# exit
Switch(config)# policy-map control-plane-policy
Switch(config-pmap)# class telnet-class
Switch(config-pmap-c)# police 80000 conform transmit exceed drop
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
! Define aggregate control plane service for the active Route Processor.
```

```
Switch(config)# control-plane
Switch(config-cp)# service-policy input control-plane-policy
Switch(config-cp)# exit
```

## Related Commands

| Command | Description |
|---|---|
| control-plane | Enters control-plane configuration mode. |
| macro global apply system-cpp | Applies the control plane policing default template to the switch. |
| policy-map | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| show policy-map control-plane | Displays the configuration either of a class or of all classes for the policy map of a control plane. |

# session module

**Note** This command is only supported in SSO mode and does not work in RPR mode.

To login to the standby supervisor engine using a virtual console, use the **session module** configuration command.

**session module** *mod*

## Syntax Description

| | |
|---|---|
| *mod* | Target module for the command. |

## Defaults

This command has no default settings.

## Command Modes

Privileged

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Catalyst 4500 series switches can be configured with 2 supervisor engines to provide redundancy. When the switch is powered, one of the supervisor engines becomes active and remains active until a switchover occurs. The other supervisor engine remains in standby mode.

Each supervisor engine has its own console port. Access to the standby supervisor engine is possible only through the console port of the standby supervisor engine. Therefore, you must connect to the standby console to access, monitor or debug the standby supervisor.

Virtual Console for Standby Supervisor Engine enables you to access the standby console from the active supervisor engine without requiring a physical connection to the standby console. It uses IPC over EOBC to communicate with the standby supervisor engine and thus emulate the standby console on the active supervisor engine. Only one active standby console session is active at any time.

The Virtual Console for Standby Supervisor Engine allows users who are logged onto the active supervisor engine to remotely execute show commands on the standby supervisor engine and view the results on the active supervisor engine. Virtual Console is available only from the active supervisor engine.

You can access the standby virtual console from the active supervisor engine with the **attach module**, **session module**, or **remote login** commands on the active supervisor engine. You must be in privilege EXEC mode (level 15) to run these commands to access the standby console.

**Note** The **session module** command is identical to the **attach module** *mod* and the **remote login module** *mod* commands.

Once you enter the standby virtual console, the terminal prompt automatically changes to "<hostname>-standby-console#" where hostname is the configured name of the switch. The prompt is restored back to the original prompt when you exit the virtual console.

You exit the virtual console with the **exit** or **quit** commands. When the inactivity period of the terminal on the active supervisor engine where you logged in exceeds the configured idle time, you are automatically logged out of the terminal on the active supervisor engine. In such a case, the virtual console session is also terminated. Virtual console session is also automatically terminated when the standby is rebooted. After the standby boots up, you need to create another virtual console session.

The following limitations apply to the standby virtual console:

All commands on the virtual console run to completion. It does not provide the auto-more feature; it behaves as if the **terminal length 0** command has been executed. It is also non-interactive. Therefore, a running command cannot be interrupted or aborted by any key sequence on the active supervisor engine. Therefore if a command produces considerable output, the virtual console displays it on the supervisor screen.

The virtual console is non-interactive. Because the virtual console does not detect the interactive nature of a command, any command that requires user interaction causes the virtual console to wait until the RPC timer aborts the command.

The virtual console timer is set to 60 seconds. The virtual console returns to its prompt after 60 seconds. During this time, you cannot abort the command from the key board. You must wait for the timer to expire before you continue.

You cannot use virtual console to view debug and syslog messages that are being displayed on the standby supervisor engine. The virtual console only displays the output of commands that are executed from the virtual console. Other information that is displayed on the real standby console does not appear on the virtual console.

## Examples

To login to the standby supervisor engine using a virtual console, do the following:

```
Switch# session module 2
Connecting to standby virtual console
Type "exit" or "quit" to end this session

Switch-standby-console# exit
Switch#
```

If the standby console is not enabled, the following message appears.

```
Switch-standby-console#
Standby console disabled.
Valid commands are: exit, logout
```

## Related Commands

| Command | Description |
|---|---|
| attach module | Remotely connects to a specific module. |
| remote login module | Remotely connects to a specific module. |

# set

To mark IP traffic by setting a class of service (CoS), a Differentiated Services Code Point (DSCP), or IP-precedence in the packet, use the **set** policy-map class configuration command. To remove the traffic classification, use the **no** form of this command.

**set** {**cos** *new-cos* | [**ip**] {**dscp** *new-dscp* | **precedence** *new-precedence*} | **qos group** *value*}

**no set cos** *new-cos* | **ip** {**dscp** *new-dscp* | **precedence** *new-precedence*} | **qos group** *value*}

## Syntax Description

| | |
|---|---|
| **cos** *new-cos* | New CoS value assigned to the classified traffic. The range is 0 to 7. |
| **ip dscp** *new-dscp* | New DSCP value assigned to the classified traffic. The range is 0 to 63. You also can enter a mnemonic name for a commonly used value. The specified value sets the type of service (ToS) traffic class byte in the IPv4/IPv6 packet header. |
| **ip precedence** *new-precedence* | New IP-precedence value assigned to the classified traffic. The range is 0 to 7. You also can enter a mnemonic name for a commonly used value. The specified value sets the precedence bit in the IP header. |
| **qos group** *value* | Internal QoS group assigned to a classified packet on ingress to an interface. |

## Defaults

No marking is enabled on packets.

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(40)SG | Added support for Supervisor Engine 6-E and Catalyst 4900M chassis. |

## Usage Guidelines

You can use the **set** command only in class-level classes.

The **set dscp** *new-dscp* and the **set precedence** *new-precedence* commands are the same as the **set ip dscp** *new-dscp* and the **set ip precedence** *new-precedence* commands.

For the **set dscp** *new-dscp* or the **set precedence** *new-precedence* command, you can enter a mnemonic name for a commonly used value. For example, you can enter the **set dscp af11** command, which is the as same entering the **set dscp 10** command. You can enter the **set precedence critical** command, which is the same as entering the **set precedence 5** command. For a list of supported mnemonics, enter the **set dscp ?** or the **set precedence ?** command to see the command-line help strings.

You can configure the **set cos** *new-cos*, **set dscp** *new-dscp*, or **set precedence** *new-precedence* command in an ingress and an egress policy map attached to an interface or VLAN.

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 create a policy map called *p1* with CoS values assigned to different traffic types. Class maps for "voice" and "video-data" have already been created.

```
Switch# configure terminal
Switch(config)# policy-map p1
Switch(config-pmap)# class voice
Switch(config-pmap-c)# set cos 1
Switch(config-pmap)# exit
Switch(config-pmap)# class video-data
Switch(config-pmap-c)# set cos 2
Switch(config-pmap)# exit
Switch#
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **class** | Specifies the name of the class whose traffic policy you want to create or change. |
| **policy-map** | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **show policy-map** | Displays information about the policy map. |
| **trust** | Defines a trust state for traffic classified through the **class** policy-map configuration command. |

# set cos

To set the Layer 2 class of service (CoS) value of a packet, use the **set cos** command in policy-map class configuration mode. To remove a specific CoS value setting, use the **no** form of this command.

**set cos** {*cos-value* | *from-field* [**table** *table-map-name*]}

**no set cos** {*cos-value* | *from-field* [**table** *table-map-name*]}

## Syntax Description

| | |
|---|---|
| *cos-value* | Specific IEEE 802.1Q CoS value from 0 to 7. |
| *from-field* | Specific packet-marking category to be used to set the CoS value of the packet. If you are using a table map for mapping and converting packet-marking values, this establishes the "map from" packet-marking category. Packet-marking category keywords are as follows:<br>• **precedence**<br>• **dscp**<br>• **cos**<br>• **qos group** |
| **table** | (Optional) Indicates that the values set in a specified table map will be used to set the CoS value. |
| *table-map-name* | (Optional) Name of the table map used to specify the CoS value. The table map name can be a maximum of 64 alphanumeric characters. |

## Command Default

No CoS value is set for the outgoing packet.

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | Support for this command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6-E and Catalyst 4900M chassis. |

## Usage Guidelines

The **set cos** command can be used in an ingress as well as an egress policy map attached to an interface or VLAN.

You can use this command to specify the "from-field" packet-marking category to be used for mapping and setting the CoS value. The "from-field" packet-marking categories are as follows:

- Precedence
- Differentiated services code point (DSCP)
- Cost of Service (CoS)
- Quality of Service (QoS) group

If you specify a "from-field" category but do not specify the **table** keyword and the applicable *table-map-name* argument, the default action will be to copy the value associated with the "from-field" category as the CoS value. For instance, if you configure the **set cos precedence** command, the precedence value will be copied and used as the CoS value.

You can do the same for the DSCP marking category. That is, you can configure the **set cos dscp** command, and the DSCP value will be copied and used as the CoS value.

**Note** If you configure the **set cos dscp** command, only the *first three bits* (the class selector bits) of the DSCP field are used.

**Note** If you configure the **set cos qos group** command, only the three least significant bits of the qos group field are used.

## Examples

This example shows how to configure a policy map called "cos-set" and assign different CoS values for different types of traffic. This example assumes that the class maps called "voice" and "video-data" have already been created.

```
Switch# configure terminal
Switch(config)# policy-map cos-set
Switch(config-pmap)# class voice
Switch(config-pmap-c)# set cos 1
Switch(config-pmap-c)# exit
Switch(config-pmap)# class video-data
Switch(config-pmap-c)# set cos 2
Switch(config-pmap-c)# end
Switch#
```

This example shows how to configure a policy map called "policy-cos" and to use the values defined in a table map called "table-map1". The table map called "table-map1" was created earlier with the **table-map** (value mapping) command. For more information about the **table-map** (value mapping) command, see the **table-map** (value mapping) command page.

This example shows how the setting of the CoS value is based on the precedence value defined in "table-map1":

```
Switch# configure terminal
Switch(config)# policy-map policy-cos
Switch(config-pmap)# class class-default
Switch(config-pmap-c)# set cos precedence table table-map1
Switch(config-pmap-c)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| match (class-map configuration) | Defines the match criteria for a class map. |
| policy-map | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| service-policy (policy-map class) | Creates a service policy that is a quality of service (QoS) policy within a policy map. |

| Command | Description |
|---|---|
| set dscp | Marks a packet by setting the differentiated services code point (DSCP) value in the type of service (ToS) byte. |
| set precedence | Sets the precedence value in the packet header. |
| show policy-map | Displays information about the policy map. |

# set dscp

To mark a packet by setting the differentiated services code point (DSCP) value in the type of service (ToS) byte, use the **set dscp** command in policy-map class configuration mode. To remove a previously set DSCP value, use the **no** form of this command.

**set** [**ip**] **dscp** {*dscp-value* | *from-field* [**table** *table-map-name*]}

**no set** [**ip**] **dscp** {*dscp-value* | *from-field* [**table** *table-map-name*]

## Syntax Description

| | |
|---|---|
| **ip** | (Optional) Specifies that the match is for IPv4 packets only. If not used, the match is on both IPv4 and IPv6 packets. |
| *dscp-value* | A number from 0 to 63 that sets the DSCP value. A mnemonic name for commonly used values can also be used. |
| *from-field* | Specific packet-marking category to be used to set the DSCP value of the packet. If you are using a table map for mapping and converting packet-marking values, this establishes the "map from" packet-marking category. Packet-marking category keywords are as follows:<br>• **cos**<br>• **qos-group**<br>• **dscp**<br>• **precedence** |
| **table** | (Optional) Used in conjunction with the *from-field* argument. Indicates that the values set in a specified table map will be used to set the DSCP value. |
| *table-map-name* | (Optional) Used in conjunction with the **table** keyword. Name of the table map used to specify the DSCP value. The name can be a maximum of 64 alphanumeric characters. |

## Command Default

Disabled

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(40)SG | Added support for 'from-field' for policy-map configured on a Supervisor Engine 6-E. |

## Usage Guidelines

Once the DSCP bit is set, other quality of service (QoS) features can then operate on the bit settings.

### DSCP and Precedence Values Are Mutually Exclusive

The **set dscp** command cannot be used with the **set precedence** command to mark the *same* packet. The two values, DSCP and precedence, are mutually exclusive. A packet can have one value or the other, but not both.

You can use this command to specify the "from-field" packet-marking category to be used for mapping and setting the DSCP value. The "from-field" packet-marking categories are as follows:

- Class of service (CoS)
- QoS group
- Precedence
- Differentiated services code point (DSCP)

If you specify a "from-field" category but do not specify the **table** keyword and the applicable *table-map-nam*e argument, the default action will be to copy the value associated with the "from-field" category as the DSCP value. For instance, if you configure the **set dscp cos** command, the CoS value will be copied and used as the DSCP value.

**Note** The CoS field is a three-bit field, and the DSCP field is a six-bit field. If you configure the **set dscp cos** command, only the three bits of the CoS field will be used.

If you configure the **set dscp qos-group** command, the QoS group value will be copied and used as the DSCP value.

The valid value range for the DSCP is a number from 0 to 63. The valid value range for the QoS group is a number from 0 to 63.

### Set DSCP Values in IPv6 Environments

When this command is used in IPv6 environments, the default match occurs on both IP and IPv6 packets. However, the actual packets set by this function are only those which meet the match criteria of the class-map containing this function.

### Set DSCP Values for IPv6 Packets Only

To set DSCP values for IPv6 values only, the **match protocol ipv6** command must also be used. Without that command, the DSCP match defaults to match both IPv4 and IPv6 packets.

### Set DSCP Values for IPv4 Packets Only

To set DSCP values for IPv4 packets only, use the **ip** keyword in the **match** command for classification. Without the **ip** keyword, the match occurs on both IPv4 and IPv6 packets.

## Examples

### Packet-marking Values and Table Map

In the following example, the policy map called "policy1" is created to use the packet-marking values defined in a table map called "table-map1". The table map was created earlier with the **table-map** (value mapping) command. For more information about the **table-map** (value mapping) command, see the table-map (value mapping) command page.

This example shows how the DSCP value is set according to the CoS value defined in the table map called "table-map1".

```
Switch# configure terminal
Switch(config)# policy-map policy1
Switch(config-pmap)# class class-default
Switch(config-pmap-c)# set dscp cos table table-map1
Switch(config-pmap-c)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **match (class-map configuration)** | Defines the match criteria for a class map. |
| **policy-map** | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **service-policy (policy-map class)** | Creates a service policy that is a quality of service (QoS) policy within a policy map. |
| **set cos** | Sets IP traffic by setting a class of service (CoS). |
| **set precedence** | Sets the precedence value in the packet header. |
| **show policy-map** | Displays information about the policy map. |
| **show policy-map interface** | Displays the statistics and configurations of the input and output policies that are attached to an interface. |
| **table-map (value mapping)** (refer to Cisco IOS documentation) | Modifies metric and tag values when the IP routing table is updated with BGP learned routes. |

# set precedence

To set the precedence value in the packet header, use the **set precedence** command in policy-map class configuration mode. To remove the precedence value, use the **no** form of this command.

**set precedence** {*precedence-value* | *from-field* [**table** *table-map-name*]}

**no set precedence** {*precedence-value* | *from-field* [**table** *table-map-name*]}

## Syntax Description

| | |
|---|---|
| *precedence-value* | A number from 0 to 7 that sets the precedence bit in the packet header. |
| *from-field* | Specific packet-marking category to be used to set the precedence value of the packet. If you are using a table map for mapping and converting packet-marking values, this argument value establishes the "map from" packet-marking category. Packet-marking category keywords are as follows:<br>• **cos**<br>• **qos-group**<br>• **dscp**<br>• **precedence** |
| **table** | (Optional) Indicates that the values set in a specified table map will be used to set the precedence value. |
| *table-map-name* | (Optional) Name of the table map used to specify a precedence value based on the class of service (CoS) value. The name can be a maximum of 64 alphanumeric characters. |

## Command Default

Disabled

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(40)SG | Added support for 'from-field' for policy-map configured on a Supervisor Engine 6-E. |

## Usage Guidelines

### Command Compatibility

The **set precedence** command cannot be used with the **set dscp** command to mark the *same* packet. The two values, DSCP and precedence, are mutually exclusive. A packet can be one value or the other, but not both.

You can use this command to specify the "from-field" packet-marking category to be used for mapping and setting the precedence value. The "from-field" packet-marking categories are as follows:

- CoS
- QoS group
- DSCP
- Precedence

If you specify a "from-field" category but do not specify the **table** keyword and the applicable *table-map-nam*e argument, the default action will be to copy the value associated with the "from-field" category as the precedence value. For instance, if you configure the **set precedence cos** command, the CoS value will be copied and used as the precedence value.

You can do the same for the QoS group-marking category. That is, you can configure the **set precedence qos-group** command, and the QoS group value will be copied and used as the precedence value.

The valid value range for the precedence value is a number from 0 to 7. The valid value range for the QoS group is a number from 0 to 63. Therefore, when configuring the **set precedence qos-group** command the three least significant bits of qos-group are copied to precedence.

#### Precedence Values in IPv6 Environments

When this command is used in IPv6 environments it can set the value in both IPv4 and IPv6 packets. However, the actual packets set by this function are only those that meet the match criteria of the class-map containing this function.

#### Setting Precedence Values for IPv6 Packets Only

To set the precedence values for IPv6 packets only, the **match protocol ipv6** command must also be used in the class-map that classified packets for this action. Without the **match protocol ipv6** command, the class-map may classify both IPv6 and IPv4 packets, (depending on other match criteria) and the **set precedence** command will act upon both types of packets.

#### Setting Precedence Values for IPv4 Packets Only

To set the precedence values for IPv4 packets only, use a command involving the **ip** keyword like the **match ip precedence** or **match ip dscp** command or include the **match protocol ip** command along with the others in the class map. Without the additional **ip** keyword, the class-map may match both IPv6 and IPv4 packets (depending on the other match criteria) and the **set precedence** or **set dscp** command may act upon both types of packets.

## Examples

In the following example, the policy map named policy-cos is created to use the values defined in a table map named table-map1. The table map named table-map1 was created earlier with the **table-map** (value mapping) command. For more information about the **table-map** (value mapping) command, see the **table-map** (value mapping) command page.

This example shows how the precedence value is set according to the CoS value defined in table-map1.

```
Switch# configure terminal
Switch(config)# policy-map policy-cos
Switch(config-pmap)# class class-default
Switch(config-pmap-c)# set precedence cos table table-map1
Switch(config-pmap-c)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **match (class-map configuration)** | Defines the match criteria for a class map. |
| **policy-map** | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **service-policy (policy-map class)** | Creates a service policy that is a quality of service (QoS) policy within a policy map. |
| **set cos** | Sets IP traffic by setting a class of service (CoS). |
| **set dscp** | Marks a packet by setting the differentiated services code point (DSCP) value in the type of service (ToS) byte. |
| **set qos-group** | Sets a quality of service (QoS) group identifier (ID) that can be used later to classify packets. |
| **set precedence** | Sets the precedence value in the packet header. |
| **show policy-map** | Displays information about the policy map. |
| **show policy-map interface** | Displays the statistics and configurations of the input and output policies that are attached to an interface. |
| **table-map (value mapping)** (refer to Cisco IOS documentation) | Modifies metric and tag values when the IP routing table is updated with BGP learned routes. |

# set qos-group

To set a quality of service (QoS) group identifier (ID) that can be used later to classify packets, use the **set qos-group** command in policy-map class configuration mode. To remove the group ID, use the **no** form of this command.

**set qos-group** *group-id*

**no set qos-group** *group-id*

## Syntax Description

| | |
|---|---|
| *group-id* | Group ID number in the range from 0 to 63. |

## Command Default

The group ID is set to 0.

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | Support for this command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6-E and Catalyst 4900M chassis |

## Usage Guidelines

The **set qos-group** command allows you to associate a group ID with a packet. This association is made through a service-policy attached to an interface or VLAN in the input direction. The group ID can be later used in the output direction to apply QoS service policies to the packet.

## Examples

This example shows how to set the qos-group to 5:

```
Switch#configure terminal
Switch(config)#policy-map p1
Switch(config-pmap)#class c1
Switch(config-pmap-c)#set qos
Switch(config-pmap-c)#set qos-group 5
Switch(config-pmap-c)#end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| match (class-map configuration) | Defines the match criteria for a class map. |
| policy-map | Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| service-policy (policy-map class) | Creates a service policy that is a quality of service (QoS) policy within a policy map. |
| show policy-map | Displays information about the policy map. |
| show policy-map interface | Displays the statistics and configurations of the input and output policies that are attached to an interface. |

# shape (class-based queueing)

To enable traffic shaping a class of traffic in a policy map attached to a physical port, use the **shape average** policy-map class command. Traffic shaping limits the data transmission rate. To return to the default setting, use the **no** form of this command.

**shape average** {*rate*} [**bps** | **kbps** | **mbps** | **gbps**]

**shape average percent** {*percent_value*}

**no shape average**

## Syntax Description

| | |
|---|---|
| *rate* | Specifies an average rate for traffic shaping; the range is 16000 to 10000000000. Post-fix notation (k, m, and g) is optional and a decimal point is allowed. |
| **bps** | (Optional) Specifies a rate in bits per seconds. |
| **kbps** | (Optional) Specifies a rate in kilobytes per seconds. |
| **mbps** | (Optional) Specifies a rate in megabits per seconds. |
| **gbps** | (Optional) Specifies a rate in gigabits per seconds. |
| **percent** | Specifies a percentage of bandwidth for traffic shaping. |
| *percent_value* | (Optional) Specifies a percentage of the bandwidth used for traffic shaping; valid values are from 1 to 100 percent. |

## Defaults

Average-rate traffic shaping is disabled.

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6E. |

## Usage Guidelines

Use the **shape** command only in a policy map attached to a physical port. This command is valid in policy maps at any level of the hierarchy.

Shaping is the process of delaying out-of-profile packets in queues so that they conform to a specified profile. Shaping is distinct from policing. Policing drops packets that exceed a configured threshold, but shaping buffers packets so that traffic remains within the threshold. Shaping offers greater smoothness in handling traffic than policing.

You cannot use the **bandwidth**, **dbl**, and the **shape** policy-map class configuration commands with the **priority** policy-map class configuration command in the same class within the same policy map. However, you can use these commands in the same policy map.

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 limit the specified traffic class to a data transmission rate of 256 kbps:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# policy-map policy1
Switch(config-pmap)# class class1
Switch(config-pmap-c)# shape average 256000
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# service-policy output policy1
Switch(config-if)# end
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **bandwidth** | Creates a signaling class structure that can be referred to by its name. |
| **class** | Specifies the name of the class whose traffic policy you want to create or change. |
| **dbl** | Enables active queue management on a transmit queue used by a class of traffic. |
| **policy-map** | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **service-policy (policy-map class)** | Creates a service policy that is a quality of service (QoS) policy within a policy map. |
| **show policy-map** | Displays information about the policy map. |

# shape (interface configuration)

To specify traffic shaping on an interface, use the **shape** command. To remove traffic shaping, use the **no** form of this command

**shape** [**rate**] [**percent**]

**no shape** [**rate**] [**percent**]

## Syntax Description

| | |
|---|---|
| **rate** | (Optional) Specifies an average rate for traffic shaping; the range is 16000 to 1000000000. Post-fix notation (k, m, and g) is optional and a decimal point is allowed. |
| **percent** | (Optional) Specifies a percent of bandwidth for traffic shaping. |

## Defaults

Default is no traffic shaping.

## Command Modes

Interface transmit queue configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

Traffic shaping is available on all the ports, and it sets an upper limit on the bandwidth.

When the high shape rates are configured on the Catalyst 4500 Supervisor Engine II-Plus-10GE (WS-X4013+10GE), the Catalyst 4500 Supervisor Engine V (WS-X4516), and the Catalyst 4500 Supervisor Engine V-10GE (WS-X4516-10GE), the shaped traffic rate may not be achieved in situations that involve contention and unusual packet size distributions. On the ports that are multiplexed through a Stub ASIC and connected to the backplane gigaports, the shape rates above 7 Mbps may not be achieved under worst-case conditions. On ports that are connected directly to the backplane gigaports, or the supervisor engine gigaports, the shape rates above 50 Mbps may not be achieved under worst-case conditions.

Some examples of ports that are connected directly to the backplane are as follows:

- Uplink ports on Supervisor Engine II+, II+10GE, III, IV, V, and V-10GE
- Ports on the WS-X4306-GB module
- The two 1000BASE-X ports on the WS-X4232-GB-RJ module
- The first two ports on the WS-X4418-GB module
- The two 1000BASE-X ports on the WS-X4412-2GB-TX module

All ports on the 24-port modules and the 48-port modules are multiplexed through a Stub ASIC. Some examples of ports multiplexed through a Stub ASIC are as follows:

- 10/100 ports on the WS-X4148-RJ45 module
- 10/100/1000 ports on the WS-X4124-GB-RJ45 module
- 10/100/1000 ports on the WS-X4448-GB-RJ45 module

## Examples

This example shows how to configure a maximum bandwidth (70 percent) for the interface fa3/1:

```
Switch(config)# interface fastethernet3/1
Switch(config-if)# tx-queue 3
Switch(config-if-tx-queue)# shape 70m
Switch(config-if-tx-queue)#
```

# show access-group mode interface

To display the ACL configuration on a Layer 2 interface, use the **show access-group mode interface** command.

**show access-group mode interface** [*interface interface-number*]

## Syntax Description

| | |
|---|---|
| *interface* | (Optional) Interface type; valid values are **ethernet**, **fastethernet**, **gigabitethernet**, **tengigabitethernet**, **and port-channel**. |
| *interface-number* | (Optional) Interface number. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The valid values for the port number depend on the chassis used.

## Examples

This example shows how to display the ACL configuration on the Fast Ethernet interface 6/1:

```
Switch# show access-group mode interface fa6/1
Interface FastEthernet6/1:
   Access group mode is: merge
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| access-group mode | Specifies the override modes (for example, VACL overrides PACL) and the non-override modes (for example, merge or strict mode). |

# show adjacency

To display information about the Layer 3 switching adjacency table, use the **show adjacency** command.

**show adjacency** [{*interface interface-number*} | {**null** *interface-number*} | {**port-channel** *number*} | {**vlan** *vlan-id*} | **detail** | **internal** | **summary**]

## Syntax Description

| | |
|---|---|
| *interface* | (Optional) Interface type; possible valid values are **ethernet**, **fastethernet**, **gigabitethernet**, **tengigabitethernet**, **pos**, **ge-wan**, and **atm**. |
| *interface-number* | (Optional) Module and port number; see the "Usage Guidelines" section for valid values. |
| **null** *interface-number* | (Optional) Specifies the null interface; the valid value is **0**. |
| **port-channel** *number* | (Optional) Specifies the channel interface; valid values are a maximum of 64 values ranging from 1 to 256. |
| **vlan** *vlan-id* | (Optional) Specifies the VLAN; valid values are from 1 to 4094. |
| **detail** | (Optional) Displays the information about the protocol detail and timer. |
| **internal** | (Optional) Displays the information about the internal data structure. |
| **summary** | (Optional) Displays a summary of CEF-adjacency information. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EW | Extended to include the 10-Gigabit Ethernet interface. |

## Usage Guidelines

The *interface-number* argument designates the module and port number. Valid values for *interface-number* depend on the specified interface type and the chassis and module that are used. For example, if you specify a Gigabit Ethernet interface and have a 48-port 10/100BASE-T Ethernet module that is installed in a 13-slot chassis, valid values for the module number are from 1 to 13, and valid values for the port number are from 1 to 48.

Hardware Layer 3 switching adjacency statistics are updated every 60 seconds.

The following information is contained in the **show adjacency** command:

- Protocol interface.
- Type of routing protocol that is configured on the interface.
- Interface address.
- Method of adjacency that was learned.

- MAC address of the adjacent router.
- Time left before the adjacency rolls out of the adjacency table. After it rolls out, a packet must use the same next hop to the destination.

## Examples

This example shows how to display adjacency information:

```
Switch# show adjacency
Protocol Interface                 Address
IP       FastEthernet2/3           172.20.52.1(3045)
IP       FastEthernet2/3           172.20.52.22(11)
Switch#
```

This example shows how to display a summary of adjacency information:

```
Switch# show adjacency summary
Adjacency Table has 2 adjacencies
  Interface                Adjacency Count
  FastEthernet2/3          2
Switch#
```

This example shows how to display protocol detail and timer information:

```
Switch# show adjacency detail
Protocol Interface                 Address
IP       FastEthernet2/3           172.20.52.1(3045)
                                   0 packets, 0 bytes
                                   000000000FF920000380000000000000
                                   00000000000000000000000000000000
                                   00605C865B2800D0BB0F980B0800
                                   ARP        03:58:12
IP       FastEthernet2/3           172.20.52.22(11)
                                   0 packets, 0 bytes
                                   000000000FF920000380000000000000
                                   00000000000000000000000000000000
                                   00801C93804000D0BB0F980B0800
                                   ARP        03:58:06
Switch#
```

This example shows how to display adjacency information for a specific interface:

```
Switch# show adjacency fastethernet2/3
Protocol Interface                 Address
IP       FastEthernet2/3           172.20.52.1(3045)
IP       FastEthernet2/3           172.20.52.22(11)
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| debug adjacency | Displays information about the adjacency debugging. |

# show arp access-list

To display detailed information on an ARP access list, use the **show arp** command.

**show arp access-list**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the ARP ACL information for a switch:

```
Switch# show arp access-list
ARP access list rose
    permit ip 10.101.1.1 0.0.0.255 mac any
    permit ip 20.3.1.0 0.0.0.255 mac any
```

## Related Commands

| Command | Description |
|---|---|
| access-group mode | Specifies the override modes (for example, VACL overrides PACL) and the non-override modes (for example, merge or strict mode). |
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| ip arp inspection filter vlan | Permits ARPs from hosts that are configured for static IP when DAI is enabled, defines an ARP access list, and applies the access list to a VLAN. |

# show auto install status

To display the status of an automatic installation, use the **show auto install status** command.

**show auto install status**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(20)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the IP address of the TFTP server and to display whether or not the switch is currently acquiring the configuration file on the TFTP server:

```
Switch# show auto install status

Status              : Downloading config file
DHCP Server         : 20.0.0.1
TFTP Server         : 30.0.0.3
Config File Fetched : Undetermined
```

The first IP address in the display indicates the server that is used for the automatic installation. The second IP address indicates the TFTP server that provided the configuration file.

# show auto qos

To display the automatic quality of service (auto-QoS) configuration that is applied, use the **show auto qos** user EXEC command.

**show auto qos** [**interface** [*interface-id*]] [{**begin** | **exclude** | **include**} *expression*]

## Syntax Description

| | |
|---|---|
| **interface** *interface-id* | (Optional) Displays auto-QoS information for the specified interface or for all interfaces. Valid interfaces include physical ports. |
| **begin** | (Optional) Begins with the line that matches the expression. |
| **exclude** | (Optional) Excludes lines that match the expression. |
| **include** | (Optional) Includes lines that match the specified expression. |
| *expression* | (Optional) Expression in the output to use as a reference point. |

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **show auto qos interface** *interface-id* command displays the auto-QoS configuration; it does not display any user changes to the configuration that might be in effect.

To display information about the QoS configuration that might be affected by auto-QoS on a non-Supervisor Engine 6-E, use one of these commands:

- **show qos**
- **show qos map**
- **show qos interface** *interface-id*
- **show running-config**

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

This example shows output from the **show auto qos** command when auto-QoS is enabled:

```
Switch# show auto qos
GigabitEthernet1/2
auto qos voip cisco-phone
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **auto qos voip** | Automatically configures quality of service (auto-QoS) for Voice over IP (VoIP) within a QoS domain. |

# show bootflash:

To display information about the bootflash: file system, use the **show bootflash:** command.

**show bootflash:** [**all** | **chips** | **filesys**]

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Displays all possible Flash information. |
| **chips** | (Optional) Displays Flash chip information. |
| **filesys** | (Optional) Displays file system information. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display file system status information:

```
Switch> show bootflash: filesys

-------- F I L E   S Y S T E M   S T A T U S --------
  Device Number = 0
DEVICE INFO BLOCK: bootflash
  Magic Number          = 6887635   File System Vers = 10000    (1.0)
  Length                = 1000000   Sector Size      = 40000
  Programming Algorithm = 39        Erased State     = FFFFFFFF
  File System Offset    = 40000     Length = F40000
  MONLIB Offset         = 100       Length = C628
  Bad Sector Map Offset = 3FFF8     Length = 8
  Squeeze Log Offset    = F80000    Length = 40000
  Squeeze Buffer Offset = FC0000    Length = 40000
  Num Spare Sectors     = 0
    Spares:
STATUS INFO:
  Writable
  NO File Open for Write
  Complete Stats
  No Unrecovered Errors
  No Squeeze in progress
USAGE INFO:
  Bytes Used     = 917CE8  Bytes Available = 628318
  Bad Sectors    = 0       Spared Sectors  = 0
  OK Files       = 2       Bytes = 917BE8
  Deleted Files  = 0       Bytes = 0
  Files w/Errors = 0       Bytes = 0
Switch>
```

This example shows how to display system image information:

```
Switch> show bootflash:
-# - ED --type-- --crc--- -seek-- nlen -length- -----date/time------ name
1   .. image    8C5A393A  237E3C   14  2063804 Aug 23 1999 16:18:45 c4-boot-mz
2   .. image    D86EE0AD  957CE8    9  7470636 Sep 20 1999 13:48:49 rp.halley
Switch>
```

This example shows how to display all bootflash information:

```
Switch> show bootflash: all
-# - ED --type-- --crc--- -seek-- nlen -length- -----date/time------ name
1   .. image    8C5A393A  237E3C   14  2063804 Aug 23 1999 16:18:45 c4-boot-
mz
2   .. image    D86EE0AD  957CE8    9  7470636 Sep 20 1999 13:48:49 rp.halley

6456088 bytes available (9534696 bytes used)

-------- F I L E   S Y S T E M   S T A T U S --------
  Device Number = 0
DEVICE INFO BLOCK: bootflash
  Magic Number          = 6887635   File System Vers = 10000    (1.0)
  Length                = 1000000   Sector Size      = 40000
  Programming Algorithm = 39        Erased State     = FFFFFFFF
  File System Offset    = 40000     Length = F40000
  MONLIB Offset         = 100       Length = C628
  Bad Sector Map Offset = 3FFF8     Length = 8
  Squeeze Log Offset    = F80000    Length = 40000
  Squeeze Buffer Offset = FC0000    Length = 40000
  Num Spare Sectors     = 0
    Spares:
STATUS INFO:
  Writable
  NO File Open for Write
  Complete Stats
  No Unrecovered Errors
  No Squeeze in progress
USAGE INFO:
  Bytes Used     = 917CE8  Bytes Available = 628318
  Bad Sectors    = 0       Spared Sectors  = 0
  OK Files       = 2       Bytes = 917BE8
  Deleted Files  = 0       Bytes = 0
  Files w/Errors = 0       Bytes = 0
Switch>
```

# show bootvar

To display BOOT environment variable information, use the **show bootvar** command.

**show bootvar**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display BOOT environment variable information:

```
Switch# show bootvar
BOOT variable = sup:1;
CONFIG_FILE variable does not exist
BOOTLDR variable does not exist
Configuration register is 0x0
Switch#
```

# show cable-diagnostics tdr

To display the test results for the TDR cable diagnostics, use the **show cable-diagnostics tdr** command.

**show cable-diagnostics tdr** {**interface** {*interface interface-number*}}

**Note** This command will be deprecated in future Cisco IOS releases. Please use the **diagnostic start** command.

## Syntax Description

| | |
|---|---|
| **interface** *interface* | Interface type; valid values are **fastethernet** and **gigabitethernet**. |
| *interface-number* | Module and port number. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The TDR test is supported on Catalyst 4500 series switches running Cisco IOS Release 12.2(25)SG for the following line cards only:

- WS-X4548-GB-RJ45
- WS-X4548-GB-RJ45V
- WS-X4524-GB-RJ45V
- WS-X4013+TS
- WS-C4948
- WS-C4948-10GE

The distance to the fault is displayed in meters (m).

## Examples

This example shows how to display information about the TDR test:

```
Switch# show cable-diagnostics tdr interface gi4/13
Interface Speed  Local pair Cable length Remote channel Status
Gi4/13    0Mbps   1-2        102 +-2m     Unknown       Fault
                  3-6        100 +-2m     Unknown       Fault
                  4-5        102 +-2m     Unknown       Fault
                  7-8        102 +-2m     Unknown       Fault
Switch#
```

Table 2-13 describes the fields in the **show cable-diagnostics tdr** command output.

*Table 2-13 show cable-diagnostics tdr Command Output Fields*

| Field | Description |
|---|---|
| Interface | Interface tested. |
| Speed | Current line speed. |
| Pair | Local pair name. |
| Cable Length | Distance to the fault in meters (m). |
| Channel | Pair designation (A, B, C, or D). |
| Status | Pair status displayed is one of the following:<br>• Terminated—The link is up.<br>• Fault—Cable fault (open or short) |

## Related Commands

| Command | Description |
|---|---|
| **test cable-diagnostics tdr** | Tests the condition of copper cables on 48-port 10/100/1000 BASE-T modules. |

# show cdp neighbors

To display detailed information about the neighboring devices that are discovered through CDP, use the **show cdp neighbors** command.

**show cdp neighbors** [*type number*] [**detail**]

## Syntax Description

| | |
|---|---|
| *type* | (Optional) Interface type that is connected to the neighbors about which you want information; possible valid values are **ethernet**, **fastethernet**, **gigabitethernet**, **tengigabitethernet**, **port-channel**, and **vlan**. |
| *number* | (Optional) Interface number that is connected to the neighbors about which you want information. |
| **detail** | (Optional) Displays detailed information about a neighbor (or neighbors) including network address, enabled protocols, hold time, and software version. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EW | Extended to include the 10-Gigabit Ethernet interface. |

## Usage Guidelines

The **vlan** keyword is supported in Catalyst 4500 series switches that are configured with a Supervisor Engine 2.

The **port-channel** values are from 0 to 282; values from 257 to 282 are supported on the CSM and the FWSM only.

## Examples

This example shows how to display the information about the CDP neighbors:

```
Switch# show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID        Local Intrfce     Holdtme    Capability  Platform  Port ID
lab-7206         Eth 0               157          R        7206VXR   Fas 0/0/0
lab-as5300-1     Eth 0               163          R        AS5300    Fas 0
lab-as5300-2     Eth 0               159          R        AS5300    Eth 0
lab-as5300-3     Eth 0               122          R        AS5300    Eth 0
lab-as5300-4     Eth 0               132          R        AS5300    Fas 0/0
lab-3621         Eth 0               140         R S       3631-telcoFas 0/0
008024 2758E0    Eth 0               132          T        CAT3000   1/2
Switch#
```

Table 2-14 describes the fields that are shown in the example.

*Table 2-14 show cdp neighbors Field Descriptions*

| Field | Definition |
|---|---|
| Device ID | Configured ID (name), MAC address, or serial number of the neighbor device. |
| Local Intrfce | (Local Interface) The protocol that is used by the connectivity media. |
| Holdtme | (Holdtime) Remaining amount of time, in seconds, that the current device holds the CDP advertisement from a transmitting router before discarding it. |
| Capability | Capability code that is discovered on the device. This device type is listed in the CDP Neighbors table. Possible values are as follows:<br>R—Router<br>T—Transparent bridge<br>B—Source-routing bridge<br>S—Switch<br>H—Host<br>I—IGMP device<br>r—Repeater<br>P—Phone |
| Platform | Product number of the device. |
| Port ID | Protocol and port number of the device. |

This example shows how to display detailed information about your CDP neighbors:

```
Switch# show cdp neighbors detail
-------------------------
Device ID: lab-7206
Entry address(es):
  IP address: 172.19.169.83
Platform: cisco 7206VXR,  Capabilities: Router
Interface: Ethernet0,  Port ID (outgoing port): FastEthernet0/0/0
Holdtime : 123 sec

Version :
Cisco Internetwork Operating System Software
IOS (tm) 5800 Software (C5800-P4-M), Version 12.1(2)
Copyright (c) 1986-2002 by Cisco Systems, Inc.

advertisement version: 2
Duplex: half

-------------------------
Device ID: lab-as5300-1
Entry address(es):
  IP address: 172.19.169.87
.
.
.
Switch#
```

Table 2-15 describes the fields that are shown in the example.

*Table 2-15 show cdp neighbors detail Field Descriptions*

| Field | Definition |
|---|---|
| Device ID | Name of the neighbor device and either the MAC address or the serial number of this device. |
| Entry address(es) | List of network addresses of neighbor devices. |
| [network protocol] address | Network address of the neighbor device. The address can be in IP, IPX, AppleTalk, DECnet, or CLNS protocol conventions. |
| Platform | Product name and number of the neighbor device. |
| Capabilities | Device type of the neighbor. This device can be a router, a bridge, a transparent bridge, a source-routing bridge, a switch, a host, an IGMP device, or a repeater. |
| Interface | Protocol and port number of the port on the current device. |
| Holdtime | Remaining amount of time, in seconds, that the current device holds the CDP advertisement from a transmitting router before discarding it. |
| Version: | Software version running on the neighbor device. |
| advertisement version: | Version of CDP that is being used for CDP advertisements. |
| Duplex: | Duplex state of connection between the current device and the neighbor device. |

## Related Commands

| Command | Description |
|---|---|
| **show cdp** (refer to Cisco IOS documentation) | Displays global CDP information, including timer and hold-time information. |
| **show cdp entry** (refer to Cisco IOS documentation) | Displays information about a specific neighboring device discovered using Cisco Discovery Protocol (CDP). |
| **show cdp interface** (refer to Cisco IOS documentation) | Displays information about the interfaces on which Cisco Discovery Protocol (CDP) is enabled. |
| **show cdp traffic** (refer to Cisco IOS documentation) | Displays traffic information from the CDP table. |

# show class-map

To display class map information, use the **show class-map** command.

**show class-map** *class_name*

## Syntax Description

| | |
|---|---|
| *class_name* | Name of the class map. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)SG | Displays results from the full flow option. |

## Examples

This example shows how to display class map information for all class maps:

```
Switch# show class-map
 Class Map match-any class-default (id 0)
   Match any
 Class Map match-any class-simple (id 2)
   Match any
 Class Map match-all ipp5 (id 1)
   Match ip precedence 5
 Class Map match-all agg-2 (id 3)
Switch#
```

This example shows how to display class map information for a specific class map:

```
Switch# show class-map ipp5
 Class Map match-all ipp5 (id 1)
   Match ip precedence 5
Switch#
```

Assume there are two active flows as shown below on Fast Ethernet interface 6/1:

```
SrcIp          DstIp          IpProt SrcL4Port DstL4Port
-------------------------------------------------------
192.168.10.10  192.168.20.20  20     6789       81
192.168.10.10  192.168.20.20  20     6789       21
```

With following configuration, each flow will be policed to a 1000000 bps with an allowed 9000-byte burst value.

**Note** If you use the **match flow ip source-address|destination-address** command, these two flows are consolidated into one flow and they have the same source and destination address.

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# class-map c1
Switch(config-cmap)# match flow ip source-address ip destination-address ip protocol l4
source-port l4 destination-port
Switch(config-cmap)# exit
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# police 1000000 9000
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface fastEthernet 6/1
Switch(config-if)# service-policy input p1
Switch(config-if)# end
Switch# write memory
Switch# show policy-map interface
FastEthernet6/1

class-map c1
   match flow  ip source-address ip destination-address ip protocol l4 source-port l4
destination-port
!
 policy-map p1
    class c1
       police 1000000 bps 9000 byte conform-action transmit exceed-action drop
!
interface FastEthernet 6/1
  service-policy input p1

Switch# show class-map c1
 Class Map match-all c1 (id 2)
   Match flow  ip source-address ip destination-address ip protocol l4 source-port l4
destination-port
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| class-map | Creates a class map to be used for matching packets to the class whose name you specify and to be used enter class-map configuration mode. |
| show policy-map | Displays information about the policy map. |
| show policy-map interface | Displays the statistics and configurations of the input and output policies that are attached to an interface. |

# show diagnostic content

To display test information about the test ID, test attributes, and supported coverage test levels for each test and for all modules, use the **show diagnostic content** command.

**show diagnostic content module** {**all** | *num*}

## Syntax Description

| | |
|---|---|
| **all** | Displays all the modules on the chassis. |
| *num* | Module number. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(20)EWA | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the test suite, monitoring interval, and test attributes for all the modules of the chassis:

```
Switch# show diagnostic content module all

module 1:

 Diagnostics test suite attributes:
     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
     m/* - Mandatory bootup test, can't be bypassed / NA
     o/* - Ongoing test, always active / NA

                                                          Testing Interval
 ID   Test Name                                 Attributes   (day hh:mm:ss.ms)
 ==== ======================================== ============ =================
   1) supervisor-bootup ----------------------> **D****I**   not configured
   2) packet-memory-bootup -------------------> **D****I**   not configured
   3) packet-memory-ongoing ------------------> **N****I*o   not configured
```

```
module 6:

 Diagnostics test suite attributes:
     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
     m/* - Mandatory bootup test, can't be bypassed / NA
     o/* - Ongoing test, always active / NA

                                                                  Testing Interval
 ID   Test Name                                  Attributes   (day hh:mm:ss.ms)
 ==== ======================================== ============ =================
   1) linecard-online-diag --------------------> **D****I**   not configured


Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show diagnostic result module** | Displays the module-based diagnostic test results. |
| **show diagnostic result module test 2** | Displays the results of the bootup packet memory test. |
| **show diagnostic result module test 3** | Displays the results from the ongoing packet memory test. |

# show diagnostic result module

To display the module-based diagnostic test results, use the **show diagnostic result module** command.

**show diagnostic result module** [*slot-num* | **all**] [**test** [*test-id* | *test-id-range* | **all**]] [**detail**]

## Syntax Description

| | |
|---|---|
| *slot-num* | (Optional) Specifies the slot on which diagnostics are displayed. |
| **all** | (Optional) Displays the diagnostics for all slots. |
| **test** | (Optional) Displays selected tests on the specified module. |
| *test-id* | (Optional) Specifies a single test ID. |
| *test-id-range* | (Optional) Specifies a range of test IDs. |
| **all** | (Optional) Displays the diagnostics for all tests. |
| **detail** | (Optional) Displays the complete test results. |

## Defaults

A summary of the test results for all modules in the chassis is displayed.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the summary results for all modules in the chassis:

```
Switch# show diagnostic result module

Current bootup diagnostic level: minimal

module 1:

  Overall diagnostic result: PASS
  Diagnostic level at card bootup: bypass

  Test results: (. = Pass, F = Fail, U = Untested)

    1) supervisor-bootup ----------------------> U
    2) packet-memory-bootup -------------------> U
    3) packet-memory-ongoing ------------------> U


module 4:

  Overall diagnostic result: PASS
  Diagnostic level at card bootup: minimal

  Test results: (. = Pass, F = Fail, U = Untested)

    1) linecard-online-diag -------------------> .
```

```
module 5:

  Overall diagnostic result: PASS
  Diagnostic level at card bootup: minimal

  Test results: (. = Pass, F = Fail, U = Untested)

    1) linecard-online-diag --------------------> .


module 6:

  Overall diagnostic result: PASS
  Diagnostic level at card bootup: minimal

  Test results: (. = Pass, F = Fail, U = Untested)

    1) linecard-online-diag --------------------> .
```

This example shows how to display the online diagnostics for module 1:

```
Switch# show diagnostic result module 1 detail

Current bootup diagnostic level: minimal

module 1:

 Overall diagnostic result: PASS
 Diagnostic level at card bootup: minimal

 Test results: (. = Pass, F = Fail, U = Untested)


_____________________________________________________________________________

   1) supervisor-bootup ----------------------> .

         Error code --------------------------> 0 (DIAG_SUCCESS)
         Total run count ---------------------> 0
         Last test execution time ------------> n/a
         First test failure time -------------> n/a
         Last test failure time --------------> n/a
         Last test pass time -----------------> n/a
         Total failure count -----------------> 0
         Consecutive failure count -----------> 0

Power-On-Self-Test Results for ACTIVE Supervisor


Power-on-self-test for Module 1:  WS-X4014
Port/Test Status: (. = Pass, F = Fail)
Reset Reason: PowerUp Software/User


Port Traffic: L2 Serdes Loopback ...
0: .  1: .  2: .  3: .  4: .  5: .  6: .  7: .  8: .  9: . 10: . 11: .
12: . 13: . 14: . 15: . 16: . 17: . 18: . 19: . 20: . 21: . 22: . 23: .
24: . 25: . 26: . 27: . 28: . 29: . 30: . 31: .


Port Traffic: L2 Asic Loopback ...
0: .  1: .  2: .  3: .  4: .  5: .  6: .  7: .  8: .  9: . 10: . 11: .
```

```
12: . 13: . 14: . 15: . 16: . 17: . 18: . 19: . 20: . 21: . 22: . 23: .
24: . 25: . 26: . 27: . 28: . 29: . 30: . 31: .


Port Traffic: L3 Asic Loopback ...
0: .  1: .  2: .  3: .  4: .  5: .  6: .  7: .  8: .  9: . 10: . 11: .
12: . 13: . 14: . 15: . 16: . 17: . 18: . 19: . 20: . 21: . 22: . 23: .
24: . 25: . 26: . 27: . 28: . 29: . 30: . 31: . au: .


Switch Subsystem Memory ...
1: .  2: .  3: .  4: .  5: .  6: .  7: .  8: .  9: . 10: . 11: . 12: .
13: . 14: . 15: . 16: . 17: . 18: . 19: . 20: . 21: . 22: . 23: . 24: .
25: . 26: . 27: . 28: . 29: . 30: . 31: . 32: . 33: . 34: . 35: . 36: .
37: . 38: . 39: . 40: . 41: . 42: . 43: . 44: . 45: . 46: . 47: . 48: .
49: . 50: . 51: . 52: . 53: . 54: .


Module 1 Passed
```

---

```
   2) packet-memory-bootup --------------------> .

         Error code --------------------------> 0 (DIAG_SUCCESS)
         Total run count ---------------------> 0
         Last test execution time ------------> n/a
         First test failure time -------------> n/a
         Last test failure time --------------> n/a
         Last test pass time -----------------> n/a
         Total failure count -----------------> 0
         Consecutive failure count -----------> 0
packet buffers on free list: 64557 bad: 0 used for ongoing tests: 979


Number of errors found: 0
Cells with hard errors (failed two or more tests): 0
Cells with soft errors (failed one test, includes hard): 0
Suspect bad cells (uses a block that tested bad): 0
total buffers: 65536
bad buffers: 0 (0.0%)
good buffers: 65536 (100.0%)
Bootup test results:1
No  errors.
```

---

```
   3) packet-memory-ongoing -------------------> U

         Error code --------------------------> 0 (DIAG_SUCCESS)
         Total run count ---------------------> 0
         Last test execution time ------------> n/a
         First test failure time -------------> n/a
         Last test failure time --------------> n/a
         Last test pass time -----------------> n/a
         Total failure count -----------------> 0
         Consecutive failure count -----------> 0
packet buffers on free list: 64557 bad: 0 used for ongoing tests: 979


Packet memory errors: 0 0
```

```
Current alert level: green
Per 5 seconds in the last minute:
   0 0 0 0 0 0 0 0 0 0
   0 0
Per minute in the last hour:
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
Per hour in the last day:
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0
Per day in the last 30 days:
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
Direct memory test failures per minute in the last hour:
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
   0 0 0 0 0 0 0 0 0 0
Potential false positives: 0 0
 Ignored because of rx errors: 0 0
 Ignored because of cdm fifo overrun: 0 0
 Ignored because of oir: 0 0
 Ignored because isl frames received: 0 0
 Ignored during boot: 0 0
 Ignored after writing hw stats: 0 0
 Ignored on high gigaport: 0
Ongoing diag action mode: Normal
Last 1000 Memory Test Failures:
Last 1000 Packet Memory errors:
First 1000 Packet Memory errors:

_____________________________________________________________________________
Switch#
```

# show diagnostic result module test

To display the results of the bootup packet memory test, use the **show diagnostic result module test** command. The output indicates whether the test passed, failed, or was not run.

**show diagnostic result module** [*N* | **all**] [**test** *test-id*] [**detail**]

## Syntax Description

| | |
|---|---|
| *N* | Specifies the module number. |
| **all** | Specifies all modules. |
| **test** *test-id* | Specifies the number for the tdr test on the platform. |
| **detail** | (Optional) Specifies the display of detailed information for analysis. This option is recommended. |

## Defaults

Non-detailed results

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **detail** keyword is intended for use by Cisco support personnel when analyzing failures.

## Examples

This example shows how to display the results of the bootup packet memory tests:

```
Switch# show diagnostic result module 6 detail

module 6:

  Overall diagnostic result:PASS

  Test results:(. = Pass, F = Fail, U = Untested)

  ____________________________________________________________________________

    1) linecard-online-diag ---------------------> .

          Error code --------------------------> 0 (DIAG_SUCCESS)
          Total run count ---------------------> 1
          Last test execution time ------------> Jan 21 2001 19:48:30
          First test failure time -------------> n/a
          Last test failure time --------------> n/a
          Last test pass time -----------------> Jan 21 2001 19:48:30
          Total failure count -----------------> 0
          Consecutive failure count -----------> 0
```

```
Slot Ports Card Type                                   Diag Status      Diag Details
---- ----- ---------------------------------------- --------------- ------------
 6    48   10/100/1000BaseT (RJ45)V, Cisco/IEEE   Passed          None

Detailed Status
---------------
. = Pass              U = Unknown
L = Loopback failure  S = Stub failure
I = Ilc failure       P = Port failure
E = SEEPROM failure   G = GBIC integrity check failure


Ports 1   2   3   4   5   6   7   8   9   10  11  12  13  14  15  16
      .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .

Ports 17  18  19  20  21  22  23  24  25  26  27  28  29  30  31  32
      .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .

Ports 33  34  35  36  37  38  39  40  41  42  43  44  45  46  47  48
      .   .   .   .   .   .   .   .   .   .   .   .   .   .   .   .
```

---

```
 2) online-diag-tdr:

Port  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
-------------------------------------------------------------------------------
      .  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U

Port 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
-------------------------------------------------------------------------------
      U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U  U


        Error code --------------------------> 0 (DIAG_SUCCESS)
        Total run count ---------------------> 1
        Last test execution time ------------> Jan 22 2001 03:01:54
        First test failure time -------------> n/a
        Last test failure time --------------> n/a
        Last test pass time -----------------> Jan 22 2001 03:01:54
        Total failure count -----------------> 0
        Consecutive failure count -----------> 0

Detailed Status
---------------
TDR test is in progress on interface Gi6/1
```

---

```
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| diagnostic start | Runs the specified diagnostic test. |

# show diagnostic result module test 2

To display the results of the bootup packet memory test, use the **show diagnostic result module test 2** command. The output indicates whether the test passed, failed, or was not run.

**show diagnostic result module** *N* **test 2** [**detail**]

## Syntax Description

| | |
|---|---|
| *N* | Specifies the module number. |
| **detail** | (Optional) Specifies the display of detailed information for analysis. |

## Defaults

Non-detailed results

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **detail** keyword is intended for use by Cisco support personnel when analyzing failures.

## Examples

This example shows how to display the results of the bootup packet memory tests:

```
Switch# show diagnostic result module 1 test 2

Test results: (. = Pass, F = Fail, U = Untested)

    2) packet-memory-bootup ------------> .
```

This example shows how to display detailed results from the bootup packet memory tests:

```
Switch# show diagnostic result module 2 test 2 detail

Test results: (. = Pass, F = Fail, U = Untested)

_______________________________________________________________________________

    2) packet-memory-bootup ------------> .

          Error code ------------------> 0 (DIAG_SUCCESS)
          Total run count -------------> 0
          Last test execution time ----> n/a
          First test failure time -----> n/a
          Last test failure time ------> n/a
          Last test pass time ---------> n/a
          Total failure count ---------> 0
          Consecutive failure count ---> 0
packet buffers on free list: 64557 bad: 0 used for ongoing tests: 979
```

```
Number of errors found: 0
Cells with hard errors (failed two or more tests): 0
Cells with soft errors (failed one test, includes hard): 0
Suspect bad cells (uses a block that tested bad): 0
total buffers: 65536
bad buffers: 0 (0.0%)
good buffers: 65536 (100.0%)
Bootup test results:
No errors.
```

## Related Commands

| Command | Description |
|---|---|
| diagnostic monitor action | Directs the action of the switch when it detects a packet memory failure. |
| show diagnostic result module test 3 | Displays the results from the ongoing packet memory test. |

# show diagnostic result module test 3

To display the results from the ongoing packet memory test, use the **show diagnostic result module test 3** command. The output indicates whether the test passed, failed, or was not run.

**show diagnostic result module** *N* **test 3** [**detail**]

## Syntax Description

| | |
|---|---|
| *N* | Module number. |
| **detail** | (Optional) Specifies the display of detailed information for analysis. |

## Defaults

Non-detailed results

## Command Modes

EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The **detail** keyword is intended for use by Cisco support personnel when analyzing failures.

## Examples

This example shows how to display the results from the ongoing packet memory tests:

```
Switch# show diagnostic result module 1 test 3

Test results: (. = Pass, F = Fail, U = Untested)

    3) packet-memory-ongoing -----------> .
```

This example shows how to display the detailed results from the ongoing packet memory tests:

```
Switch# show diagnostic result module 1 test 3 detail

Test results: (. = Pass, F = Fail, U = Untested)


_____________________________________________________________________________

    3) packet-memory-ongoing -----------> .

          Error code ------------------> 0 (DIAG_SUCCESS)
          Total run count -------------> 0
          Last test execution time ----> n/a
          First test failure time -----> n/a
          Last test failure time ------> n/a
          Last test pass time ---------> n/a
          Total failure count ---------> 0
          Consecutive failure count ---> 0
packet buffers on free list: 64557 bad: 0 used for ongoing tests: 979
```

```
Packet memory errors: 0 0
Current alert level: green
Per 5 seconds in the last minute:
    0 0 0 0 0 0 0 0 0 0
    0 0
Per minute in the last hour:
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
Per hour in the last day:
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0
Per day in the last 30 days:
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
Direct memory test failures per minute in the last hour:
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
    0 0 0 0 0 0 0 0 0 0
Potential false positives: 0 0
  Ignored because of rx errors: 0 0
  Ignored because of cdm fifo overrun: 0 0
  Ignored because of oir: 0 0
  Ignored because isl frames received: 0 0
  Ignored during boot: 0 0
  Ignored after writing hw stats: 0 0
  Ignored on high gigaport: 0
Ongoing diag action mode: Normal
Last 1000 Memory Test Failures: v
Last 1000 Packet Memory errors:
First 1000 Packet Memory errors:
```

## Related Commands

| Command | Description |
|---|---|
| diagnostic monitor action | Directs the action of the switch when it detects a packet memory failure. |
| show diagnostic result module test 2 | Displays the results of the bootup packet memory test. |

# show dot1x

To display the 802.1X statistics and operational status for the entire switch or for a specified interface, use the **show dot1x** command.

**show dot1x** [**interface** *interface-id*] | [**statistics** [**interface** *interface-id*]] | [**all**]

## Syntax Description

| | |
|---|---|
| **interface** *interface-id* | (Optional) Displays the 802.1X status for the specified port. |
| **statistics** | (Optional) Displays 802.1X statistics for the switch or the specified interface. |
| **all** | (Optional) Displays per-interface 802.1X configuration information for all interfaces with a non-default 802.1X configuration. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | Display enhanced to show the guest-VLAN value. |
| 12.2(25)EW | Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EWA | Support for currently-assigned reauthentication timer (if the timer is configured to honor the Session-Timeout value) was added. |
| 12.2(31)SG | Support for port direction control and critical recovery was added. |

## Usage Guidelines

If you do not specify an interface, the global parameters and a summary are displayed. If you specify an interface, the details for that interface are displayed.

If you enter the **statistics** keyword without the **interface** option, the statistics are displayed for all interfaces. If you enter the **statistics** keyword with the **interface** option, the statistics are displayed for the specified interface.

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* are displayed.

The **show dot1x** command displays the currently assigned reauthentication timer and time remaining before reauthentication, if reauthentication is enabled.

## Examples

This example shows how to display the output from the **show dot1x** command:

```
Switch# show dot1x
Sysauthcontrol = Disabled
Dot1x Protocol Version = 2
Dot1x Oper Controlled Directions = Both
Dot1x Admin Controlled Directions = Both
Critical Recovery Delay = 500
Critical EAP = Enabled
Switch#
```

This example shows how to display the 802.1X statistics for a specific port:

```
Switch# show dot1x interface fastethernet6/1
Dot1x Info for FastEthernet6/1
-----------------------------------
PAE                       = AUTHENTICATOR
PortControl               = AUTO
ControlDirection          = Both
HostMode                  = MULTI_DOMAIN
ReAuthentication          = Disabled
QuietPeriod               = 60
ServerTimeout             = 30
SuppTimeout               = 30
ReAuthPeriod              = 3600 (Locally configured)
ReAuthMax                 = 2
MaxReq                    = 2
TxPeriod                  = 30
RateLimitPeriod           = 0

Dot1x Authenticator Client List
-------------------------------
Domain                    = DATA
Supplicant                = 0000.0000.ab01
        Auth SM State     = AUTHENTICATED
        Auth BEND SM Stat = IDLE

Port Status               = AUTHORIZED
Authentication Method     = Dot1x
Authorized By             = Authentication Server
Vlan Policy               = 12

Domain                    = VOICE
Supplicant                = 0060.b057.4687
        Auth SM State     = AUTHENTICATED
        Auth BEND SM Stat = IDLE
Port Status               = AUTHORIZED
Authentication Method     = Dot1x
Authorized By             = Authentication Server

Switch#
```

**Note** Table 2-16 provides a partial list of the displayed fields. The remaining fields in the display show internal state information. For a detailed description of these state machines and their settings, refer to the 802.1X specification.

*Table 2-16 show dot1x interface Field Description*

| Field | Description |
|---|---|
| PortStatus | Status of the port (authorized or unauthorized). The status of a port is displayed as authorized if the **dot1x port-control** interface configuration command is set to **auto** and has successfully completed authentication. |
| Port Control | Setting of the **dot1x port-control** interface configuration command. |
| MultiHosts | Setting of the **dot1x multiple-hosts** interface configuration command (allowed or disallowed). |

This is an example of output from the **show dot1x statistics interface gigabitethernet1/1** command. Table 2-17 describes the fields in the display.

```
Switch# show dot1x statistics interface gigabitethernet1/1

PortStatistics Parameters for Dot1x
---------------------------------------
TxReqId = 0    TxReq = 0     TxTotal = 0
RxStart = 0    RxLogoff = 0  RxRespId = 0  RxResp = 0
RxInvalid = 0  RxLenErr = 0  RxTotal= 0
RxVersion = 0  LastRxSrcMac 0000.0000.0000
Switch#
```

*Table 2-17 show dot1x statistics Field Descriptions*

| Field | Description |
|---|---|
| TxReq/TxReqId | Number of EAP-request/identity frames that have been sent. |
| TxTotal | Number of EAPOL frames of any type that have been sent. |
| RxStart | Number of valid EAPOL-start frames that have been received. |
| RxLogoff | Number of EAPOL-logoff frames that have been received. |
| RxRespId | Number of EAP-response/identity frames that have been received. |
| RxResp | Number of valid EAP-response frames (other than response/identity frames) that have been received. |
| RxInvalid | Number of EAPOL frames that have been received and have an unrecognized frame type. |
| RxLenError | Number of EAPOL frames that have been received in which the packet body length field is invalid. |
| RxTotal | Number of valid EAPOL frames of any type that have been received. |
| RxVersion | Protocol version number carried in the most recently received EAPOL frame. |
| LastRxSrcMac | Source MAC address carried in the most recently received EAPOL frame. |

**Related Commands**

| Command | Description |
|---|---|
| **dot1x critical** | Enables the 802.1X critical authentication on a port. |
| **dot1x critical eapol** | Enables sending EAPOL success packets when a port is critically authorized partway through an EAP exchange. |
| **dot1x critical recovery delay** | Sets the time interval between port reinitializations. |
| **dot1x critical vlan** | Assigns a critically authenticated port to a specific VLAN. |
| **dot1x guest-vlan** | Enables a guest VLAN on a per-port basis. |
| **dot1x max-reauth-req** | Sets the maximum number of times that the switch will retransmit an EAP-Request/Identity frame to the client before restarting the authentication process. |
| **dot1x port-control** | Enables manual control of the authorization state on a port. |
| **mac-address-table notification** | Enables MAC address notification on a switch. |

# show environment

To display the environment alarm, operational status, and current reading for the chassis, use the **show environment** command.

**show environment** [**alarm**] | [**status** [**chassis** | **fantray** | **powersupply** | **supervisor**]] | [**temperature**]

## Syntax Description

| | |
|---|---|
| **alarm** | (Optional) Specifies the alarm status of the chassis. |
| **status** | (Optional) Specifies the operational status information. |
| **chassis** | (Optional) Specifies the operational status of the chassis. |
| **fantray** | (Optional) Specifies the status of the fan tray, and shows fan tray power consumption. |
| **powersupply** | (Optional) Specifies the status of the power supply. |
| **supervisor** | (Optional) Specifies the status of the supervisor engine. |
| **temperature** | (Optional) Specifies the current chassis temperature readings. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for the ability to display generic environment information with the **show environment** command was added. |

## Examples

This example shows how to display information about the environment alarms, operational status, and current temperature readings for the chassis:

```
Switch# show environment
no temperature alarms

Module  Sensor                    Temperature          Status
------+--------------------------+--------------------+------------
1       air inlet                 22C (41C,56C,66C)    ok
1       air outlet (back)         24C (45C,59C,69C)    ok
1       air outlet (front)          22C (43C,57C,67C)      ok
3       air inlet                 33C (51C,65C,68C)    ok
3       air outlet                39C (69C,83C,86C)    ok
4       air inlet                 32C (51C,65C,68C)    ok
4       air outlet                  38C (69C,83C,86C)      ok
Power                             Fan         Inline
Supply Model No          Type     Status      Sensor Status
------ ---------------- --------- ----------- ------- -------
PS1    PWR-C45-1400AC    AC       1400W       good    good n.a.
PS2     none               --       --          --       --
```

```
Power supplies needed by system : 1
Power supplies currently available : 1
Chassis Type : WS-C4507R-E

Power consumed by backplane : 40 Watts

Switch Bandwidth Utilization : 0%

Supervisor Led Color : Green

Module 1 Status Led Color : Green
Module 2 Status Led Color : Green PoE Led Color : Off
Module 3 Status Led Color : Green
Module 4 Status Led Color : Green

Fantray : Good

Power consumed by Fantray : 135 Watts
Switch#
```

This example shows how to display information about the environment alarms:

```
Switch# show environment alarm
no alarm
Switch#
```

This example shows how to display information about the power supplies, chassis type, and fan trays:

```
Switch# show environment status
Power                                          Fan
Supply  Model No          Type       Status    Sensor
------  ----------------  ---------  --------  ------
PS1     PWR-C45-1400AC    AC 1400W   good      good
PS2     none              --         --        --

Power Supply    Max     Min     Max     Min     Absolute
(Nos in Watts)  Inline  Inline  System  System  Maximum
--------------  ------  ------  ------  ------  --------
PS1                0       0    1360    1360    1400
PS2               --      --      --      --     --

Power supplies needed by system : 1

Chassis Type : WS-C4507R

Supervisor Led Color : Green

Fantray : good

Power consumed by Fantray : 50 Watts

Switch#
```

This example shows how to display information about the chassis:

```
Switch# show environment status chassis
Chassis Type :WS-C4507R
Switch#
```

This example shows how to display information about the fan tray:

```
Switch# show environment status fantray
Fantray : good
Power consumed by Fantray : 50 Watts
Switch#
```

This example shows how to display information about the power supply:

```
Switch# show environment status powersupply
Power                                        Fan
Supply  Model No          Type       Status   Sensor
------  ----------------  ---------  -------  ------
PS1     WS-X4008          AC 400W    good     good
PS2     WS-X4008          AC 400W    good     good
PS3     none              --         --       --
Switch#
```

This example shows how to display information about the supervisor engine:

```
Switch# show environment status supervisor
Supervisor Led Color :Green
Switch#
```

This example shows how to display information about the temperature of the chassis:

```
Switch# show environment temperature
Chassis Temperature                    = 32 degrees Celsius
Chassis Over Temperature Threshold     = 75 degrees Celsius
Chassis Critical Temperature Threshold = 95 degrees Celsius
Switch#
```

# show errdisable detect

To display the error disable detection status, use the **show errdisable detect** command.

**show errdisable detect**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | Display includes the status of storm control. |

## Examples

This example shows how to display the error disable detection status:

```
Switch# show errdisable detect
ErrDisable Reason    Detection status
-----------------    ----------------
udld                 Enabled
bpduguard            Enabled
security-violatio    Enabled
channel-misconfig    Disabled
psecure-violation    Enabled
vmps                 Enabled
pagp-flap            Enabled
dtp-flap             Enabled
link-flap            Enabled
l2ptguard            Enabled
gbic-invalid         Enabled
dhcp-rate-limit      Enabled
unicast-flood        Enabled
storm-control        Enabled
ilpower              Enabled
arp-inspection       Enabled
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **errdisable detect** | Enables error-disable detection. |
| **errdisable recovery** | Configures the recovery mechanism variables. |
| **show interfaces status** | Displays the interface status or a list of interfaces in error-disabled state. |

# show errdisable recovery

To display error disable recovery timer information, use the **show errdisable recovery** command.

**show errdisable recovery**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | Display includes the status of storm control. |

## Examples

This example shows how to display recovery timer information for error disable:

```
Switch# show errdisable recovery
ErrDisable Reason    Timer Status
-----------------    --------------
udld                 Disabled
bpduguard            Disabled
security-violatio    Disabled
channel-misconfig    Disabled
vmps                 Disabled
pagp-flap            Disabled
dtp-flap             Disabled
link-flap            Disabled
l2ptguard            Disabled
psecure-violation    Disabled
gbic-invalid         Disabled
dhcp-rate-limit      Disabled
unicast-flood        Disabled
storm-control        Disabled
arp-inspection       Disabled

Timer interval:30 seconds

Interfaces that will be enabled at the next timeout:

Interface    Errdisable reason    Time left(sec)
---------    -----------------    --------------
 Fa7/32          arp-inspect           13
```

## Related Commands

| Command | Description |
|---|---|
| errdisable detect | Enables error-disable detection. |
| errdisable recovery | Configures the recovery mechanism variables. |
| show interfaces status | Displays the interface status or a list of interfaces in error-disabled state. |

# show etherchannel

To display EtherChannel information for a channel, use the **show etherchannel** command.

**show etherchannel** [*channel-group*] {**port-channel** | **brief** | **detail** | **summary** | **port** | **load-balance** | **protocol**}

## Syntax Description

| | |
|---|---|
| *channel-group* | (Optional) Number of the channel group; valid values are from 1 to 64. |
| **port-channel** | Displays port-channel information. |
| **brief** | Displays a summary of EtherChannel information. |
| **detail** | Displays detailed EtherChannel information. |
| **summary** | Displays a one-line summary per channel group. |
| **port** | Displays EtherChannel port information. |
| **load-balance** | Displays load-balance information. |
| **protocol** | Displays the enabled protocol. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(13)EW | Support for LACP was added to this command. |

## Usage Guidelines

If you do not specify a channel group, all channel groups are displayed.

In the output below, the Passive port list field is displayed for Layer 3 port channels only. This field means that the physical interface, which is still not up, is configured to be in the channel group (and indirectly is in the only port channel in the channel group).

## Examples

This example shows how to display port-channel information for a specific group:

```
Switch# show etherchannel 1 port-channel
                Port-channels in the group:
                ----------------------
Port-channel: Po1
------------
Age of the Port-channel   = 02h:35m:26s
Logical slot/port   = 10/1          Number of ports in agport = 0
GC                  = 0x00000000      HotStandBy port = null
Passive port list   = Fa5/4 Fa5/5
Port state          = Port-channel L3-Ag Ag-Not-Inuse
```

```
Ports in the Port-channel:
Index   Load   Port
------------------
Switch#
```

This example shows how to display load-balancing information:

```
Switch# show etherchannel load-balance
Source XOR Destination mac address
Switch#
```

This example shows how to display a summary of information for a specific group:

```
Switch# show etherchannel 1 brief
Group state = L3
Ports: 2   Maxports = 8
port-channels: 1 Max port-channels = 1
Switch#
```

This example shows how to display detailed information for a specific group:

```
Switch# show etherchannel 1 detail
Group state = L3
Ports: 2   Maxports = 8
Port-channels: 1 Max Port-channels = 1
               Ports in the group:
               -------------------
Port: Fa5/4
------------

Port state    = EC-Enbld Down Not-in-Bndl Usr-Config
Channel group = 1           Mode = Desirable     Gcchange = 0
Port-channel  = null        GC   = 0x00000000    Psudo-agport = Po1
Port indx     = 0           Load = 0x00

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.
Timers: H - Hello timer is running.        Q - Quit timer is running.
        S - Switching timer is running.    I - Interface timer is running.

Local information:
                              Hello    Partner  PAgP     Learning  Group
Port      Flags State   Timers  Interval Count   Priority   Method  Ifindex
Fa5/4     d     U1/S1           1s       0        128        Any      0

Age of the port in the current state: 02h:33m:14s
Port: Fa5/5
------------

Port state    = EC-Enbld Down Not-in-Bndl Usr-Config
Channel group = 1           Mode = Desirable     Gcchange = 0
Port-channel  = null        GC   = 0x00000000    Psudo-agport = Po1
Port indx     = 0           Load = 0x00

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.
Timers: H - Hello timer is running.        Q - Quit timer is running.
        S - Switching timer is running.    I - Interface timer is running.

Local information:
                              Hello    Partner  PAgP     Learning  Group
Port      Flags State   Timers  Interval Count   Priority   Method  Ifindex
Fa5/5     d     U1/S1           1s       0        128        Any      0
```

```
Age of the port in the current state: 02h:33m:17s
               Port-channels in the group:
               ----------------------

Port-channel: Po1
------------
Age of the Port-channel   = 02h:33m:52s
Logical slot/port   = 10/1           Number of ports in agport = 0
GC                  = 0x00000000      HotStandBy port = null
Passive port list   = Fa5/4 Fa5/5
Port state          = Port-channel L3-Ag Ag-Not-Inuse

Ports in the Port-channel:

Index   Load   Port
-------------------
Switch#
```

This example shows how to display a one-line summary per channel group:

```
Switch# show etherchannel summary
U-in use  I-in port-channel   S-suspended   D-down  i-stand-alone  d-default

Group Port-channel  Ports
----- ------------  ----------------------------------------------------------
1     Po1(U)        Fa5/4(I)  Fa5/5(I)
2     Po2(U)        Fa5/6(I)  Fa5/7(I)
Switch#
```

This example shows how to display EtherChannel port information for all ports and all groups:

```
Switch# show etherchannel port
               Channel-group listing:
               ----------------------

Group: 1
----------
               Ports in the group:
               -------------------
Port: Fa5/4
------------
Port state    = EC-Enbld Down Not-in-Bndl Usr-Config
Channel group = 1           Mode = Desirable     Gcchange = 0
Port-channel  = null        GC   = 0x00000000    Psudo-agport = Po1
Port indx     = 0           Load = 0x00

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.
Timers: H - Hello timer is running.        Q - Quit timer is running.
        S - Switching timer is running.    I - Interface timer is running.

Local information:
                              Hello    Partner  PAgP     Learning  Group
Port      Flags State   Timers  Interval Count   Priority   Method  Ifindex
Fa5/4     d     U1/S1           1s       0        128        Any      0

Age of the port in the current state: 02h:40m:35s
Port: Fa5/5
------------

Port state    = EC-Enbld Down Not-in-Bndl Usr-Config
Channel group = 1           Mode = Desirable     Gcchange = 0
Port-channel  = null        GC   = 0x00000000    Psudo-agport = Po1
Port indx     = 0           Load = 0x00
```

```
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.
Timers: H - Hello timer is running.        Q - Quit timer is running.
        S - Switching timer is running.    I - Interface timer is running.

<...output truncated...>

Switch#
```

This example shows how to display the protocol enabled:

```
Switch# show etherchannel protocol
                Channel-group listing:
                ----------------------

Group: 12
----------
Protocol:  PAgP

Group: 24
----------
Protocol:   -  (Mode ON)
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| channel-group | Assigns and configures an EtherChannel interface to an EtherChannel group. |
| interface port-channel | Accesses or creates a port-channel interface. |

# show flowcontrol

To display the per-interface status and statistics related to flow control, use the **show flowcontrol** command.

**show flowcontrol** [**module** *slot* | **interface** *interface*]

## Syntax Description

| | |
|---|---|
| **module** *slot* | (Optional) Limits the display to interfaces on a specific module. |
| **interface** *interface* | (Optional) Displays the status on a specific interface. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Table 2-18 describes the fields in the **show flowcontrol** command output.

*Table 2-18 show flowcontrol Command Output*

| Field | Description |
|---|---|
| Port | Module and port number. |
| Send-Flowcontrol-Admin | Flow-control administration. Possible settings: **on** indicates the local port sends flow control to the far end; **off** indicates the local port does not send flow control to the far end; **desired** indicates the local end sends flow control to the far end if the far end supports it. |
| Send-Flowcontrol-Oper | Flow-control operation. Possible setting: **disagree** indicates the two ports could not agree on a link protocol. |
| Receive-Flowcontrol-Admin | Flow-control administration. Possible settings: **on** indicates the local port requires the far end to send flow control; **off** indicates the local port does not allow the far end to send flow control; **desired** indicates the local end allows the far end to send flow control. |
| Receive-Flowcontrol-Oper | Flow-control operation. Possible setting: **disagree** indicates the two ports could not agree on a link protocol. |
| RxPause | Number of pause frames received. |
| TxPause | Number of pause frames transmitted. |

## Examples

This example shows how to display the flow control status on all the Gigabit Ethernet interfaces:

```
Switch# show flowcontrol
Port       Send FlowControl  Receive FlowControl  RxPause TxPause
           admin    oper     admin    oper
---------  -------- -------- -------- --------    ------- -------
Te1/1      off      off      on       off         0       0
Te1/2      off      off      on       off         0       0
Gi1/3      off      off      desired  on          0       0
Gi1/4      off      off      desired  on          0       0
Gi1/5      off      off      desired  on          0       0
Gi1/6      off      off      desired  on          0       0
Gi3/1      off      off      desired  off         0       0
Gi3/2      off      off      desired  off         0       0
Gi3/3      off      off      desired  off         0       0
Gi3/4      off      off      desired  off         0       0
Gi3/5      off      off      desired  off         0       0
Gi3/6      off      off      desired  off         0       0
Switch#
```

This example shows how to display the flow control status on module 1:

```
Switch# show flowcontrol module 1
Port    Send FlowControl  Receive FlowControl  RxPause TxPause
        admin    oper     admin    oper
-----   -------- -------- -------- --------    ------- -------
Gi1/1   desired  off      off      off         0       0
Gi1/2   on       disagree on       on          0       0
Switch#
```

This example shows how to display the flow control status on Gigabit Ethernet interface 3/4:

```
Switch# show flowcontrol interface gigabitethernet3/4
Port    Send FlowControl  Receive FlowControl  RxPause TxPause
        admin    oper     admin    oper
-----   -------- -------- -------- --------    ------- -------
Gi3/4   off      off      on       on          0       0
Switch#
```

This example shows how to display the flow control status on 10-Gigabit Ethernet interface 1/1:

```
Switch# show flowcontrol interface tengigabitethernet1/1
Port       Send FlowControl  Receive FlowControl  RxPause TxPause
           admin    oper     admin    oper
---------  -------- -------- -------- --------    ------- -------
Te1/1      off      off      on      off         0       0
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| channel-group | Configures a Gigabit Ethernet interface to send or receive pause frames. |
| show interfaces status | Displays the interface status or a list of interfaces in error-disabled state. |

# show hw-module port-group

To display how the X2 holes on a module are grouped, use the **show hw-module port-group** command.

**show hw-module module** *number* **port-group**

## Syntax Description

| | |
|---|---|
| **module** | Specifies a line module. |
| *number* | Specifies a slot or module number. |
| **port-group** | Specifies a port-group on a switch. |

## Defaults

X2 mode.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | Support for WS-X4606-10GE-E Twin Gigabit convertor introduced. |

## Usage Guidelines

When a TwinGig Convertor is enabled or disabled, the number and type of ports on the linecard change dynamically. The terminology must reflect this behavior. In Cisco IOS, 10-Gigabit ports are named TenGigabit and 1-Gigabit ports are named Gigabit. Starting with Cisco IOS Release 12.2(40)SG, to avoid having ports named TenGigabit1/1 and Gigabit1/1, the 10-Gigabit and 1-Gigabit port numbers are independent. The WS-X4606-10GE-E module with six X2 ports are named TenGigabit<slot-num>/<1-6>, and the SFP ports are named Gigabit<slot-num>/<7-18.

In the Supervisor Engine 6-E and Catalyst 4900M chassis, the ports are connected to the switching engine through a stub ASIC. This stub ASIC imposes some limitations on the ports: Gigabit and 10-Gigabit ports cannot be mixed on a single stub ASIC; they must either be all 10-Gigabit (X2), or all Gigabit (TwinGig Converter and SFP). The faceplates of X2 modules show this stub-port grouping, either with an actual physical grouping, or a box drawn around a grouping.

## Examples

This example shows to determine how the X2 holes on a module are grouped on a WS-X4606-10GE-E:

```
Switch# show hw-module module 1 port-group
Module   Port-group   Active      Inactive
------------------------------------------------------------
1        1            Te1/1-3     Gi1/7-12
1        2            Te1/4-6     Gi1/13-18
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **hw-module port-group** | Selects either Gigabit Ethernet or Ten Gigabit Ethernet interfaces on your module. |

# show hw-module uplink

To display the current uplink mode, use the **show hw-module uplink** command.

**show hw-module uplink**

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If the active uplink mode is different than configured mode, the output displays the change.

By default, the current (operational) uplink selection is displayed.

## Examples

This example shows the output displaying the current (active) uplinks:

```
Switch# show hw-module uplink
Active uplink configuration is TenGigabitEthernet
```

This example shows the output for redundant systems in SSO mode if the 10-Gigabit Ethernet uplinks are active, and the Gigabit Ethernet uplinks are selected:

```
Switch# show hw-module uplink
Active uplink configuration is TenGigabitEthernet
(will be GigabitEthernet after next reload)
A 'redundancy reload shelf' or power-cycle of chassis is required to
apply the new configuration
```

This example shows the output for redundant systems in RPR mode if the 10-Gigabit Ethernet uplinks are active, and the Gigabit Ethernet uplinks are selected:

```
Switch# show hw-module uplink
Active uplink configuration is TenGigabitEthernet
(will be GigabitEthernet after next reload)
A reload of active supervisor is required to apply the new configuration.
```

## Related Commands

| Command | Description |
|---|---|
| hw-module uplink select | Selects the 10-Gigabit Ethernet or Gigabit Ethernet uplinks on the Supervisor Engine V-10GE within the W-C4510R chassis. |

# show idprom

To display the IDPROMs for the chassis, supervisor engine, module, power supplies, fan trays, clock module, and multiplexer (mux) buffer, use the **show idprom** command.

**show idprom** {**all** | **chassis** | **module** [*mod*] | **interface** *int_name* | **supervisor** | **power-supply** *number* | **fan-tray**}

## Syntax Description

| | |
|---|---|
| **all** | Displays information for all IDPROMs. |
| **chassis** | Displays information for the chassis IDPROMs. |
| **module** | Displays information for the module IDPROMs. |
| *mod* | (Optional) Specifies the module name. |
| **interface** *int_name* | Displays information for the GBIC or SFP IDPROMs. |
| **supervisor** | Displays information for the supervisor engine IDPROMs. |
| **power-supply** *number* | Displays information for the power supply IDPROMs. |
| **fan-tray** | Displays information for the fan tray IDPROMs. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for the **power-supply**, **fan-tray**, **clock-module**, and **mux-buffer** keywords was added. |
| 12.1(13)EW | Support for **interface** keyword was added. |
| 12.2(18)EW | Enhanced the **show idprom interface** output to include the hexadecimal display of the GBIC/SFP SEEPROM contents. |
| 12.2(25)EW | Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

When you enter the **show idprom interface** command, the output lines for Calibration type and Rx (receive) power measurement may not be displayed for all GBICs.

## Examples

This example shows how to display IDPROM information for module 4:

```
Switch# show idprom module 4
Module 4 Idprom:
 Common Block Signature = 0xABAB
 Common Block Version = 1
 Common Block Length = 144
 Common Block Checksum = 4199
 Idprom Size = 256
 Block Count = 2
 FRU Major Type = 0x4201
 FRU Minor Type = 303
 OEM String = Cisco Systems, Inc.
 Product Number = WS-X4306
 Serial Number = 00000135
 Part Number = <tbd>
 Hardware Revision = 0.2
 Manufacturing Bits = 0x0000
 Engineering Bits = 0x0000
 Snmp OID = 0.0.0.0.0.0.0.0
 Power Consumption = 0
 RMA Failure Code = 0 0 0 0
 Linecard Block Signature = 0x4201
 Linecard Block Version = 1
 Linecard Block Length = 24
 Linecard Block Checksum = 658
 Feature Bits = 0x0000000000000000
 Card Feature Index = 50
 MAC Base = 0010.7bab.9830
 MAC Count = 6
Switch#
```

This example shows how to display IDPROM information for the GBICs on the Gigabit Ethernet interface 1/2:

```
Switch# show idprom interface gigabitethernet1/2
GBIC Serial EEPROM Contents:
Common Block:
 Identifier        = GBIC [0x1]
 Extended Id       = Not specified/compliant with defined MOD_DEF [0x0]
 Connector         = SC connector [0x1]
 Transceiver
  Speed            = Not available [0x0]
  Media            = Not available [0x0]
  Technology       = Not available [0x0]
  Link Length      = Not available [0x0]
  GE Comp Codes    = Not available [0x0]
  SONET Comp Codes = Not available [0x0]
 Encoding          = 8B10B  [0x1]
 BR, Nominal       = 1300000000 MHz
 Length(9u) in km  = GBIC does not support single mode fibre, or the length
                     must be determined from the transceiver technology.
 Length(9u)        = > 25.4 km
 Length(50u)       = GBIC does not support 50 micron multi-mode fibre, or the
                     length must be determined from the transceiver technology.
 Length(62.5u)     = GBIC does not support 62.5 micron multi-mode fibre, or
                     the length must be determined from transceiver technology.
 Length(Copper)    = GBIC does not support copper cables, or the length must
                     be determined from the transceiver technology.
 Vendor name       = CISCO-FINISAR
 Vendor OUI        = 36965
 Vendor Part No.   = FTR-0119-CSC
 Vendor Part Rev.  = B
 Wavelength        = Not available
```

```
 CC_BASE           = 0x1A

Extended ID Fields
 Options           = Loss of Signal implemented TX_FAULT signal implemented TX_DISABLE is
implemented and disables the serial output  [0x1A]
 BR, max           = Unspecified
 BR, min           = Unspecified
 Vendor Serial No. = K1273DH
 Date code         = 030409
 Diag monitoring   = Implemented
 Calibration type  = Internal
 Rx pwr measuremnt = Optical Modulation Amplitude (OMA)
 Address change    = Required
 CC_EXT            = 0xB2

Vendor Specific ID Fields:
20944D30  29 00 02 80 22 33 38 3D C7 67 83 E8 DF 65 6A AF   )..."38=Gg^Ch_ej/
20944D40  1A 80 ED 00 00 00 00 00 00 00 00 00 38 23 3C 1B   ............8#<.


        SEEPROM contents (hex) size 128:
0x0000  01 00 01 00 00 00 00 00 00 00 00 01 0D 00 00 FF   ................
0x0010  00 00 00 00 43 49 53 43 4F 2D 46 49 4E 49 53 41   ....CISCO-FINISA
0x0020  52 20 20 20 00 00 90 65 46 54 52 2D 30 31 31 39   R   ..^PeFTR-0119
0x0030  2D 43 53 43 20 20 20 20 42 20 20 20 00 00 00 1A   -CSC    B   ....
0x0040  00 1A 00 00 4B 31 32 37 33 44 48 20 20 20 20 20   ....K1273DH
0x0050  20 20 20 20 30 33 30 34 30 39 20 20 64 00 00 B2       030409  d..2
0x0060  29 00 02 80 22 33 38 3D C7 67 83 E8 DF 65 6A AF   )..^@"38=Gg^C._ej.
0x0070  1A 80 ED 00 00 00 00 00 00 00 00 00 38 23 3C 1B   .^@m.........8#<.
Switch#
```

This example shows how to display IDPROM information for the 10-Gigabit Ethernet interface 1/1:

```
Switch# show idprom interface tengigabitethernet1/1
X2 Serial EEPROM Contents:
Non-Volatile Register (NVR) Fields
 X2 MSA Version supported             :0xA
 NVR Size in bytes                    :0x100
 Number of bytes used                 :0xD0
 Basic Field Address                  :0xB
 Customer Field Address               :0x77
 Vendor Field Address                 :0xA7
 Extended Vendor Field Address        :0x100
 Reserved                             :0x0
 Transceiver type                     :0x2 =X2
 Optical connector type               :0x1 =SC
 Bit encoding                         :0x1 =NRZ
 Normal BitRate in multiple of 1M b/s :0x2848
 Protocol Type                        :0x1 =10GgE

Standards Compliance Codes :
 10GbE Code Byte 0                    :0x2 =10GBASE-LR
 10GbE Code Byte 1                    :0x0
 SONET/SDH Code Byte 0                :0x0
 SONET/SDH Code Byte 1                :0x0
 SONET/SDH Code Byte 2                :0x0
 SONET/SDH Code Byte 3                :0x0
 10GFC Code Byte 0                    :0x0
 10GFC Code Byte 1                    :0x0
 10GFC Code Byte 2                    :0x0
 10GFC Code Byte 3                    :0x0
 Transmission range in 10m            :0x3E8
Fibre Type :
 Fibre Type Byte 0                    :0x40 =NDSF only
```

```
 Fibre Type Byte 1                    :0x0 =Unspecified

 Centre Optical Wavelength in 0.01nm steps - Channel 0 :0x1 0xFF 0xB8
 Centre Optical Wavelength in 0.01nm steps - Channel 1 :0x0 0x0 0x0
 Centre Optical Wavelength in 0.01nm steps - Channel 2 :0x0 0x0 0x0
 Centre Optical Wavelength in 0.01nm steps - Channel 3 :0x0 0x0 0x0
 Package Identifier OUI  :0xC09820
 Transceiver Vendor OUI  :0x3400800
 Transceiver vendor name :CISCO-OPNEXT,INC
 Part number provided by transceiver vendor       :TRT5021EN-SMC-W
 Revision level of part number provided by vendor :00
 Vendor serial number           :ONJ08290041
 Vendor manufacturing date code :2004072000

 Reserved1 : 00 02 02 20 D1 00 00
 Basic Field Checksum :0x10

 Customer Writable Area :
  0x00: 58 32 2D 31 30 47 42 2D 4C 52 20 20 20 20 20 20
  0x10: 20 20 20 20 20 4F 4E 4A 30 38 32 39 30 30 34 31
  0x20: 31 30 2D 32 30 33 36 2D 30 31 20 20 41 30 31 20

 Vendor Specific :
  0x00: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  0x10: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  0x20: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
  0x30: 00 00 00 00 11 E2 69 A9 2F 95 C6 EE D2 DA B3 FD
  0x40: 9A 34 4A 24 CB 00 00 00 00 00 00 00 00 00 EF FC
  0x50: F4 AC 1A D7 11 08 01 36 00
Switch#
```

This example shows how to display IDPROM information for the supervisor engine:

```
Switch# show idprom supervisor
Supervisor Idprom:
 Common Block Signature = 0xABAB
 Common Block Version = 1
 Common Block Length = 144
 Common Block Checksum = 4153
 Idprom Size = 256
 Block Count = 2
 FRU Major Type = 0x4101
 FRU Minor Type = 333
 OEM String = Cisco Systems, Inc.
 Product Number = WS-X4014
 Serial Number = JAB05320CCE
 Part Number = 73-6854-04
 Part Revision = 05
 Manufacturing Deviation String = 0
 Hardware Revision = 0.4
 Manufacturing Bits = 0x0000
 Engineering Bits = 0x0000
 Snmp OID = 0.0.0.0.0.0.0.0
 Power Consumption = 0
 RMA Failure Code = 0 0 0 0
 Supervisor Block Signature = 0x4101
 Supervisor Block Version = 1
 Supervisor Block Length = 24
 Supervisor Block Checksum = 548
 Feature Bits = 0x0000000000000000
 Card Feature Index = 95
 MAC Base = 0007.0ee5.2a44
 MAC Count = 2
Switch#
```

This example shows how to display IDPROM information for the chassis:

```
Switch# show idprom chassis
Chassis Idprom:
 Common Block Signature = 0xABAB
 Common Block Version = 1
 Common Block Length = 144
 Common Block Checksum = 4285
 Idprom Size = 256
 Block Count = 2
 FRU Major Type = 0x4001
 FRU Minor Type = 24
 OEM String = Cisco Systems, Inc.
 Product Number = WS-C4507R
 Serial Number = FOX04473737
 Part Number = 73-4289-02
 Part Revision = 02
 Manufacturing Deviation String = 0x00
 Hardware Revision = 0.2
 Manufacturing Bits = 0x0000
 Engineering Bits = 0x0000
 Snmp OID = 0.0.0.0.0.0.0.0
 Chassis Block Signature = 0x4001
 Chassis Block Version = 1
 Chassis Block Length = 22
 Chassis Block Checksum = 421
 Feature Bits = 0x0000000000000000
 MAC Base = 0004.dd42.2600
 MAC Count = 1024
Switch#
```

This example shows how to display IDPROM information for power supply 1:

```
Switch# show idprom power-supply 1
Power Supply 0 Idprom:
 Common Block Signature = 0xABAB
 Common Block Version = 1
 Common Block Length = 144
 Common Block Checksum = 10207
 Idprom Size = 256
 Block Count = 1
 FRU Major Type = 0xAB01
 FRU Minor Type = 8224
 OEM String = Cisco Systems, Inc.
 Product Number = WS-CAC-1440W
 Serial Number = ACP05180002
 Part Number = 34-XXXX-01
 Part Revision = A0
 Manufacturing Deviation String =
 Hardware Revision = 1.1
 Manufacturing Bits = 0x0000
 Engineering Bits = 0x3031
 Snmp OID = 9.12.3.65535.65535.65535.65535.65535
 Power Consumption = -1
 RMA Failure Code = 255 255 255 255
 Power Supply Block Signature = 0xFFFF
 PowerSupply Block Version = 255
 PowerSupply Block Length = 255
 PowerSupply Block Checksum = 65535
 Feature Bits = 0x00000000FFFFFFFF
 Current @ 110V = -1
 Current @ 220V = -1
 StackMIB OID = 65535
```

```
Switch#
```

This example shows how to display IDPROM information for the fan tray:

```
Switch# show idprom fan-tray
Fan Tray Idprom :
 Common Block Signature = 0xABAB
 Common Block Version = 1
 Common Block Length = 144
 Common Block Checksum = 19781
 Idprom Size = 256
 Block Count = 1
 FRU Major Type = 0x4002
 FRU Minor Type = 0
 OEM String = "Cisco Systems"
 Product Number = WS-X4502-fan
 Serial Number =
 Part Number =
 Part Revision =
 Manufacturing Deviation String =
 Hardware Revision = 0.1
 Manufacturing Bits = 0xFFFF
 Engineering Bits = 0xFFFF
 Snmp OID = 65535.65535.65535.65535.65535.65535.65535.65535
 Power Consumption = -1
 RMA Failure Code = 255 255 255 255
Switch#
```

# show interfaces

To display traffic on a specific interface, use the **show interfaces** command.

**show interfaces** [{{**fastethernet** *mod/interface-number*} | {**gigabitethernet** *mod/interface-number*} | {**tengigabitethernet** *mod/interface-number*} | {**null** *interface-number*} | **vlan** *vlan_id*} | **status**}]

## Syntax Description

| | |
|---|---|
| **fastethernet** *mod/interface-number* | (Optional) Specifies the Fast Ethernet module and interface. |
| **gigabitethernet** *mod/interface-number* | (Optional) Specifies the Gigabit Ethernet module and interface. |
| **tengigabitethernet** *mod/interface-number* | (Optional) Specifies the 10-Gigabit Ethernet module and interface. |
| **null** *interface-number* | (Optional) Specifies the null interface; the valid value is 0. |
| **vlan** *vlan_id* | (Optional) Specifies the VLAN; valid values are from 1 to 4094. |
| **status** | (Optional) Displays status information. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended VLAN addresses was added. |
| 12.2(25)EW | Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch. |
| 12.2(31)SGA | Support for auto-MDIX reflected in command output. |

## Usage Guidelines

The statistics are collected on a per-VLAN basis for Layer 2 switched packets and Layer 3 switched packets. The statistics are available for both unicast and multicast. The Layer 3 switched packet counts are available for both the ingress and egress directions. The per-VLAN statistics are updated every 5 seconds.

In some cases, you might see a difference in the duplex mode that is displayed between the **show interfaces** command and the **show running-config** commands. The duplex mode that is displayed in the **show interfaces** command is the actual duplex mode that the interface is running. The **show interfaces** command shows the operating mode for an interface, while the **show running-config** command shows the configured mode for an interface.

If you do not enter any keywords, all counters for all modules are displayed.

Linecards that support auto-MDIX configuration on their copper media ports include: WS-X4124-RJ45, WS-X4148-RJ with hardware revision 3.0 or higher, and WS-X4232-GB-RJ with hardware revision 3.0 or higher.

## Examples

This example shows how to display traffic for Gigabit Ethernet interface 2/5:

```
Switch# show interfaces gigabitethernet2/5
GigabitEthernet9/5 is up, line protocol is up
Hardware is C4k 1000Mb 802.3, address is 0001.64f8.3fa5 (bia 0001.64f8.3fa5)
Internet address is 172.20.20.20/24
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
Full-duplex, 1000Mb/s
ARP type: ARPA, ARP Timeout 04:00:00
Last input 00:00:00, output never, output hang never
Last clearing of "show interface" counters never
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 1000 bits/sec, 2 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
L2 Switched: ucast: 8199 pkt, 1362060 bytes - mcast: 6980 pkt, 371952 bytes
L3 in Switched: ucast: 0 pkt, 0 bytes - mcast: 0 pkt, 0 bytes mcast
L3 out Switched: ucast: 0 pkt, 0 bytes - mcast: 0 pkt, 0 bytes
300114 packets input, 27301436 bytes, 0 no buffer
Received 43458 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
0 input packets with dribble condition detected
15181 packets output, 1955836 bytes, 0 underruns
0 output errors, 0 collisions, 3 interface resets
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier
0 output buffer failures, 0 output buffers swapped out
Switch#
```

This example shows how to display traffic for 10-Gigabit Ethernet interface 1/1:

```
Switch# show interfaces tengigabitethernet1/1
Name: Tengigabitethernet1/1
Switchport: Enabled
Administrative Mode: private-vlan promiscuous trunk
Operational Mode: private-vlan promiscuous (suspended member of bundle Po1)
Administrative Trunking Encapsulation: negotiate
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: none
Trunking Native Mode VLAN: none
Administrative Native VLAN tagging: enabled
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: 202 (VLAN0202) 303 (VLAN0303) 304 (VLAN0304)
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk
Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: 802.1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Administrative private-vlan mapping trunk: New 202 (VLAN0202) 303 (VLAN0303) 304
(VLAN0304) 204 (VLAN0204) 305 (VLAN0305) 306 (VLAN0306)
```

```
Operational private-vlan: 202 (VLAN0202) 303 (VLAN0303) 304 (VLAN0304)
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Switch#
```

This example shows how to verify the status of auto-MDIX on a RJ-45 port:

**Note** You can verify the configuration setting and the operational state of auto-MDIX on the interface by entering the **show interfaces** EXEC command. This field is applicable and appears only on the **show interfaces** command output for 10/100/1000BaseT RJ45 copper ports on supported linecards including WS-X4124-RJ45, WS-X4148-RJ with hardware revision 3.0 or higher, and WS-X4232-GB-RJ with hardware revision 3.0 or higher.

```
FastEthernet6/3 is up, line protocol is up (connected)
  Hardware is Fast Ethernet Port, address is 0003.6ba8.ee68 (bia 0003.6ba8.ee68)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s, link type is auto, media type is 10/100BaseTX
  input flow-control is unsupported output flow-control is unsupported
Auto-MDIX on (operational: on)
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 input packets with dribble condition detected
     157082 packets output, 13418032 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 babbles, 0 late collision, 0 deferred
     1 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
Switch#
```

This example shows how to display status information for Gigabit Ethernet interface 1/2:

```
Switch# show interfaces gigabitethernet1/2 status
Port      Name         Status       Vlan       Duplex  Speed Type
Gi1/2                  notconnect   1            auto   1000 1000-XWDM-RXONLY
Switch#
```

This example shows how to display status information for the interfaces on the supervisor engine:

```
Switch# show interfaces status

Port      Name               Status       Vlan       Duplex  Speed Type
Te1/1                        connected    1            full    10G 10GBase-LR
Te1/2                        connected    1            full    10G 10GBase-LR
Switch#
```

# show interfaces capabilities

To display the interface capabilities for an interface or for all the interfaces on a switch, use the **show interfaces capabilities** command.

**show interfaces capabilities** [{**module** *mod*}]

**show interfaces** [*interface interface-number*] **capabilities**

## Syntax Description

| | |
|---|---|
| **module** *mod* | (Optional) Display information for the specified module only. |
| *interface* | (Optional) Interface type; valid values are **fastethernet**, **gigabitethernet**, **tengigabitethernet**, and **port-channel**. |
| *interface-number* | (Optional) Port number. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch. |
| 12.2(31)SGA | Support for auto-MDIX reflected in command output. |

## Usage Guidelines

The *interface-number* argument designates the module and port number. Valid values for *interface-number* depend on the chassis and module used. For example, if you have a 48-port 10/100-Mbps Fast Ethernet RJ-21 (telco connector) switching module installed in a Catalyst 4507 chassis, valid values for the slot number are from 2 to 13 and valid values for the port number are 1 to 48.

Linecards that support auto-MDIX configuration on their copper media ports include: WS-X4124-RJ45, WS-X4148-RJ with hardware revision 3.0 or higher, and WS-X4232-GB-RJ with hardware revision 3.0 or higher.

## Examples

This example shows how to display the interface capabilities for a module:

```
Switch# show interfaces capabilities module 1
GigabitEthernet1/1
  Model:                 WS-X4516-Gbic
  Type:                  Unsupported GBIC
  Speed:                 1000
  Duplex:                full
  Trunk encap. type:     802.1Q,ISL
  Trunk mode:            on,off,desirable,nonegotiate
  Channel:               yes
  Broadcast suppression:percentage(0-100), hw
  Flowcontrol:           rx-(off,on,desired),tx-(off,on,desired)
  VLAN Membership:       static, dynamic
  Fast Start:            yes
  Queuing:               rx-(N/A), tx-(4q1t, Sharing/Shaping)
  CoS rewrite:           yes
  ToS rewrite:           yes
  Inline power:          no
  SPAN:                  source/destination
  UDLD                    yes
  Link Debounce:         no
  Link Debounce Time:    no
  Port Security           yes
  Dot1x                   yes
GigabitEthernet1/2
  Model:                 WS-X4516-Gbic
  Type:                  Unsupported GBIC
  Speed:                 1000
  Duplex:                full
  Trunk encap. type:     802.1Q,ISL
  Trunk mode:            on,off,desirable,nonegotiate
  Channel:               yes
  Broadcast suppression:percentage(0-100), hw
  Flowcontrol:           rx-(off,on,desired),tx-(off,on,desired)
  VLAN Membership:       static, dynamic
  Fast Start:            yes
  Queuing:               rx-(N/A), tx-(4q1t, Sharing/Shaping)
  CoS rewrite:           yes
  ToS rewrite:           yes
  Inline power:          no
  SPAN:                  source/destination
  UDLD                    yes
  Link Debounce:         no
  Link Debounce Time:    no
  Port Security           yes
  Dot1x                   yes
Switch#
```

This example shows how to display the interface capabilities for the 10-Gigabit Ethernet interface 1/1:

```
Switch# show interfaces tengigabitethernet1/1 capabilities
TenGigabitEthernet1/1
  Model:                 WS-X4517-X2
  Type:                  10GBase-LR
  Speed:                 10000
  Duplex:                full
  Trunk encap. type:     802.1Q,ISL
  Trunk mode:            on,off,desirable,nonegotiate
  Channel:               yes
  Broadcast suppression: percentage(0-100), hw
  Flowcontrol:           rx-(off,on),tx-(off,on)
  VLAN Membership:       static, dynamic
  Fast Start:            yes
```

```
  Queuing:               rx-(N/A), tx-(1p3q1t, Sharing/Shaping)
  CoS rewrite:           yes
  ToS rewrite:           yes
  Inline power:          no
  SPAN:                  source/destination
  UDLD:                  yes
  Link Debounce:         no
  Link Debounce Time:    no
  Port Security:         yes
  Dot1x:                 yes
  Maximum MTU:           9198 bytes (Jumbo Frames)
  Multiple Media Types:  no
  Diagnostic Monitoring: N/A
Switch#
```

This example shows how to display the interface capabilities for Gigabit Ethernet interface 1/1:

```
Switch# show interfaces gigabitethernet1/1 capabilities
GigabitEthernet1/1
  Model:                 WS-X4014-Gbic
  Type:                  No Gbic
  Speed:                 1000
  Duplex:                full
  Trunk encap. type:     802.1Q,ISL
  Trunk mode:            on,off,desirable,nonegotiate
  Channel:               yes
  Broadcast suppression:percentage(0-100), hw
  Flowcontrol:           rx-(off,on,desired),tx-(off,on,desired)
  VLAN Membership:       static, dynamic
  Fast Start:            yes
  Queuing:               rx-(N/A), tx-(4q1t, Sharing/Shaping)
  CoS rewrite:           yes
  ToS rewrite:           yes
  Inline power:          no
  SPAN:                  source/destination
  UDLD:                  yes
  Link Debounce:         no
  Link Debounce Time:    no
  Port Security:         yes
  Dot1x:                 yes
  MTU Supported:         jumbo frames, baby giants
Switch#
```

This example shows how to display the interface capabilities for Fast Ethernet interface 3/1:

```
Switch# show interfaces fastethernet3/1 capabilities
FastEthernet3/1
  Model:                 WS-X4148-RJ-RJ-45
  Type:                  10/100BaseTX
  Speed:                 10,100,auto
  Duplex:                half,full,auto
  Trunk encap. type:     802.1Q,ISL
  Trunk mode:            on,off,desirable,nonegotiate
  Channel:               yes
  Broadcast suppression:percentage(0-100), sw
  Flowcontrol:           rx-(none),tx-(none)
  VLAN Membership:       static, dynamic
  Fast Start:            yes
  Queuing:               rx-(N/A), tx-(4q1t, Shaping)
  CoS rewrite:           yes
  ToS rewrite:           yes
  Inline power:          no
  SPAN:                  source/destination
  UDLD:                  yes
```

```
  Link Debounce:         no
  Link Debounce Time:    no
  Port Security:         yes
  Dot1x:                 yes
  MTU Supported:         no jumbo frames, baby giants
Switch#
```

This example shows how to verify that the auto-MDIX configuration is supported on a port:

```
Switch# show interfaces fastethernet6/3 capabilities
FastEthernet6/3
  Model:                 WS-X4232-GB-RJ-RJ-45
  Type:                  10/100BaseTX
  Speed:                 10,100,auto
  Duplex:                half,full,auto
  Auto-MDIX              yes
  Trunk encap. type:     802.1Q,ISL
  Trunk mode:            on,off,desirable,nonegotiate
  Channel:               yes
  Broadcast suppression: percentage(0-100), hw
  Flowcontrol:           rx-(none),tx-(none)
  VLAN Membership:       static, dynamic
  Fast Start:            yes
  Queuing:               rx-(N/A), tx-(1p3q1t, Sharing/Shaping)
  CoS rewrite:           yes
  ToS rewrite:           yes
  Inline power:          no
  SPAN:                  source/destination
  UDLD:                  yes
  Link Debounce:         no
  Link Debounce Time:    no
  Port Security:         yes
  Dot1x:                 yes
  Maximum MTU:           1552 bytes (Baby Giants)
  Multiple Media Types:  no
  Diagnostic Monitoring: N/A
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces counters | Displays the traffic on the physical interface. |

# show interfaces counters

To display the traffic on the physical interface, use the **show interfaces counters** command.

**show interfaces counters** [**all** | **detail** | **errors** | **storm-control** | **trunk**] [**module** *mod*]

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Displays all the interface counters including errors, trunk, and detail. |
| **detail** | (Optional) Displays the detailed interface counters. |
| **errors** | (Optional) Displays the interface error counters. |
| **storm-control** | (Optional) Displays the number of packets discarded due to suppression on the interface. |
| **trunk** | (Optional) Displays the interface trunk counters. |
| **module** *mod* | (Optional) Limits the display to interfaces on a specific module. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | Support for storm control. |
| 12.2(18)EW | Support for the display of total suppression discards. |

## Usage Guidelines

If you do not enter any keywords, all the counters for all modules are displayed.

The display for the **storm-control** keyword includes the suppressed multicast bytes.

## Examples

This example shows how to display the error counters for a specific module:

```
Switch# show interfaces counters errors module 1

Port        Align-Err    FCS-Err   Xmit-Err    Rcv-Err UnderSize
Gi1/1               0          0          0          0         0
Gi1/2               0          0          0          0         0

Port      Single-Col Multi-Col  Late-Col Excess-Col Carri-Sen     Runts    Giants
Gi1/1              0         0         0          0         0         0       0
Gi1/2              0         0         0          0         0         0       0
Switch#
```

This example shows how to display the traffic that is seen by a specific module:

```
Switch# show interfaces counters module 1

Port            InOctets    InUcastPkts    InMcastPkts    InBcastPkts
Gi1/1                  0              0              0              0
Gi1/2                  0              0              0              0

Port           OutOctets   OutUcastPkts   OutMcastPkts   OutBcastPkts
Gi1/1                  0              0              0              0
Gi1/2                  0              0              0              0
Switch#
```

This example shows how to display the trunk counters for a specific module:

```
Switch# show interfaces counters trunk module 1

Port        TrunkFramesTx  TrunkFramesRx  WrongEncap
Gi1/1                   0              0           0
Gi1/2                   0              0           0
Switch#
```

This example shows how to display the number of packets that are discarded due to suppression:

```
Switch# show interfaces counters storm-control

Multicast Suppression : Enabled

Port        BcastSuppLevel  TotalSuppressionDiscards
Fa5/35             10.00%                   6278550
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces capabilities | Displays the interface capabilities for an interface or for all the interfaces on a switch. |

# show interfaces description

To display a description and status of an interface, use the **show interfaces description** command.

**show interfaces** [*interface*] **description**

## Syntax Description

| | |
|---|---|
| *interface* | (Optional) Type of interface. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display information for all interfaces:

```
Switch# show interfaces description
 Interface Status         Protocol Description
 PO0/0     admin down     down     First interface
 PO0/1     admin down     down
 Gi1/1     up             up       GigE to server farm
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **description** (refer to Cisco IOS documentation) | Includes a specific description about the digital signal processor (DSP) interface. |

# show interfaces link

To display how long a cable has been disconnected from an interface, use the **show interfaces link** command:

**show interfaces link** [**module** *mod_num*]

**Syntax Description**

| | |
|---|---|
| **module** *mod_num* | (Optional) Limits the display to interfaces on a module. |

**Defaults**

This command has no default settings.

**Command Modes**

Privileged EXEC mode

**Command History**

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

**Usage Guidelines**

If the interface state is up, the command displays 0:00. If the interface state is down, the time (in hours, minutes, and seconds) is displayed.

**Examples**

This example shows how to display active link-level information:

```
Switch# show interfaces link

Port    Name               Down Time
Gi1/1                       00:00:00
Gi1/2                       00:00:00
Gi3/1                    00:00:00
Gi3/2                    00:00:00
Fa4/1                       00:00:00
Fa4/2                       00:00:00
Fa4/3                       00:00:00
Fa4/4                       00:00:00
```

This example shows how to display inactive link-level information:

```
Switch# show interfaces link

Port    Name               Down Time
Gi3/4                      1 minute 28 secs
Gi3/5                      1 minute 28 secs
Gi3/6                      1 minute 28 secs
Gi4/1                      1 minute 28 secs
```

In this example, the cable has been disconnected from the port for 1 minute and 28 seconds.

# show interfaces mtu

To display the maximum transmission unit (MTU) size of all the physical interfaces and SVIs on the switch, use the **show interfaces mtu** command.

**show interfaces mtu** [**module** *mod*]

## Syntax Description

| | |
|---|---|
| **module** *mod* | (Optional) Limits the display to interfaces on a specific module. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the MTU size for all interfaces on module 1:

```
Switch> show interfaces mtu module 1

Port     Name                MTU
Gi1/1                        1500
Gi1/2                        1500
Switch>
```

## Related Commands

| Command | Description |
|---|---|
| mtu | Enables jumbo frames on an interface by adjusting the maximum size of a packet or maximum transmission unit (MTU). |

# show interfaces private-vlan mapping

To display PVLAN mapping information for VLAN SVIs, use the **show interfaces private-vlan mapping** command.

**show interfaces private-vlan mapping** [**active**]

## Syntax Description

| | |
|---|---|
| **active** | (Optional) Displays active interfaces only. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command displays SVI information only.

## Examples

This example shows how to display PVLAN mapping information:

```
Switch# show interfaces private-vlan mapping
Interface Secondary VLAN Type
--------- -------------- -----------------
vlan2     301            isolated
vlan2     302            isolated
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **private-vlan** | Configures private VLANs and the association between a private VLAN and a secondary VLAN. |
| **private-vlan mapping** | Creates a mapping between the primary and the secondary VLANs so that both share the same primary VLAN SVI. |

# show interfaces status

To display the interface status or a list of interfaces in error-disabled state, use the **show interfaces status** command.

**show interfaces status** [**err-disabled** | **inactive** ] [**module** {*module*}]

## Syntax Description

| | |
|---|---|
| **err-disabled** | (Optional) Displays interfaces in error-disabled state. |
| **inactive** | (Optional) Displays interfaces in inactive state. |
| **module** *module* | (Optional) Displays interfaces on a specific module. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(40)SG | Support for WS-X4606-10GE-E Twin Gigabit convertor introduced. |

## Examples

This example shows how to display the status of all interfaces:

```
Switch# show interfaces status

Port    Name               Status     Vlan       Duplex Speed Type
Gi1/1                      disabled   routed       full  1000 missing
Gi1/2                      notconnect 1            full  1000 unknown (4)
Fa5/1                      disabled   routed       auto  auto 10/100BaseTX
Fa5/2                      disabled   routed       auto  auto 10/100BaseTX
Fa5/3                      disabled   routed       auto  auto 10/100BaseTX
Fa5/4                      disabled   routed       auto  auto 10/100BaseTX
...
Fa5/15                     disabled   routed       auto  auto 10/100BaseTX
Fa5/16                     disabled   routed       auto  auto 10/100BaseTX
Fa5/17                     disabled   routed       auto  auto 10/100BaseTX
Switch#
```

This example shows how to display the status of interfaces in an error-disabled state:

```
Switch# show interfaces status err-disabled

Port    Name               Status       Reason
Fa9/4                      notconnect   link-flap

informational error message when the timer expires on a cause
-------------------------------------------------------------

5d04h:%PM-SP-4-ERR_RECOVER:Attempting to recover from link-flap err-disable state on Fa9/4
Switch#
```

This example shows how to display the Gigabit Ethernet interfaces on a WS-X4606-10GE-E using the TwinGig Convertor:

```
Switch# show interfaces status module 1
Port Name Status Vlan Duplex Speed Type
Te1/1 inactive 1 full 10G No X2
Te1/2 inactive 1 full 10G No X2
Te1/3 inactive 1 full 10G No X2
Te1/4 notconnect 1 full 10G No X2
Te1/5 notconnect 1 full 10G No X2
Te1/6 notconnect 1 full 10G No X2
Gi1/7 notconnect 1 full 1000 No Gbic
Gi1/8 notconnect 1 full 1000 No Gbic
Gi1/9 notconnect 1 full 1000 No Gbic
Gi1/10 notconnect 1 full 1000 No Gbic
Gi1/11 notconnect 1 full 1000 No Gbic
Gi1/12 notconnect 1 full 1000 No Gbic
Gi1/13 inactive 1 full 1000 No Gbic
Gi1/14 inactive 1 full 1000 No Gbic
Gi1/15 inactive 1 full 1000 No Gbic
Gi1/16 inactive 1 full 1000 No Gbic
Gi1/17 inactive 1 full 1000 No Gbic
Gi1/18 inactive 1 full 1000 No Gbic
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| errdisable detect | Enables error-disable detection. |
| hw-module port-group | Selects either Gigabit Ethernet or Ten Gigabit Ethernet interfaces on your module. |
| show errdisable recovery | Displays error disable recovery timer information. |

# show interfaces switchport

To display the administrative and operational status of a switching (nonrouting) port, use the **show interfaces switchport** command.

**show interfaces** [*interface-id*] **switchport** [**module** *mod*]

## Syntax Description

| | |
|---|---|
| *interface-id* | (Optional) Interface ID for the physical port. |
| **module** *mod* | (Optional) Limits the display to interfaces on the specified module; valid values are from 1 to 6. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | Support for per-interface display. |
| 12.2(18)EW | Support for displaying the status of native VLAN tagging in the command output. |

## Examples

This example shows how to display switch-port information using the **begin** output modifier:

```
Switch# show interfaces switchport | include VLAN
Name: Fa5/6
Access Mode VLAN: 200 (VLAN0200)
Trunking Native Mode VLAN: 1 (default)
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: ALL
Switch#
```

This example shows how to display switch-port information for module 1:

```
Switch# show interfaces switchport module 1
Name:Gi1/1
Switchport:Enabled
Administrative Mode:dynamic auto
Operational Mode:down
Administrative Trunking Encapsulation:negotiate
Negotiation of Trunking:On
Access Mode VLAN:1 (default)
Trunking Native Mode VLAN:1 (default)
Administrative private-vlan host-association:none
Administrative private-vlan mapping:none
Operational private-vlan:none
Trunking VLANs Enabled:ALL
Pruning VLANs Enabled:2-1001

Name:Gi1/2
Switchport:Enabled
```

```
Administrative Mode:dynamic auto
Operational Mode:down
Administrative Trunking Encapsulation:negotiate
Negotiation of Trunking:On
Access Mode VLAN:1 (default)
Trunking Native Mode VLAN:1 (default)
Administrative private-vlan host-association:none
Administrative private-vlan mapping:none
Operational private-vlan:none
Trunking VLANs Enabled:ALL
Pruning VLANs Enabled:2-1001
Switch#
```

This example shows how to display the status of native VLAN tagging on the port:

```
Switch# show interfaces f3/1 switchport
show interface f3/1 switchport
Name: Fa3/1
Switchport: Enabled
Administrative Mode: private-vlan trunk promiscuous
Operational Mode: private-vlan trunk promiscuous
Administrative Trunking Encapsulation: negotiate
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
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: 1
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: 1
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings:
    10 (VLAN0010) 100 (VLAN0100)
Operational private-vlan:
  10 (VLAN0010) 100 (VLAN0100)
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
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces capabilities | Displays the interface capabilities for an interface or for all the interfaces on a switch. |
| show interfaces counters | Displays the traffic on the physical interface. |

# show interfaces transceiver

To display diagnostic-monitoring data for all interfaces that have transceivers installed, use the **show interfaces transceiver** command.

**show interfaces** {{[*int_name*] **transceiver** {[**detail**]} | {**transceiver** [**module** *mod*] | **detail** [**module** *mod*]}}

## Syntax Description

| | |
|---|---|
| *int_name* | (Optional) Interface. |
| **detail** | (Optional) Displays the calibrated values and the A2D readouts if the readout values differ from the calibrated values. Also displays the high-alarm, high-warning, low-warning, and low-alarm thresholds. |
| **module** *mod* | (Optional) Limits the display to interfaces on a specific module. |

## Defaults

The noninterface-specific versions of the **show interfaces transceiver** command are enabled by default.

The interface-specific versions of these commands are enabled by default if the specified interface has a transceiver (GBIC or SFP) that is configured for diagnostic monitoring, and the transceiver is in a module that supports diagnostic monitoring.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(20)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(18)EW | Support for the **calibration** keyword was withdrawn. |

## Usage Guidelines

The **show interfaces transceiver** command provides useful information under the following conditions:

- At least one transceiver is installed on a chassis that is configured for diagnostic monitoring.
- The transceiver is in a module that supports diagnostic monitoring.

If you notice that the alarm and warning flags have been set on a transceiver, reenter the command to confirm.

## Examples

This example shows how to display diagnostic monitoring data for all interfaces with transceivers installed on the switch:

```
Switch# 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).
                                            Optical   Optical
             Temperature  Voltage  Current   Tx Power  Rx Power
    Port     (Celsius)    (Volts)  (mA)      (dBm)     (dBm)
    -------  -----------  -------  --------  --------  --------
    Gi1/1      48.1       3.30       0.0       8.1 ++   N/A
    Gi1/2      33.0       3.30       1.8     -10.0     -36.9
    Gi2/1      43.7       5.03      50.6 +   -16.7 --   N/A
    Gi2/2      39.2       5.02      25.7       0.8      N/A
Switch#
```

**Note** The value for the Optical Tx Power (in dBm) equals ten times log (Tx Power in mW). If the Tx Power value is 3 mW, then the Optical Tx Power value equals 10 * log (3), which equals 10 * .477 or 4.77 dBm. The Optical Rx Power value behaves similarly. If the Tx Power or the Rx Power is zero, then its dBm value is undefined and is shown as N/A (not applicable).

This example shows how to display detailed diagnostic monitoring data, including calibrated values, alarm and warning thresholds, A2D readouts, and alarm and warning flags. The A2D readouts are reported separately in parentheses only if they differ from the calibrated values:

```
Switch# show interfaces transceiver detail
    mA: milliamperes, dBm: decibels (milliwatts), NA or 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 calibrated.

                           High Alarm  High Warn  Low Warn   Low Alarm
           Temperature     Threshold   Threshold  Threshold  Threshold
    Port   (Celsius)       (Celsius)   (Celsius)  (Celsius)  (Celsius)
    ------ ---------------- ----------  ---------  ---------  ---------
    Gi1/1   48.1            100.0       100.0        0.0        0.0
    Gi1/2   34.9            100.0       100.0        0.0        0.0
    Gi2/1   43.5             70.0        60.0        5.0        0.0
    Gi2/2   39.1             70.0        60.0        5.0        0.0

                           High Alarm  High Warn  Low Warn   Low Alarm
           Voltage         Threshold   Threshold  Threshold  Threshold
    Port   (Volts)          (Volts)     (Volts)    (Volts)    (Volts)
    -------  ------------    ----------  ---------  ---------  ---------
    Gi1/1  3.30               6.50        6.50        N/A        N/A
    Gi1/2  3.30               6.50        6.50        N/A        N/A
    Gi2/1  5.03               5.50        5.25       4.75       4.50
    Gi2/2  5.02               5.50        5.25       4.75       4.50

                           High Alarm  High Warn  Low Warn   Low Alarm
           Current         Threshold   Threshold  Threshold  Threshold
    Port   (milliamperes)  (mA)        (mA)       (mA)       (mA)
    -------  --------------  ----------  ---------  ---------  ---------
    Gi1/1    0.0           130.0       130.0        N/A        N/A
    Gi1/2    1.7           130.0       130.0        N/A        N/A
    Gi2/1   50.6      +     60.0        40.0        10.0        5.0
    Gi2/2   25.8           60.0        40.0        10.0        5.0
```

```
          Optical            High Alarm  High Warn  Low Warn   Low Alarm
          Transmit Power     Threshold   Threshold  Threshold  Threshold
Port      (dBm)              (dBm)       (dBm)      (dBm)      (dBm)
--------  -----------------  ----------  ---------  ---------  ---------
Gi1/1       8.1          ++      8.1         8.1        N/A        N/A
Gi1/2      -9.8                 8.1         8.1        N/A        N/A
Gi2/1     -16.7 (-13.0) --      3.4         3.2        -0.3       -0.5
Gi2/2       0.8 (  5.1)         3.4         3.2        -0.3       -0.5

          Optical            High Alarm  High Warn  Low Warn   Low Alarm
          Receive Power      Threshold   Threshold  Threshold  Threshold
Port      (dBm)              (dBm)       (dBm)      (dBm)      (dBm)
--------  -----------------  ----------  ---------  ---------  ---------
Gi1/1      N/A                 8.1         8.1        N/A        N/A
Gi1/2     -30.9                8.1         8.1        N/A        N/A
Gi2/1      N/A  (-28.5)         5.9        -6.7       -28.5      -28.5
Gi2/2      N/A  (-19.5)         5.9        -6.7       -28.5      -28.5
Switch#
```

This example shows how to display the monitoring data for the interfaces that have transceivers installed on module 2:

```
Switch# show interfaces transceiver module 2
    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).

                                          Optical   Optical
          Temperature  Voltage  Current   Tx Power  Rx Power
Port      (Celsius)    (Volts)  (mA)      (dBm)     (dBm)
--------  -----------  -------  --------  --------  --------
Gi2/1       43.7       5.03      50.6 +   -16.7 --   N/A
Gi2/2       39.2       5.02      25.7       0.8      N/A
Switch#
```

This example shows how to display the detailed monitoring data for the interfaces that have transceivers installed on module 2:

```
Switch# show interfaces transceiver detail module 2
    mA: milliamperes, dBm: decibels (milliwatts), NA or 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 calibrated.

                           High Alarm  High Warn  Low Warn   Low Alarm
         Temperature       Threshold   Threshold  Threshold  Threshold
Port      (Celsius)        (Celsius)   (Celsius)  (Celsius)  (Celsius)
--------  ----------------  ----------  ---------  ---------  ---------
Gi2/1      43.5               70.0        60.0        5.0        0.0
Gi2/2      39.1               70.0        60.0        5.0        0.0

                           High Alarm  High Warn  Low Warn   Low Alarm
          Voltage          Threshold   Threshold  Threshold  Threshold
Port      (Volts)          (Volts)     (Volts)    (Volts)    (Volts)
--------  ---------------  ----------  ---------  ---------  ---------
Gi2/1     5.03               5.50        5.25       4.75       4.50
Gi2/2     5.02               5.50        5.25       4.75       4.50
```

```
                                 High Alarm  High Warn  Low Warn   Low Alarm
           Current               Threshold   Threshold  Threshold  Threshold
Port       (milliamperes)        (mA)        (mA)       (mA)       (mA)
-------  ------------------  ----------  ---------  ---------  ---------
Gi2/1     50.6          +       60.0        40.0       10.0        5.0
Gi2/2     25.8                  60.0        40.0       10.0        5.0

           Optical               High Alarm  High Warn  Low Warn   Low Alarm
           Transmit Power        Threshold   Threshold  Threshold  Threshold
Port       (dBm)                 (dBm)       (dBm)      (dBm)      (dBm)
-------  ------------------  ----------  ---------  ---------  ---------
Gi2/1    -16.7 (-13.0) --        3.4         3.2        -0.3       -0.5
Gi2/2      0.8 (  5.1)           3.4         3.2        -0.3       -0.5

           Optical               High Alarm  High Warn  Low Warn   Low Alarm
           Receive Power         Threshold   Threshold  Threshold  Threshold
Port       (dBm)                 (dBm)       (dBm)      (dBm)      (dBm)
-------  ------------------  ----------  ---------  ---------  ---------
Gi2/1     N/A  (-28.5)            5.9        -6.7       -28.5      -28.5
Gi2/2     N/A  (-19.5)            5.9        -6.7       -28.5      -28.5
Switch#
```

This example shows how to display the monitoring data for the transceivers on interface Gi1/2:

```
Switch# show interfaces g1/2 transceiver
    ITU Channel 23 (1558.98 nm),
    Transceiver is externally calibrated.
    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).

                                                Optical   Optical
           Temperature  Voltage  Current      Tx Power  Rx Power
Port       (Celsius)    (Volts)  (mA)         (dBm)     (dBm)
-------  -----------  -------  --------     --------  --------
Gi2/1       43.7       5.03      50.6 +     -16.7 --   N/A
Switch#
```

This example shows how to display detailed the monitoring data for the transceivers on interface Gi1/2:

```
Switch# show interfaces g1/2 transceiver detail
    ITU Channel 23 (1558.98 nm),
    Transceiver is externally calibrated.
    mA: milliamperes, dBm: decibels (milliwatts), NA or 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 calibrated.

                                 High Alarm  High Warn  Low Warn   Low Alarm
          Temperature            Threshold   Threshold  Threshold  Threshold
Port      (Celsius)              (Celsius)   (Celsius)  (Celsius)  (Celsius)
------- ------------------  ----------  ---------  ---------  ---------
Gi2/1     43.5                  70.0        60.0        5.0        0.0

                                 High Alarm  High Warn  Low Warn   Low Alarm
           Voltage               Threshold   Threshold  Threshold  Threshold
Port       (Volts)               (Volts)     (Volts)    (Volts)    (Volts)
-------  ---------------    ----------  ---------  ---------  ---------
Gi2/1    5.03                  5.50        5.25       4.75       4.50
```

```
                                 High Alarm  High Warn  Low Warn   Low Alarm
           Current               Threshold   Threshold  Threshold  Threshold
Port       (milliamperes)        (mA)        (mA)       (mA)       (mA)
-------  ------------------  ----------  ---------  ---------  ---------
Gi2/1     50.6          +       60.0        40.0       10.0        5.0

           Optical               High Alarm  High Warn  Low Warn   Low Alarm
           Transmit Power        Threshold   Threshold  Threshold  Threshold
Port       (dBm)                 (dBm)       (dBm)      (dBm)      (dBm)
-------  ------------------  ----------  ---------  ---------  ---------
Gi2/1    -16.7 (-13.0) --       3.4         3.2        -0.3       -0.5

           Optical               High Alarm  High Warn  Low Warn   Low Alarm
           Receive Power         Threshold   Threshold  Threshold  Threshold
Port       (dBm)                 (dBm)       (dBm)      (dBm)      (dBm)
-------  ------------------  ----------  ---------  ---------  ---------
Gi2/1     N/A  (-28.5)           5.9         -6.7       -28.5      -28.5
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show idprom** | Displays the IDPROMs for the chassis. |
| **show interfaces status** | Displays the interface status or a list of interfaces in error-disabled state. |

# show interfaces trunk

To display port and module interface-trunk information, use the **show interfaces trunk** command.

**show interfaces trunk** [**module** *mod*]

## Syntax Description

| | |
|---|---|
| **module** *mod* | (Optional) Limits the display to interfaces on the specified module; valid values are from 1 to 6. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If you do not specify a keyword, only information for trunking ports is displayed.

## Examples

This example shows how to display interface-trunk information for module 5:

```
Switch# show interfaces trunk module 5

Port      Mode         Encapsulation  Status        Native vlan
Fa5/1     routed       negotiate      routed        1
Fa5/2     routed       negotiate      routed        1
Fa5/3     routed       negotiate      routed        1
Fa5/4     routed       negotiate      routed        1
Fa5/5     routed       negotiate      routed        1
Fa5/6     off          negotiate      not-trunking  10
Fa5/7     off          negotiate      not-trunking  10
Fa5/8     off          negotiate      not-trunking  1
Fa5/9     desirable    n-isl          trunking      1
Fa5/10    desirable    negotiate      not-trunking  1
Fa5/11    routed       negotiate      routed        1
Fa5/12    routed       negotiate      routed        1
...
Fa5/48    routed       negotiate      routed        1

Port      Vlans allowed on trunk
Fa5/1     none
Fa5/2     none
Fa5/3     none
Fa5/4     none
Fa5/5     none
Fa5/6     none
Fa5/7     none
Fa5/8     200
Fa5/9     1-1005
```

```
Fa5/10    none
Fa5/11    none
Fa5/12    none

Fa5/48    none

Port      Vlans allowed and active in management domain
Fa5/1     none
Fa5/2     none
Fa5/3     none
Fa5/4     none
Fa5/5     none
Fa5/6     none
Fa5/7     none
Fa5/8     200
Fa5/9     1-6,10,20,50,100,152,200,300,303-305,349-351,400,500,521,524,570,801-8
02,850,917,999,1002-1005
Fa5/10    none
Fa5/11    none
Fa5/12    none


Fa5/48    none

Port      Vlans in spanning tree forwarding state and not pruned
Fa5/1     none
Fa5/2     none
Fa5/3     none
Fa5/4     none
Fa5/5     none
Fa5/6     none
Fa5/7     none
Fa5/8     200
Fa5/9     1-6,10,20,50,100,152,200,300,303-305,349-351,400,500,521,524,570,801-8
02,850,917,999,1002-1005
Fa5/10    none
Fa5/11    none


Fa5/48    none
Switch#
```

This example shows how to display trunking information for active trunking ports:

```
Switch# show interfaces trunk

Port      Mode         Encapsulation  Status        Native vlan
Fa5/9     desirable    n-isl          trunking      1

Port      Vlans allowed on trunk
Fa5/9     1-1005

Port      Vlans allowed and active in management domain
Fa5/9     1-6,10,20,50,100,152,200,300,303-305,349-351,400,500,521,524,570,801-8
02,850,917,999,1002-1005

Port      Vlans in spanning tree forwarding state and not pruned
Fa5/9     1-6,10,20,50,100,152,200,300,303-305,349-351,400,500,521,524,570,801-8
02,850,917,999,1002-1005
Switch#
```

# show ip arp inspection

To show the status of dynamic ARP inspection for a specific range of VLANs, use the **show ip arp inspection** command.

**show ip arp inspection** {[**statistics**] **vlan** *vlan-range* | **interfaces** [*interface-name*]}

## Syntax Description

| | |
|---|---|
| **statistics** | (Optional) Displays statistics for the following types of packets that have been processed by this feature: forwarded, dropped, MAC validation failure, and IP validation failure. |
| **vlan** *vlan-range* | (Optional) When used with the **statistics** keyword, displays the statistics for the selected range of VLANs. Without the **statistics** keyword, displays the configuration and operating state of DAI for the selected range of VLANs. |
| **interfaces** *interface-name* | (Optional) Displays the trust state and the rate limit of ARP packets for the provided interface. When the interface name is not specified, the command displays the trust state and rate limit for all applicable interfaces in the system. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the statistics of packets that have been processed by DAI for VLAN 3:

```
Switch# show ip arp inspection statistics vlan 3

 Vlan      Forwarded        Dropped     DHCP Drops     ACL Drops
 ----      ---------        -------     ----------     ----------
    3          31753         102407         102407              0

 Vlan   DHCP Permits    ACL Permits   Source MAC Failures
 ----   ------------    -----------   -------------------
    3          31753              0                     0

 Vlan   Dest MAC Failures   IP Validation Failures
 ----   -----------------   ----------------------
    3                  0                        0
Switch#
```

This example shows how to display the statistics of packets that have been processed by DAI for all active VLANs:

```
Switch# show ip arp inspection statistics

 Vlan      Forwarded        Dropped     DHCP Drops     ACL Drops
 ----      ---------        -------     ----------     ----------
    1              0              0              0             0
    2              0              0              0             0
    3          68322         220356         220356             0
    4              0              0              0             0
  100              0              0              0             0
  101              0              0              0             0
 1006              0              0              0             0
 1007              0              0              0             0

 Vlan   DHCP Permits    ACL Permits   Source MAC Failures
 ----   ------------    -----------   -------------------
    1              0              0                     0
    2              0              0                     0
    3          68322              0                     0
    4              0              0                     0
  100              0              0                     0
  101              0              0                     0
 1006              0              0                     0
 1007              0              0                     0

 Vlan   Dest MAC Failures   IP Validation Failures
 ----   -----------------   ----------------------
    1                  0                        0
    2                  0                        0
    3                  0                        0
    4                  0                        0
  100                  0                        0
  101                  0                        0
 1006                  0                        0
 1007                  0                        0
Switch#
```

This example shows how to display the configuration and operating state of DAI for VLAN 1:

```
Switch# show ip arp inspection vlan 1
Source Mac Validation      : Disabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled

 Vlan     Configuration    Operation   ACL Match          Static ACL
 ----     -------------    ---------   ---------          ----------
    1     Enabled          Active

 Vlan     ACL Logging      DHCP Logging
 ----     -----------      ------------
    1     Deny             Deny
Switch#
```

This example shows how to display the trust state of Fast Ethernet interface 6/1:

```
Switch# show ip arp inspection interfaces fastEthernet 6/1
Interface        Trust State     Rate (pps)    Burst Interval
 ---------------  -----------     ----------    --------------
 Fa6/1            Untrusted              20                 5
Switch#
```

This example shows how to display the trust state of the interfaces on the switch:

```
Switch# show ip arp inspection interfaces
Interface        Trust State     Rate (pps)
 ---------------  -----------     ----------
 Gi1/1            Untrusted              15
 Gi1/2            Untrusted              15
 Gi3/1            Untrusted              15
 Gi3/2            Untrusted              15
 Fa3/3            Trusted              None
 Fa3/4            Untrusted              15
 Fa3/5            Untrusted              15
 Fa3/6            Untrusted              15
 Fa3/7            Untrusted              15
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| clear ip arp inspection log | Clears the status of the log buffer. |
| show ip arp inspection log | Displays the status of the log buffer. |

# show ip arp inspection log

To show the status of the log buffer, use the **show ip arp inspection log** command.

**show ip arp inspection log**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the current contents of the log buffer before and after the buffers are cleared:

```
Switch# show ip arp inspection log
Total Log Buffer Size : 10
Syslog rate : 0 entries per 10 seconds.

 Interface        Vlan   Sender MAC         Sender IP        Num of Pkts
 ---------------  -----  -----------------  ---------------  -----------
Fa6/3             1      0002.0002.0002  1.1.1.2          1(12:02:52 UTC Fri Apr 25 2003)
Fa6/3             1      0002.0002.0002  1.1.1.3          1(12:02:52 UTC Fri Apr 25 2003)
Fa6/3             1      0002.0002.0002  1.1.1.4          1(12:02:52 UTC Fri Apr 25 2003)
Fa6/3             1      0002.0002.0002  1.1.1.5          1(12:02:52 UTC Fri Apr 25 2003)
Fa6/3             1      0002.0002.0002  1.1.1.6          1(12:02:52 UTC Fri Apr 25 2003)
Fa6/3             1      0002.0002.0002  1.1.1.7          1(12:02:52 UTC Fri Apr 25 2003)
Fa6/3             1      0002.0002.0002  1.1.1.8          1(12:02:52 UTC Fri Apr 25 2003)
Fa6/3             1      0002.0002.0002  1.1.1.9          1(12:02:52 UTC Fri Apr 25 2003)
Fa6/3             1      0002.0002.0002  1.1.1.10         1(12:02:52 UTC Fri Apr 25 2003)
Fa6/3             1      0002.0002.0002  1.1.1.11         1(12:02:52 UTC Fri Apr 25 2003)
    --             --          --                --        5(12:02:52 UTC Fri Apr 25 2003)
Switch#
```

This example shows how to clear the buffer with the **clear ip arp inspection log** command:

```
Switch# clear ip arp inspection log
Switch# show ip arp inspection log
Total Log Buffer Size : 10
Syslog rate : 0 entries per 10 seconds.
No entries in log buffer.
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| arp access-list | Defines an ARP access list or adds clauses at the end of a predefined list. |
| clear ip arp inspection log | Clears the status of the log buffer. |

# show ip cef vlan

To view IP CEF VLAN interface status and configuration information and display the prefixes for a specific interface, use the **show ip cef vlan** command.

**show ip cef vlan** *vlan_num* [**detail**]

## Syntax Description

| | |
|---|---|
| *vlan_num* | Number of the VLAN. |
| **detail** | (Optional) Displays detailed information. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the prefixes for a specific VLAN:

```
Switch# show ip cef vlan 1003
Prefix              Next Hop            Interface
0.0.0.0/0           172.20.52.1         FastEthernet3/3
0.0.0.0/32          receive
10.7.0.0/16         172.20.52.1         FastEthernet3/3
10.16.18.0/23       172.20.52.1         FastEthernet3/3
Switch#
```

This example shows how to display detailed IP CEF information for a specific VLAN:

```
Switch# show ip cef vlan 1003 detail
IP Distributed CEF with switching (Table Version 2364), flags=0x0
  1383 routes, 0 reresolve, 0 unresolved (0 old, 0 new)
  1383 leaves, 201 nodes, 380532 bytes, 2372 inserts, 989 invalidations
  0 load sharing elements, 0 bytes, 0 references
  universal per-destination load sharing algorithm, id 9B6C9823
  3 CEF resets, 0 revisions of existing leaves
  refcounts:  54276 leaf, 51712 node

Adjacency Table has 5 adjacencies
Switch#
```

# show ip dhcp snooping

To display the DHCP snooping configuration, use the **show ip dhcp snooping** command.

**show ip dhcp snooping**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EWA | Support for option 82 on untrusted ports was added. |

## Examples

This example shows how to display the DHCP snooping configuration:

```
Switch# show ip dhcp snooping
Switch DHCP snooping is enabled
DHCP snooping is configured on following VLANs:
500,555
DHCP snooping is operational on following VLANs:
500,555
DHCP snooping is configured on the following L3 Interfaces:
Insertion of option 82 is enabled
circuit-id default format: vlan-mod-port
remote-id: switch123 (string)
Option 82 on untrusted port is not allowed Verification of hwaddr field is enabled DHCP
snooping trust/rate is configured on the following Interfaces:
Interface Trusted Rate limit (pps)
------------------------ ------- ----------------
FastEthernet5/1 yes 100
Custom circuit-ids:
VLAN 555: customer-555
FastEthernet2/1 no unlimited
Custom circuit-ids:
VLAN 500: customer-500
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping limit rate | Configures the number of the DHCP messages that an interface can receive per second. |

| Command | Description |
|---|---|
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |

# show ip dhcp snooping binding

To display the DHCP snooping binding entries, use the **show ip dhcp snooping binding** command.

**show ip dhcp snooping binding** [*ip-address*] [*mac-address*] [**vlan** *vlan_num*] [**interface** *interface_num*]

## Syntax Description

| | |
|---|---|
| *ip-address* | (Optional) IP address for the binding entries. |
| *mac-address* | (Optional) MAC address for the binding entries. |
| **vlan** *vlan_num* | (Optional) Specifies a VLAN. |
| **interface** *interface_num* | (Optional) Specifies an interface. |

## Defaults

If no argument is specified, the switch will display the entire DHCP snooping binding table.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

DHCP snooping is enabled on a VLAN only if both the global snooping and the VLAN snooping are enabled.

To configure a range of VLANs, use the optional *last_vlan* argument to specify the end of the VLAN range.

## Examples

This example shows how to display the DHCP snooping binding entries for a switch:

```
Switch# show ip dhcp snooping binding

MacAddress      IP Address     Lease (seconds)     Type               VLAN     Interface
-----------     -----------    ----------------    -------------      -----    ------------
0000.0100.0201   10.0.0.1         1600                dhcp-snooping       100       FastEthernet3/1
Switch#
```

This example shows how to display an IP address for DHCP snooping binding entries:

```
Switch# show ip dhcp snooping binding 172.100.101.102

MacAddress      IP Address       Lease (seconds)     Type               VLAN     Interface
-----------     -----------      ----------------    -------------      -----    ------------
0000.0100.0201    172.100.101.102   1600                dhcp-snooping       100       FastEthernet3/1
Switch#
```

This example shows how to display the MAC address for the DHCP snooping binding entries:

```
Switch# show ip dhcp snooping binding 55.5.5.2 0002.b33f.3d5f

MacAddress          IpAddress        Lease(sec)  Type              VLAN  Interface
------------------  ---------------  ----------  -------------     ----  --------------------
00:02:B3:3F:3D:5F   55.5.5.2         492         dhcp-snooping      99 FastEthernet6/36
Switch#
```

This example shows how to display the DHCP snooping binding entries' MAC address for a specific VLAN:

```
Switch# show ip dhcp snooping binding 55.5.5.2 0002.b33f.3d5f vlan 99

MacAddress          IpAddress        Lease(sec)  Type              VLAN  Interface
------------------  ---------------  ----------  -------------     ----  --------------------
00:02:B3:3F:3D:5F   55.5.5.2         479         dhcp-snooping     99    FastEthernet6/36
Switch#
```

This example shows how to display the dynamic DHCP snooping binding entries:

```
Switch# show ip dhcp snooping binding dynamic

MacAddress      IP Address     Lease (seconds)      Type             VLAN     Interface
-----------     -----------    ----------------     ------------     -----    ------------
0000.0100.0201   10.0.0.1         1600                dhcp-snooping       100       FastEthernet3/1
Switch#
```

This example shows how to display the DHCP snooping binding entries on VLAN 100:

```
Switch# show ip dhcp snooping binding vlan 100'

MacAddress      IP Address     Lease (seconds)     Type             VLAN     Interface
-----------     -----------    ----------------    ------------     -----    ------------
0000.0100.0201   10.0.0.1         1600               dhcp-snooping       100       FastEthernet3/1
Switch#
```

This example shows how to display the DHCP snooping binding entries on Ethernet interface 0/1:

```
Switch# show ip dhcp snooping binding interface fastethernet3/1

MacAddress      IP Address     Lease (seconds)     Type             VLAN     Interface
-----------     -----------    ----------------    ------------     -----    ------------
0000.0100.0201   10.0.0.1         1600               dhcp-snooping       100       FastEthernet3/1
Switch#
```

Table 2-19 describes the fields in the **show ip dhcp snooping** command output.

***Table 2-19 show ip dhcp snooping Command Output***

| Field | Description |
|---|---|
| Mac Address | Client hardware MAC address. |
| IP Address | Client IP address assigned from the DHCP server. |
| Lease (seconds) | IP address lease time. |
| Type | Binding type; statically configured from CLI or dynamically learned. |
| VLAN | VLAN number of the client interface. |
| Interface | Interface that connects to the DHCP client host. |

**Related Commands**

| Command | Description |
|---|---|
| **ip dhcp snooping information option** | Enables DHCP option 82 data insertion. |
| **ip dhcp snooping limit rate** | Configures the number of the DHCP messages that an interface can receive per second. |
| **ip dhcp snooping trust** | Enables DHCP snooping on a trusted VLAN. |
| **ip dhcp snooping vlan** | Enables DHCP snooping on a VLAN or a group of VLANs. |
| **ip igmp snooping** | Enables IGMP snooping. |
| **ip igmp snooping vlan** | Enables IGMP snooping for a VLAN. |

# show ip dhcp snooping database

To display the status of the DHCP snooping database agent, use the **show ip dhcp snooping database** command.

**show ip dhcp snooping database** [**detail**]

## Syntax Description

| | |
|---|---|
| **detail** | (Optional) Provides additional operating state and statistics information. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | Added support of state and statistics information. |

## Examples

This example shows how to display the DHCP snooping database:

```
Switch# show ip dhcp snooping database
Agent URL :
Write delay Timer : 300 seconds
Abort Timer : 300 seconds

Agent Running : No
Delay Timer Expiry : Not Running
Abort Timer Expiry : Not Running

Last Succeded Time : None
Last Failed Time : None
Last Failed Reason : No failure recorded.

Total Attempts       :        0   Startup Failures :        0
Successful Transfers :        0   Failed Transfers :        0
Successful Reads     :        0   Failed Reads     :        0
Successful Writes    :        0   Failed Writes    :        0
Media Failures       :        0

Switch#
```

This example shows how to view additional operating statistics:

```
Switch# show ip dhcp snooping database detail
Agent URL : tftp://10.1.1.1/directory/file
Write delay Timer : 300 seconds
Abort Timer : 300 seconds

Agent Running : No
Delay Timer Expiry : 7 (00:00:07)
Abort Timer Expiry : Not Running

Last Succeded Time : None
Last Failed Time : 17:14:25 UTC Sat Jul 7 2001
Last Failed Reason : Unable to access URL.

Total Attempts       :       21   Startup Failures :        0
Successful Transfers :        0   Failed Transfers :       21
Successful Reads     :        0   Failed Reads     :        0
Successful Writes    :        0   Failed Writes    :       21
Media Failures       :        0

First successful access: Read

Last ignored bindings counters :
Binding Collisions    :        0   Expired leases    :        0
Invalid interfaces    :        0   Unsupported vlans :        0
Parse failures        :        0
Last Ignored Time : None

Total ignored bindings counters:
Binding Collisions    :        0   Expired leases    :        0
Invalid interfaces    :        0   Unsupported vlans :        0
Parse failures        :        0

Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping | Globally enables DHCP snooping. |
| ip dhcp snooping database | Stores the bindings that are generated by DHCP snooping. |
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping limit rate | Configures the number of the DHCP messages that an interface can receive per second. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip dhcp snooping vlan | Enables DHCP snooping on a VLAN or a group of VLANs. |

# show ip igmp interface

To view IP IGMP interface status and configuration information, use the **show ip igmp interface** command.

**show ip igmp interface** [**fastethernet** *slot/port* | **gigabitethernet** *slot/port* | **tengigabitethernet** *slot/port* | **null** *interface-number* | **vlan** *vlan_id*]

## Syntax Description

| | |
|---|---|
| **fastethernet** *slot/port* | (Optional) Specifies the Fast Ethernet interface and the number of the slot and port. |
| **gigabitethernet** *slot/port* | (Optional) Specifies the Gigabit Ethernet interface and the number of the slot and port; valid values are from 1 to 9. |
| **tengigabitethernet** *slot/port* | (Optional) Specifies the 10-Gigabit Ethernet interface and the number of the slot and port; valid values are from 1 to 2. |
| **null** *interface-number* | (Optional) Specifies the null interface and the number of the interface; the only valid value is **0**. |
| **vlan** *vlan_id* | (Optional) Specifies the VLAN and the number of the VLAN; valid values are from 1 to 4094. |

## Defaults

If you do not specify a VLAN, information for VLAN 1 is shown.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Added support for extended VLAN addresses. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Usage Guidelines

If you omit the optional arguments, the **show ip igmp interface** command displays information about all interfaces.

## Examples

This example shows how to view IGMP information for VLAN 200:

```
Switch# show ip igmp interface vlan 200
IGMP snooping is globally enabled
IGMP snooping is enabled on this Vlan
IGMP snooping immediate-leave is disabled on this Vlan
IGMP snooping mrouter learn mode is pim-dvmrp on this Vlan
IGMP snooping is running in IGMP-ONLY mode on this VLAN
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| clear ip igmp group | Deletes the IGMP group cache entries. |
| show ip igmp snooping mrouter | Displays information on the dynamically learned and manually configured multicast switch interfaces. |

# show ip igmp profile

To view all configured IGMP profiles or a specified IGMP profile, use the **show ip igmp profile** privileged EXEC command.

**show ip igmp profile** [*profile number*]

## Syntax Description

| | |
|---|---|
| *profile number* | (Optional) IGMP profile number to be displayed; valid ranges are from 1 to 4294967295. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(11b)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If no profile number is entered, all IGMP profiles are displayed.

## Examples

This example shows how to display IGMP profile 40:

```
Switch# show ip igmp profile 40
IGMP Profile 40
    permit
    range 233.1.1.1 233.255.255.255
Switch#
```

This example shows how to display all IGMP profiles:

```
Switch# 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
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip igmp profile | Creates an IGMP profile. |

# show ip igmp snooping

To display information on dynamically learned and manually configured VLAN switch interfaces, use the **show ip igmp snooping** command.

**show ip igmp snooping** [**querier** | **groups** | **mrouter**] [**vlan** *vlan_id*] *a.b.c.d* [*summary* | *sources* | *hosts*] [*count*]

## Syntax Description

| | |
|---|---|
| **querier** | (Optional) Specifies that the display will contain IP address and version information. |
| **groups** | (Optional) Specifies that the display will list VLAN members sorted by group IP addresses. |
| **mrouter** | (Optional) Specifies that the display will contain information on dynamically learned and manually configured multicast switch interfaces. |
| **vlan** *vlan_id* | (Optional) Specifies a VLAN; valid values are from 1 to 1001 and from 1006 to 4094. |
| *a.b.c.d* | Group or multicast IP address. |
| **summary** | (Optional) Specifies a display of detailed information for a v2 or v3 group. |
| **sources** | (Optional) Specifies a list of the source IPs for the specified group. |
| **hosts** | (Optional) Specifies a list of the host IPs for the specified group. |
| **count** | (Optional) Specifies a display of the total number of group addresses learned by the system on a global or per-VLAN basis. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | Support for extended addressing was added. |
| 12.1(20)EW | Added support to display configuration state for IGMPv3 explicit host tracking. |

## Usage Guidelines

You can also use the **show mac-address-table multicast** command to display the entries in the MAC address table for a VLAN that has IGMP snooping enabled.

You can display IGMP snooping information for VLAN interfaces by entering the **show ip igmp snooping** command.

## Examples

This example shows how to display the global snooping information on the switch:

```
Switch# show ip igmp snooping
Global IGMP Snooping configuration:
-----------------------------------
IGMP snooping             : Enabled
IGMPv3 snooping           : Enabled
Report suppression        : Enabled
TCN solicit query         : Disabled
TCN flood query count     : 2

Vlan 1:
--------
IGMP snooping                  : Enabled
IGMPv2 immediate leave         : Disabled
Explicit host tracking         : Enabled
Multicast router learning mode : pim-dvmrp
CGMP interoperability mode     : IGMP_ONLY

Vlan 2:
--------
IGMP snooping                  : Enabled
IGMPv2 immediate leave         : Disabled
Explicit host tracking         : Enabled
Multicast router learning mode : pim-dvmrp
CGMP interoperability mode     : IGMP_ONLY
Switch>
```

This example shows how to display the snooping information on VLAN 2:

```
Switch# show ip igmp snooping vlan 2
Global IGMP Snooping configuration:
-----------------------------------
IGMP snooping             : Enabled
IGMPv3 snooping           : Enabled
Report suppression        : Enabled
TCN solicit query         : Disabled
TCN flood query count     : 2

Vlan 2:
--------
IGMP snooping                  : Enabled
IGMPv2 immediate leave         : Disabled
Explicit host tracking         : Enabled
Multicast router learning mode : pim-dvmrp
CGMP interoperability mode     : IGMP_ONLY
Switch>
```

This example shows how to display IGMP querier information for all VLANs on a switch:

```
Switch# show ip igmp snooping querier
Vlan      IP Address     IGMP Version        Port
--------------------------------------------------
2         10.10.10.1     v2                  Router
3         172.20.50.22   v3                  Fa3/15
Switch>
```

This example shows how to display IGMP querier information for VLAN 5 when running IGMPv2:

```
Switch# show ip igmp snooping querier vlan 5
IP address               :5.5.5.10
IGMP version             :v2
Port                     :Fa3/1
Max response time        :10s
Switch>
```

This example shows how to display IGMP querier information for VLAN 5 when running IGMPv3:

```
Switch# show ip igmp snooping querier vlan 5
IP address               :5.5.5.10
IGMP version             :v3
Port                     :Fa3/1
Max response time        :10s
Query interval           :60s
Robustness variable      :2
Switch>
```

This example shows how to display snooping information for a specific group:

```
Switch# show ip igmp snooping group

Vlan      Group           Version     Ports
------------------------------------------------------------
2         224.0.1.40      v3          Router
2         224.2.2.2       v3          Fa6/2
Switch>
```

This example shows how to display the group's host types and ports in VLAN 1:

```
Switch# show ip igmp snooping group vlan 1
Vlan      Group           Host Type     Ports
------------------------------------------------------------
1         229.2.3.4      v3           fa2/1 fa2/3
1         224.2.2.2       v3           Fa6/2
Switch>
```

This example shows how to display the group's host types and ports in VLAN 1:

```
Switch# show ip igmp snooping group vlan 10 226.6.6.7
Vlan      Group           Version     Ports
------------------------------------------------------------
10        226.6.6.7       v3          Fa7/13, Fa7/14
Switch>
```

This example shows how to display the current state of a group with respect to a source IP address:

```
Switch# show ip igmp snooping group vlan 10 226.6.6.7 sources
Source information for group 226.6.6.7:
Timers: Expired sources are deleted on next IGMP General Query

SourceIP       Expires   Uptime    Inc Hosts Exc Hosts
------------------------------------------------------------
2.0.0.1        00:03:04  00:03:48  2         0
2.0.0.2        00:03:04  00:02:07  2         0
Switch>
```

This example shows how to display the current state of a group with respect to a host MAC address:

```
Switch# show ip igmp snooping group vlan 10 226.6.6.7 hosts
IGMPv3 host information for group 226.6.6.7
Timers: Expired hosts are deleted on next IGMP General Query

Host (MAC/IP)  Filter mode    Expires   Uptime    # Sources
-------------------------------------------------------------
175.1.0.29     INCLUDE        stopped   00:00:51       2
175.2.0.30     INCLUDE        stopped   00:04:14       2
Switch>
```

This example shows how to display summary information for a v3 group:

```
Switch# show ip igmp snooping group vlan 10 226.6.6.7 summary
Group Address (Vlan 10)         : 226.6.6.7
Host type                       : v3
Member Ports                    : Fa7/13, Fa7/14
Filter mode                     : INCLUDE
Expires                         : stopped
Sources                         : 2
Reporters (Include/Exclude)     : 2/0
Switch>
```

This example shows how to display multicast router information for VLAN 1:

```
Switch# show ip igmp snooping mrouter vlan 1
vlan            ports
-----+---------------------------------------
  1          Gi1/1,Gi2/1,Fa3/48,Router
Switch#
```

This example shows how to display the total number of group addresses learned by the system globally:

```
Switch# show ip igmp snooping group count
Total number of groups:   54
Switch>
```

This example shows how to display the total number of group addresses learned on VLAN 5:

```
Switch# show ip igmp snooping group vlan 5 count
Total number of groups:   30
Switch>
```

## Related Commands

| Command | Description |
|---|---|
| ip igmp snooping | Enable IGMP snooping. |
| ip igmp snooping vlan immediate-leave | Enable IGMP immediate-leave processing. |
| ip igmp snooping vlan mrouter | Configures a Layer 2 interface as a multicast router interface for a VLAN. |
| ip igmp snooping vlan static | Configures a Layer 2 interface as a member of a group. |
| show ip igmp interface | Displays the information about the IGMP-interface status and configuration. |
| show ip igmp snooping mrouter | Displays information on the dynamically learned and manually configured multicast switch interfaces. |
| show mac-address-table multicast | Displays information about the multicast MAC address table. |

# show ip igmp snooping membership

To display host membership information, use the **show ip igmp snooping membership** command.

**show ip igmp snooping membership** [**interface** *interface_num*] [**vlan** *vlan_id*] [**reporter** *a.b.c.d*] [**source** *a.b.c.d* **group** *a.b.c.d*]

## Syntax Description

| | |
|---|---|
| **interface** *interface_num* | (Optional) Displays IP address and version information of an interface. |
| **vlan** *vlan_id* | (Optional) Displays VLAN members sorted by group IP address of a VLAN; valid values are from 1 to 1001 and from 1006 to 4094. |
| **reporter** *a.b.c.d* | (Optional) Displays membership information for a specified reporter. |
| **source** *a.b.c.d* | (Optional) Specifies a reporter, source, or group IP address. |
| **group** *a.b.c.d* | (Optional) Displays all members of a channel (source, group), sorted by interface or VLAN. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(20)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Usage Guidelines

This command is valid only if explicit host tracking is enabled on the switch.

## Examples

This example shows how to display host membership for the Gigabit Ethernet interface 4/1:

```
Switch# show ip igmp snooping membership interface gigabitethernet4/1
#channels: 5
#hosts : 1
Source/Group Interface Reporter Uptime Last-Join Last-Leave

40.40.40.2/224.10.10.10 Gi4/1 20.20.20.20 00:23:37 00:06:50 00:20:30
40.40.40.4/224.10.10.10Gi4/1 20.20.20.20 00:39:42 00:09:17 -
Switch#
```

This example shows how to display host membership for VLAN 20 and group 224.10.10.10:

```
Switch# show ip igmp snooping membership vlan 20 source 40.40.40.2 group 224.10.10.10
#channels: 5
#hosts : 1
Source/Group Interface Reporter Uptime Last-Join Last-Leave

40.40.40.2/224.10.10.10 Gi4/1 20.20.20.20 00:23:37 00:06:50 00:20:30
Switch#
```

This example shows how to display host membership information for VLAN 20 and to delete the explicit host tracking:

```
Switch# show ip igmp snooping membership vlan 20
Snooping Membership Summary for Vlan 20
----------------------------------------
Total number of channels:5
Total number of hosts   :4

Source/Group                    Interface   Reporter            Uptime   Last-Join/
                                                                                 Last-Leave
-------------------------------------------------------------------------------------------------

40.0.0.1/224.1.1.1               Fa7/37    0002.4ba0.a4f6  00:00:04 00:00:04 /
                                                                                 -

40.0.0.2/224.1.1.1               Fa7/37    0002.fd80.f770   00:00:17 00:00:17 /
                                                                                 -

40.0.0.3/224.1.1.1               Fa7/36    20.20.20.20       00:00:04 00:00:04 /
                                                                                 -

40.0.0.4/224.1.1.1               Fa7/35    20.20.20.210     00:00:17 00:00:17 /
                                                                                 -

40.0.0.5/224.1.1.1               Fa7/37    0002.fd80.f770   00:00:17 00:00:17 /
                                                                                 -
Switch# clear ip igmp snooping membership vlan 20
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| clear ip igmp snooping membership | Clears the explicit host tracking database. |
| ip igmp snooping vlan explicit-tracking | Enables per-VLAN explicit host tracking. |
| show ip igmp snooping | Displays information on dynamically learned and manually configured VLAN switch interfaces. |

# show ip igmp snooping mrouter

To display information on the dynamically learned and manually configured multicast switch interfaces, use the **show ip igmp snooping mrouter** command.

**show ip igmp snooping mrouter** [{**vlan** *vlan-id*}]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-id* | (Optional) Specifies a VLAN; valid values are from 1 to 1001 and from 1006 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(19)EW | Added support for extended VLAN addresses. |

## Usage Guidelines

You can also use the **show mac-address-table multicast** command to display entries in the MAC address table for a VLAN that has IGMP snooping enabled.

You can display IGMP snooping information for the VLAN interfaces by entering the **show ip igmp interface vlan** *vlan-num* command.

## Examples

This example shows how to display snooping information for a specific VLAN:

```
Switch# show ip igmp snooping mrouter vlan 1
vlan            ports
-----+---------------------------------------
  1          Gi1/1,Gi2/1,Fa3/48,Switch
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **ip igmp snooping vlan mrouter** | Statically configures a Layer 2 interface as a multicast router interface for a VLAN. |
| **show ip igmp interface** | Displays the information about the IGMP-interface status and configuration. |
| **show mac-address-table multicast** | Displays information about the multicast MAC address table. |

# show ip igmp snooping vlan

To display information on the dynamically learned and manually configured VLAN switch interfaces, use the **show ip igmp snooping vlan** command.

**show ip igmp snooping vlan** *vlan_num*

## Syntax Description

| | |
|---|---|
| *vlan_num* | Number of the VLAN; valid values are from 1 to 1001 and from 1006 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended addressing was added. |

## Usage Guidelines

You can also use the **show mac-address-table multicast** command to display the entries in the MAC address table for a VLAN that has IGMP snooping enabled.

## Examples

This example shows how to display snooping information for a specific VLAN:

```
Switch# show ip igmp snooping vlan 2
vlan 2
----------
IGMP snooping is globally enabled
IGMP snooping TCN solicit query is globally enabled
IGMP snooping global TCN flood query count is 2
IGMP snooping is enabled on this Vlan
IGMP snooping immediate-leave is disabled on this Vlan
IGMP snooping mrouter learn mode is pim-dvmrp on this Vlan
IGMP snooping is running in IGMP_ONLY mode on this Vlan
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| ip igmp snooping | Enable IGMP snooping. |
| ip igmp snooping vlan immediate-leave | Enable IGMP immediate-leave processing. |
| ip igmp snooping vlan mrouter | Statically configures a Layer 2 interface as a multicast router interface for a VLAN. |
| ip igmp snooping vlan static | Configures a Layer 2 interface as a member of a group. |
| show ip igmp interface | Displays the information about the IGMP-interface status and configuration. |
| show ip igmp snooping mrouter | Displays information on the dynamically learned and manually configured multicast switch interfaces. |
| show mac-address-table multicast | Displays information about the multicast MAC address table. |

# show ip interface

To display the usability status of interfaces that are configured for IP, use the **show ip interface** command.

**show ip interface** [*type number*]

## Syntax Description

| | |
|---|---|
| *type* | (Optional) Interface type. |
| *number* | (Optional) Interface number. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(25)EW | Extended to include the 10-Gigabit Ethernet interface. |

## Usage Guidelines

The Cisco IOS software automatically enters a directly connected route in the routing table if the interface is usable. A usable interface is one through which the software can send and receive packets. If the software determines that an interface is not usable, it removes the directly connected routing entry from the routing table. Removing the entry allows the software to use dynamic routing protocols to determine backup routes to the network, if any.

If the interface can provide two-way communication, the line protocol is marked "up." If the interface hardware is usable, the interface is marked "up."

If you specify an optional interface type, you see information only on that specific interface.

If you specify no optional arguments, you see information on all the interfaces.

When an asynchronous interface is encapsulated with PPP or Serial Line Internet Protocol (SLIP), IP fast switching is enabled. The **show ip interface** command on an asynchronous interface that is encapsulated with PPP or SLIP displays a message indicating that IP fast switching is enabled.

## Examples

This example shows how to display the usability status for a specific VLAN:

```
Switch# show ip interface vlan 1
Vlan1 is up, line protocol is up
  Internet address is 10.6.58.4/24
  Broadcast address is 255.255.255.255
  Address determined by non-volatile memory
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is disabled
  Outgoing access list is not set
  Inbound  access list is not set
  Proxy ARP is enabled
```

```
  Local Proxy ARP is disabled
  Security level is default
  Split horizon is enabled
  ICMP redirects are always sent
  ICMP unreachables are always sent
  ICMP mask replies are never sent
  IP fast switching is enabled
  IP fast switching on the same interface is disabled
  IP Flow switching is disabled
  IP CEF switching is enabled
  IP Fast switching turbo vector
  IP Normal CEF switching turbo vector
  IP multicast fast switching is enabled
  IP multicast distributed fast switching is disabled
  IP route-cache flags are Fast, CEF
  Router Discovery is disabled
  IP output packet accounting is disabled
  IP access violation accounting is disabled
  TCP/IP header compression is disabled
  RTP/IP header compression is disabled
  Probe proxy name replies are disabled
  Policy routing is disabled
  Network address translation is disabled
  WCCP Redirect outbound is disabled
  WCCP Redirect inbound is disabled
  WCCP Redirect exclude is disabled
  BGP Policy Mapping is disabled
  Sampled Netflow is disabled
  IP multicast multilayer switching is disabled
  Netflow Data Export (hardware) is enabled
Switch#
```

Table 2-20 describes the fields that are shown in the example.

***Table 2-20 show ip interface Field Descriptions***

| Field | Description |
|---|---|
| Ethernet0 is up | If the interface hardware is usable, the interface is marked “up.” For an interface to be usable, both the interface hardware and line protocol must be up. |
| line protocol is up | If the interface can provide two-way communication, the line protocol is marked “up.” For an interface to be usable, both the interface hardware and line protocol must be up. |
| Internet address and subnet mask | IP address and subnet mask of the interface. |
| Broadcast address | Broadcast address. |
| Address determined by... | Status of how the IP address of the interface was determined. |
| MTU | MTU value that is set on the interface. |
| Helper address | Helper address, if one has been set. |
| Secondary address | Secondary address, if one has been set. |
| Directed broadcast forwarding | Status of directed broadcast forwarding. |
| Multicast groups joined | Multicast groups to which this interface belongs. |
| Outgoing access list | Status of whether the interface has an outgoing access list set. |
| Inbound access list | Status of whether the interface has an incoming access list set. |

*Table 2-20 show ip interface Field Descriptions (continued)*

| Field | Description |
|---|---|
| Proxy ARP | Status of whether Proxy Address Resolution Protocol (ARP) is enabled for the interface. |
| Security level | IP Security Option (IPSO) security level set for this interface. |
| Split horizon | Status of split horizon. |
| ICMP redirects | Status of the redirect messages on this interface. |
| ICMP unreachables | Status of the unreachable messages on this interface. |
| ICMP mask replies | Status of the mask replies on this interface. |
| IP fast switching | Status of whether fast switching has been enabled for this interface. Fast switching is typically enabled on serial interfaces, such as this one. |
| IP SSE switching | Status of the IP silicon switching engine (SSE). |
| Router Discovery | Status of the discovery process for this interface. It is typically disabled on serial interfaces. |
| IP output packet accounting | Status of IP accounting for this interface and the threshold (maximum number of entries). |
| TCP/IP header compression | Status of compression. |
| Probe proxy name | Status of whether the HP Probe proxy name replies are generated. |
| WCCP Redirect outbound is enabled | Status of whether packets that are received on an interface are redirected to a cache engine. |
| WCCP Redirect exclude is disabled | Status of whether packets that are targeted for an interface are excluded from being redirected to a cache engine. |
| Netflow Data Export (hardware) is enabled | NDE hardware flow status on the interface. |

# show ip mfib

To display all active Multicast Forwarding Information Base (MFIB) routes, use the **show ip mfib** command.

**show ip mfib** [**all** | **counters** | **log** [*n*]]

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Specifies all routes in the MFIB, including those routes that are used to accelerate fast switching but that are not necessarily in the upper-layer routing protocol table. |
| **counters** | (Optional) Specifies the counts of MFIB-related events. Only nonzero counters are shown. |
| **log** | (Optional) Specifies a log of the most recent number of MFIB-related events. The most recent event is first. |
| *n* | (Optional) Number of events. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(40)SG | Support for command introduced on the Supervisor Engine 6-E and Catalyst 4900M chassis. |

## Usage Guidelines

In the Supervisor Engine 6-E and Catalyst 4900M chassis, the output of the **show ip mfib** command does not display any hardware counters.

The MFIB table contains a set of IP multicast routes; each route in the MFIB table contains several flags that associate to the route.

The route flags indicate how a packet that matches a route is forwarded. For example, the IC flag on an MFIB route indicates that some process on the switch needs to receive a copy of the packet. These flags are associated with MFIB routes:

- Internal Copy (IC) flag—Set on a route when a process on the switch needs to receive a copy of all packets matching the specified route.
- Signaling (S) flag—Set on a route when a switch process needs notification that a packet matching the route is received. In the expected behavior, the protocol code updates the MFIB state in response to having received a packet on a signaling interface.
- Connected (C) flag—When set on a route, the C flag has the same meaning as the S flag, except that the C flag indicates that only packets sent by directly connected hosts to the route should be signaled to a protocol process.

A route can also have a set of flags associated with one or more interfaces. For an (S,G) route, the flags on interface 1 indicate how the ingress packets should be treated and whether packets matching the route should be forwarded onto interface 1. These per-interface flags are associated with the MFIB routes:

- Accepting (A)—Set on the RPF interface when a packet that arrives on the interface and that is marked as Accepting (A) is forwarded to all Forwarding (F) interfaces.
- Forwarding (F)—Used with the A flag as described above. The set of forwarding interfaces together form a multicast olist or output interface list.
- Signaling (S)—Set on an interface when a multicast routing protocol process in Cisco IOS needs to be notified of ingress packets on that interface.
- Not Platform (NP) fast-switched—Used with the F flag. A forwarding interface is also marked as Not Platform fast-switched whenever that output interface cannot be fast-switched by the platform hardware and requires software forwarding.

  For example, the Catalyst 4506 switch with Supervisor Engine III cannot switch tunnel interfaces in hardware so these interfaces are marked with the NP flag. When an NP interface is associated with a route, a copy of every ingress packet arriving on an Accepting interface is sent to the switch software forwarding path for software replication and then forwarded to the NP interface.

## Examples

This example shows how to display all active MFIB routes:

```
Switch# show ip mfib
IP Multicast Forwarding Information Base
Entry Flags: C - Directly Connected, S - Signal,
             IC - Internal Copy
Interface Flags: A - Accept, F - Forward, NS - Signal,
             NP - Not platform switched
Packets: Fast/Partial/Slow Bytes: Fast/Partial/Slow:
(171.69.10.13, 224.0.1.40), flags (IC)
   Packets: 2292/2292/0, Bytes: 518803/0/518803
   Vlan7 (A)
   Vlan100 (F NS)
   Vlan105 (F NS)
(*, 224.0.1.60), flags ()
   Packets: 2292/0/0, Bytes: 518803/0/0
   Vlan7 (A NS)
(*, 224.0.1.75), flags ()
   Vlan7 (A NS)
(10.34.2.92, 239.192.128.80), flags ()
   Packets: 24579/100/0, 2113788/15000/0 bytes
   Vlan7 (F NS)
   Vlan100 (A)
(*, 239.193.100.70), flags ()
   Packets: 1/0/0, 1500/0/0 bytes
   Vlan7 (A)
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| clear ip mfib counters | Clears the global MFIB counters and the counters for all active MFIB routes. |

# show ip mfib fastdrop

To display all currently active fast-drop entries and to show whether fast drop is enabled, use the **show ip mfib fastdrop** command.

**show ip mfib fastdrop**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display all currently active fast-drop entries and whether fast drop is enabled.

```
Switch# show ip mfib fasttdrop
MFIB fastdrop is enabled.
MFIB fast-dropped flows:
(10.0.0.1, 224.1.2.3, Vlan9 ) 00:01:32
(10.1.0.2, 224.1.2.3, Vlan9 ) 00:02:30
(1.2.3.4, 225.6.7.8, Vlan3) 00:01:50
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| clear ip mfib fastdrop | Clears all the MFIB fast-drop entries. |

# show ip mroute

To display IP multicast routing table information, use the **show ip mroute** command.

**show ip mroute** [*interface_type slot/port* | *host_name* | *host_address* [*source*] | **active** [*kbps* | *interface_type num*] | **count** | **pruned** | **static** | **summary**]

## Syntax Description

| | |
|---|---|
| *interface_type slot/port* | (Optional) Interface type and number of the slot and port; valid values for *interface type* are **fastethernet**, **gigabitethernet**, **tengigabitethernet**, **null**, and **vlan**. |
| *host_name* | (Optional) Name or IP address as defined in the DNS hosts table. |
| *host_address source* | (Optional) IP address or name of a multicast source. |
| **active** | (Optional) Displays the rate that active sources are sending to multicast groups. |
| *kbps interface_type num* | (Optional) Minimum rate at which active sources are sending to multicast groups; active sources sending at this rate or greater will be displayed. Valid values are from 1 to 4294967295 kbps. |
| **count** | (Optional) Displays the route and packet count information. |
| **pruned** | (Optional) Displays the pruned routes. |
| **static** | (Optional) Displays the static multicast routes. |
| **summary** | (Optional) Displays a one-line, abbreviated summary of each entry in the IP multicast routing table. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Usage Guidelines

If you omit all the optional arguments and keywords, the **show ip mroute** command displays all the entries in the IP multicast routing table.

The **show ip mroute active** *kbps* command displays all the sources sending at a rate greater than or equal to *kbps*.

The multicast routing table is populated by creating source, group (S,G) entries from star, group (*,G) entries. The star refers to all source addresses, the “S” refers to a single source address, and the “G” refers to the destination multicast group address. In creating (S,G) entries, the software uses the best path to that destination group found in the unicast routing table (through Reverse Path Forwarding (RPF).

## Examples

This example shows how to display all the entries in the IP multicast routing table:

```
Switch# show ip mroute

IP Multicast Routing Table
Flags:D - Dense, S - Sparse, 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, X - Proxy Join Timer Running
       A - Advertised via MSDP, U - URD, I - Received Source Specific Host
           Report
Outgoing interface flags:H - Hardware switched
Timers:Uptime/Expires
Interface state:Interface, Next-Hop or VCD, State/Mode

(*, 230.13.13.1), 00:16:41/00:00:00, RP 10.15.1.20, flags:SJC
  Incoming interface:GigabitEthernet4/8, RPF nbr 10.15.1.20
  Outgoing interface list:

 GigabitEthernet4/9, Forward/Sparse-Dense, 00:16:41/00:00:00, H

(*, 230.13.13.2), 00:16:41/00:00:00, RP 10.15.1.20, flags:SJC

 Incoming interface:GigabitEthernet4/8, RPF nbr 10.15.1.20, RPF-MFD
  Outgoing interface list:
    GigabitEthernet4/9, Forward/Sparse-Dense, 00:16:41/00:00:00, H

(10.20.1.15, 230.13.13.1), 00:14:31/00:01:40, flags:CJT

 Incoming interface:GigabitEthernet4/8, RPF nbr 10.15.1.20, RPF-MFD
  Outgoing interface list:
    GigabitEthernet4/9, Forward/Sparse-Dense, 00:14:31/00:00:00, H
(132.206.72.28, 224.2.136.89), 00:14:31/00:01:40, flags:CJT
  Incoming interface:GigabitEthernet4/8, RPF nbr 10.15.1.20, RPF-MFD

 Outgoing interface list:Null
Switch#
```

This example shows how to display the rate that the active sources are sending to the multicast groups and to display only the active sources that are sending at greater than the default rate:

```
Switch# show ip mroute active

Active IP Multicast Sources - sending > = 4 kbps

Group: 224.2.127.254, (sdr.cisco.com)
   Source: 146.137.28.69 (mbone.ipd.anl.gov)
     Rate: 1 pps/4 kbps(1sec), 4 kbps(last 1 secs), 4 kbps(life avg)

Group: 224.2.201.241, ACM 97
   Source: 130.129.52.160 (webcast3-e1.acm97.interop.net)
     Rate: 9 pps/93 kbps(1sec), 145 kbps(last 20 secs), 85 kbps(life avg)

Group: 224.2.207.215, ACM 97
   Source: 130.129.52.160 (webcast3-e1.acm97.interop.net)
     Rate: 3 pps/31 kbps(1sec), 63 kbps(last 19 secs), 65 kbps(life avg)
Switch#
```

This example shows how to display route and packet count information:

```
Switch# show ip mroute count
IP Multicast Statistics
56 routes using 28552 bytes of memory
13 groups, 3.30 average sources per group
Forwarding Counts:Pkt Count/Pkts per second/Avg Pkt Size/Kilobits per second

Other counts:Total/RPF failed/Other drops(OIF-null, rate-limit etc)

Group:224.2.136.89, Source count:1, Group pkt count:29051
  Source:132.206.72.28/32, Forwarding:29051/-278/1186/0, Other:85724/8/56665
Switch#
```

This example shows how to display summary information:

```
Switch# show ip mroute summary
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, 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, X - Proxy Join Timer Running
       A - Advertised via MSDP, U - URD, I - Received Source Specific Host
           Report
Outgoing interface flags: H - Hardware switched
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

Switch#
```

Table 2-21 describes the fields shown in the output.

***Table 2-21 show ip mroute Field Descriptions***

| Field | Description |
|---|---|
| Flags: | Information about the entry. |
| D - Dense | Entry is operating in dense mode. |
| S - Sparse | Entry is operating in sparse mode. |
| s - SSM Group | Entry is a member of an SSM group. |
| C - Connected | Member of the multicast group is present on the directly connected interface. |
| L - Local | Switch is a member of the multicast group. |
| P - Pruned | Route has been pruned. This information is retained in case a downstream member wants to join the source. |
| R - Rp-bit set | Status of the (S,G) entry; is the (S,G) entry pointing toward the RP. The R - Rp-bit set is typically a prune state along the shared tree for a particular source. |
| F - Register flag | Status of the software; indicates if the software is registered for a multicast source. |
| T - SPT-bit set | Status of the packets; indicates if the packets been received on the shortest path source tree. |

*Table 2-21 show ip mroute Field Descriptions (continued)*

| Field | Description |
|---|---|
| J - Join SPT | For (*, G) entries, indicates that the rate of traffic flowing down the shared tree is exceeding the SPT-Threshold set for the group. (The default SPT-Threshold setting is 0 kbps.) When the J - Join SPT flag is set, the next (S,G) packet received down the shared tree triggers an (S,G) join in the direction of the source causing the switch to join the source tree.<br><br>For (S, G) entries, indicates that the entry was created because the SPT-Threshold for the group was exceeded. When the J - Join SPT flag is set for (S,G) entries, the switch monitors the traffic rate on the source tree and attempts to switch back to the shared tree for this source if the traffic rate on the source tree falls below the group's SPT-Threshold for more than one minute.<br><br>The switch measures the traffic rate on the shared tree and compares the measured rate to the group's SPT-Threshold once every second. If the traffic rate exceeds the SPT-Threshold, the J- Join SPT flag is set on the (*, G) entry until the next measurement of the traffic rate. The flag is cleared when the next packet arrives on the shared tree and a new measurement interval is started.<br><br>If the default SPT-Threshold value of 0 Kbps is used for the group, the J- Join SPT flag is always set on (*, G) entries and is never cleared. When the default SPT-Threshold value is used, the switch immediately switches to the shortest-path tree when traffic from a new source is received. |
| Outgoing interface flag: | Information about the outgoing entry. |
| H - Hardware switched | Entry is hardware switched. |
| Timer: | Uptime/Expires. |
| Interface state: | Interface, Next-Hop or VCD, State/Mode. |
| (*, 224.0.255.1)<br>(198.92.37.100/32, 224.0.255.1) | Entry in the IP multicast routing table. The entry consists of the IP address of the source switch followed by the IP address of the multicast group. An asterisk (*) in place of the source switch indicates all sources.<br><br>Entries in the first format are referred to as (*,G) or "star comma G" entries. Entries in the second format are referred to as (S,G) or "S comma G" entries. (*,G) entries are used to build (S,G) entries. |
| uptime | How long (in hours, minutes, and seconds) the entry has been in the IP multicast routing table. |
| expires | How long (in hours, minutes, and seconds) until the entry is removed from the IP multicast routing table on the outgoing interface. |

*Table 2-21 show ip mroute Field Descriptions (continued)*

| Field | Description |
|---|---|
| RP | Address of the RP switch. For switches and access servers operating in sparse mode, this address is always 0.0.0.0. |
| flags: | Information about the entry. |
| Incoming interface | Expected interface for a multicast packet from the source. If the packet is not received on this interface, it is discarded. |
| RPF neighbor | IP address of the upstream switch to the source. "Tunneling" indicates that this switch is sending data to the RP encapsulated in Register packets. The hexadecimal number in parentheses indicates to which RP it is registering. Each bit indicates a different RP if multiple RPs per group are used. |
| DVMRP or Mroute | Status of whether the RPF information is obtained from the DVMRP routing table or the static mroutes configuration. |
| Outgoing interface list | Interfaces through which packets are forwarded. When the **ip pim nbma-mode** command is enabled on the interface, the IP address of the PIM neighbor is also displayed. |
| Ethernet0 | Name and number of the outgoing interface. |
| Next hop or VCD | Next hop specifies downstream neighbor's IP address. VCD specifies the virtual circuit descriptor number. VCD0 indicates that the group is using the static-map virtual circuit. |
| Forward/Dense | Status of the packets; indicates if they are they forwarded on the interface if there are no restrictions due to access lists or the TTL threshold. Following the slash (/), mode in which the interface is operating (dense or sparse). |
| Forward/Sparse | Sparse mode interface is in forward mode. |
| time/time (uptime/expiration time) | Per interface, how long (in hours, minutes, and seconds) the entry has been in the IP multicast routing table. Following the slash (/), how long (in hours, minutes, and seconds) until the entry is removed from the IP multicast routing table. |

## Related Commands

| Command | Description |
|---|---|
| **ip multicast-routing** (refer to Cisco IOS documentation) | Enables IP multicast routing. |
| **ip pim** (refer to Cisco IOS documentation) | Enables Protocol Independent Multicast (PIM) on an interface. |

# show ip source binding

To display IP source bindings that are configured on the system, use the **show ip source binding** EXEC command.

**show ip source binding** [*ip-address*] [*mac-address*] [**dhcp-snooping** | **static**] [**vlan** *vlan-id*] [**interface** *interface-name*]

## Syntax Description

| | |
|---|---|
| *ip-address* | (Optional) Binding IP address. |
| *mac-address* | (Optional) Binding MAC address. |
| **dhcp-snooping** | (Optional) DHCP-snooping type binding. |
| **static** | (Optional) Statically configured binding. |
| **vlan** *vlan-id* | (Optional) VLAN number. |
| **interface** *interface-name* | (Optional) Binding interface. |

## Defaults

Displays both static and DHCP snooping bindings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The optional parameters  filter the display output result.

## Examples

This example shows how to display the IP source bindings:

```
Switch# show ip source binding
MacAddress          IpAddress        Lease(sec)  Type           VLAN  Interface
------------------  ---------------  ----------  -------------  ----  --------------------
00:00:00:0A:00:0B   11.0.0.1         infinite    static         10    FastEthernet6/10

Switch#
```

This example shows how to display the static IP binding entry of IP address 11.0.01:

```
Switch# show ip source binding 11.0.0.1 0000.000A.000B static vlan 10 interface Fa6/10
show ip source binding 11.0.0.1 0000.000A.000B static vlan 10 interface Fa6/10
MacAddress          IpAddress        Lease(sec)  Type           VLAN  Interface
------------------  ---------------  ----------  -------------  ----  --------------------
00:00:00:0A:00:0B   11.0.0.1         infinite    static         10    FastEthernet6/10
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| ip source binding | Adds or deletes a static IP source binding entry. |

# show ip verify source

To display the IP source guard configuration and filters on a particular interface, use the **show ip verify source** command.

**show ip verify source** [**interface** *interface_num*]

**Syntax Description**

| | |
|---|---|
| **interface** *interface_num* | (Optional) Specifies an interface. |

**Defaults**

This command has no default settings.

**Command Modes**

Privileged EXEC mode

**Command History**

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

**Examples**

These examples show how to display the IP source guard configuration and filters on a particular interface with the **show ip verify source interface** command:

- This output appears when DHCP snooping is enabled on VLANs 10–20, interface fa6/1 has IP source filter mode that is configured as IP, and an existing IP address binding 10.0.0.1 is on VLAN 10:

```
Interface  Filter-type  Filter-mode  IP-address       Mac-address     Vlan
---------  -----------  -----------  ---------------  --------------  ---------
fa6/1      ip           active       10.0.0.1                         10
fa6/1      ip           active       deny-all                         11-20
```

**Note** The second entry shows that a default PVACL (deny all IP traffic) is installed on the port for those snooping-enabled VLANs that do not have a valid IP source binding.

- This output appears when you enter the **show ip verify source interface fa6/2** command and DHCP snooping is enabled on VLANs 10–20, interface fa6/1 has IP source filter mode that is configured as IP, and there is an existing IP address binding 10.0.0.1 on VLAN 10:

```
Interface  Filter-type  Filter-mode  IP-address       Mac-address     Vlan
---------  -----------  -----------  ---------------  --------------  ---------
fa6/2      ip           inactive-trust-port
```

- This output appears when you enter the **show ip verify source interface fa6/3** command and the interface fa6/3 does not have a VLAN enabled for DHCP snooping:

```
Interface  Filter-type  Filter-mode  IP-address       Mac-address     Vlan
---------  -----------  -----------  ---------------  --------------  ---------
fa6/3      ip           inactive-no-snooping-vlan
```

- This output appears when you enter the **show ip verify source interface fa6/4** command and the interface fa6/4 has an IP source filter mode that is configured as IP MAC and the existing IP MAC that binds 10.0.0.2/aaaa.bbbb.cccc on VLAN 10 and 11.0.0.1/aaaa.bbbb.cccd on VLAN 11:

```
Interface  Filter-type  Filter-mode  IP-address       Mac-address     Vlan
---------  -----------  -----------  ---------------  --------------  ---------
fa6/4      ip-mac       active       10.0.0.2         aaaa.bbbb.cccc  10
fa6/4      ip-mac       active       11.0.0.1         aaaa.bbbb.cccd  11
fa6/4      ip-mac       active       deny-all         deny-all        12-20
```

- This output appears when you enter the **show ip verify source interface fa6/5** command and the interface fa6/5 has IP source filter mode that is configured as IP MAC and existing IP MAC binding 10.0.0.3/aaaa.bbbb.ccce on VLAN 10, but port security is not enabled on fa6/5:

```
Interface  Filter-type  Filter-mode  IP-address       Mac-address     Vlan
---------  -----------  -----------  ---------------  --------------  ---------
fa6/5      ip-mac       active       10.0.0.3         permit-all      10
fa6/5      ip-mac       active       deny-all         permit-all      11-20
```

**Note** Enable port security first because the DHCP security MAC filter cannot apply to the port or VLAN.

- This output appears when you enter the **show ip verify source interface fa6/6** command and the interface fa6/6 does not have IP source filter mode that is configured:

```
DHCP security is not configured on the interface fa6/6.
```

This example shows how to display all the interfaces on the switch that have DHCP snooping security and IP Port Security tracking enabled with the **show ip verify source** command.

The output is an accumulation of per-interface **show** CLIs:

```
Interface  Filter-type  Filter-mode  IP-address       Mac-address     Vlan
---------  -----------  -----------  ---------------  --------------  ---------
fa6/1      ip           active       10.0.0.1                         10
fa6/1      ip           active       deny-all                         11-20
fa6/2      ip           inactive-trust-port
Fa6/3      ip trk       active       40.1.1.24                           10
Fa6/3      ip trk       active       40.1.1.20                           10
Fa6/3      ip trk       active       40.1.1.21                           10
fa6/4      ip-mac       active       10.0.0.2         aaaa.bbbb.cccc  10
fa6/4      ip-mac       active       11.0.0.1         aaaa.bbbb.cccd  11
fa6/4      ip-mac       active       deny-all         deny-all        12-20
fa6/5      ip-mac       active       10.0.0.3         permit-all      10
fa6/5      ip-mac       active       deny-all         permit-all      11-20
```

## Related Commands

| Command | Description |
|---|---|
| ip dhcp snooping information option | Enables DHCP option 82 data insertion. |
| ip dhcp snooping limit rate | Configures the number of the DHCP messages that an interface can receive per second. |
| ip dhcp snooping trust | Enables DHCP snooping on a trusted VLAN. |
| ip igmp snooping | Enables IGMP snooping. |
| ip igmp snooping vlan | Enables IGMP snooping for a VLAN. |
| ip source binding | Adds or deletes a static IP source binding entry. |
| ip verify source | Enables IP source guard on untrusted Layer 2 interfaces. |
| show ip source binding | Displays the DHCP snooping binding entries. |

# show ipc

To display IPC information, use the **show ipc** command.

**show ipc** {**nodes** | **ports** | **queue** | **status**}

## Syntax Description

| | |
|---|---|
| **nodes** | Displays the participating nodes. |
| **ports** | Displays the local IPC ports. |
| **queue** | Displays the contents of the IPC retransmission queue. |
| **status** | Displays the status of the local IPC server. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the participating nodes:

```
Switch# show ipc nodes
There are 3 nodes in this IPC realm.
   ID     Type                 Name                      Last  Last
                                                         Sent  Heard
   10000 Local      IPC Master                             0      0
 2010000 Local      GALIOS IPC:Card 1                      0      0
 2020000 Ethernet   GALIOS IPC:Card 2                      12     26
Switch#
```

This example shows how to display the local IPC ports:

```
Switch# show ipc ports
There are 11 ports defined.

Port ID        Type       Name                 (current/peak/total)
   10000.1     unicast    IPC Master:Zone
   10000.2     unicast    IPC Master:Echo
   10000.3     unicast    IPC Master:Control
   10000.4     unicast    Remote TTY Server Port
   10000.5     unicast    GALIOS RF :Active
     index = 0  seat_id = 0x2020000  last sent = 0     heard = 1635   0/1/1635

   10000.6     unicast    GALIOS RED:Active
     index = 0  seat_id = 0x2020000  last sent = 0     heard = 2      0/1/2

 2020000.3     unicast    GALIOS IPC:Card 2:Control
 2020000.4     unicast    GALIOS RFS :Standby
 2020000.5     unicast    Slave: Remote TTY Client Port
 2020000.6     unicast    GALIOS RF :Standby
 2020000.7     unicast    GALIOS RED:Standby
```

```
RPC packets: current/peak/total
                                                                0/1/17
Switch#
```

This example shows how to display the contents of the IPC retransmission queue:

```
Switch# show ipc queue
There are 0 IPC messages waiting for acknowledgement in the transmit queue.
There are 0 IPC messages waiting for a response.
There are 0 IPC messages waiting for additional fragments.
There are 0 IPC messages currently on the IPC inboundQ.
There are 0 messages currently in use by the system.
Switch#
```

This example shows how to display the status of the local IPC server:

```
Switch# show ipc status
IPC System Status:

This processor is the IPC master server.

6000 IPC message headers in cache
3363 messages in, 1680 out, 1660 delivered to local port,
1686 acknowledgements received, 1675 sent,
0 NACKS received, 0 sent,
0 messages dropped on input, 0 messages dropped on output
0 no local port, 0 destination unknown, 0 no transport
0 missing callback or queue, 0 duplicate ACKs, 0 retries,
0 message timeouts.
0 ipc_output failures, 0 mtu failures,
0 msg alloc failed, 0 emer msg alloc failed, 0 no origs for RPC replies
0 pak alloc failed, 0 memd alloc failed
0 no hwq, 1 failed opens, 0 hardware errors
No regular dropping of IPC output packets for test purposes
Switch#
```

# show ipv6 mld snooping

To display IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping configuration of the switch or the VLAN, use the **show ipv6 mld snooping** command.

**show ipv6 mld snooping** [**vlan** *vlan-id*]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-id* | (Optional) Specify a VLAN; the range is 1 to 1001 and 1006 to 4094. |

## Command Modes

User EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500. |

## Usage Guidelines

Use this command to display MLD snooping configuration for the switch or for a specific VLAN.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

## Examples

This is an example of output from the **show ipv6 mld snooping vlan** command. It shows snooping characteristics for a specific VLAN.

```
Switch> show ipv6 mld snooping vlan 100
Global MLD Snooping configuration:
-------------------------------------------
MLD snooping                  : Enabled
MLDv2 snooping (minimal)      : Enabled
Listener message suppression  : Enabled
TCN solicit query             : Disabled
TCN flood query count         : 2
Robustness variable           : 3
Last listener query count     : 2
Last listener query interval  : 1000

Vlan 100:
--------
MLD snooping                        : Disabled
MLDv1 immediate leave               : Disabled
Explicit host tracking              : Enabled
Multicast router learning mode      : pim-dvmrp
Robustness variable                 : 3
Last listener query count           : 2
Last listener query interval        : 1000
```

This is an example of output from the **show ipv6 mld snooping** command. It displays snooping characteristics for all VLANs on the switch.

```
Switch> show ipv6 mld snooping
Global MLD Snooping configuration:
-------------------------------------------
```

```
MLD snooping                   : Enabled
MLDv2 snooping (minimal)       : Enabled
Listener message suppression   : Enabled
TCN solicit query              : Disabled
TCN flood query count          : 2
Robustness variable            : 3
Last listener query count      : 2
Last listener query interval   : 1000

Vlan 1:
--------
MLD snooping                          : Disabled
MLDv1 immediate leave                 : Disabled
Explicit host tracking                : Enabled
Multicast router learning mode        : pim-dvmrp
Robustness variable                   : 1
Last listener query count             : 2
Last listener query interval          : 1000

<output truncated>

Vlan 951:
--------
MLD snooping                          : Disabled
MLDv1 immediate leave                 : Disabled
Explicit host tracking                : Enabled
Multicast router learning mode        : pim-dvmrp
Robustness variable                   : 3
Last listener query count             : 2
Last listener query interval          : 1000
```

## Related Commands

| Command | Description |
|---|---|
| **ipv6 mld snooping** | Enables IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping globally or on the specified VLAN. |

# show ipv6 mld snooping mrouter

To display dynamically learned and manually configured IP version 6 (IPv6) Multicast Listener Discovery (MLD) switch ports for the switch or a VLAN, use the **show ipv6 mld snooping mrouter** command.

**show ipv6 mld snooping mrouter** [**vlan** *vlan-id*]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-id* | (Optional) Specify a VLAN; the range is 1 to 1001 and 1006 to 4094. |

## Command Modes

User EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on Catalyst 4500. |

## Usage Guidelines

Use this command to display MLD snooping switch ports for the switch or for a specific VLAN.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

## Examples

This is an example of output from the **show ipv6 mld snooping mrouter** command. It displays snooping characteristics for all VLANs on the switch that are participating in MLD snooping.

```
Switch> show ipv6 mld snooping mrouter
Vlan    ports
----    -----
   2    Gi1/0/11(dynamic)
  72    Gi1/0/11(dynamic)
 200    Gi1/0/11(dynamic)
```

This is an example of output from the **show ipv6 mld snooping mrouter vlan** command. It shows multicast switch ports for a specific VLAN.

```
Switch> show ipv6 mld snooping mrouter vlan 100
Vlan    ports
----    -----
   2    Gi1/0/11(dynamic)
```

## Related Commands

| Command | Description |
|---|---|
| **ipv6 mld snooping** | Enables IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping globally or on the specified VLAN. |
| **ipv6 mld snooping vlan** | Configures IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping parameters on the VLAN interface. |

# show ipv6 mld snooping querier

To display IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping querier-related information most recently received by the switch or the VLAN, use the **show ipv6 mld snooping querier** command.

**show ipv6 mld snooping querier** [**vlan** *vlan-id*]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan-id* | (Optional) Specify a VLAN; the range is 1 to 1001 and 1006 to 4094. |

## Command Modes

User EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500. |

## Usage Guidelines

Use the **show ipv6 mld snooping querier** command to display the MLD version and IPv6 address of a detected device that sends MLD query messages, which is also called a *querier*. A subnet can have multiple multicast switches but has only one MLD querier. The querier can be a Layer 3 switch.

The **show ipv6 mld snooping querier** command output also shows the VLAN and interface on which the querier was detected. If the querier is the switch, the output shows the *Port* field as *Router*. If the querier is a router, the output shows the port number on which the querier is learned in the *Port* field.

The output of the **show ipv6 mld snoop querier vlan** command displays the information received in response to a query message from an external or internal querier. It does not display user-configured VLAN values, such as the snooping robustness variable on the particular VLAN. This querier information is used only on the MASQ message that is sent by the switch. It does not override the user-configured robustness variable that is used for aging out a member that does not respond to query messages.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

## Examples

This is an example of output from the **show ipv6 mld snooping querier** command:

```
Switch> show ipv6 mld snooping querier
Vlan      IP Address               MLD Version Port
------------------------------------------------------------
2         FE80::201:C9FF:FE40:6000 v1          Gi3/0/1
```

This is an example of output from the **show ipv6 mld snooping querier vlan** command:

```
Switch> show ipv6 mld snooping querier vlan 2
IP address : FE80::201:C9FF:FE40:6000
MLD version : v1
Port : Gi3/0/1
Max response time : 1000s
```

## Related Commands

| Command | Description |
|---|---|
| ipv6 mld snooping | Enables IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping globally or on the specified VLAN. |
| ipv6 mld snooping last-listener-query-count | Configures IP version 6 (IPv6) Multicast Listener Discovery Mulitcast Address Specific Queries (MASQs) that will be sent before aging out a client. |
| ipv6 mld snooping last-listener-query-interval | Configures IP version 6 (IPv6) MLD snooping last-listener query interval on the switch or on a VLAN. |
| ipv6 mld snooping robustness-variable | Configures the number of IP version 6 (IPv6) MLD queries that the switch sends before deleting a listener that does not respond. |
| ipv6 mld snooping tcn | Configures IP version 6 (IPv6) MLD Topology Change Notifications (TCNs). |

# show issu capability

To display the ISSU capability for a client, use the **show issu capability** command.

**show issu capability** {**entries** | **groups** | **types**} [*client_id*]

## Syntax Description

| | |
|---|---|
| **entries** | Displays a list of Capability Types and Dependent Capability Types that are included in a single Capability Entry. Types within an entry can also be independent. |
| **groups** | Displays a list of Capability Entries in priority order (the order that they will be negotiated on a session). |
| **types** | Displays an ID that identifies a particular capability. |
| *client_id* | (Optional) Identifies the client registered to the ISSU infrastructure.<br>To obtain a list of client IDs, use the **show issu clients** command. |

## Defaults

This command has no default settings.

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Capability is a functionality that an ISSU client can support and is required to interoperate with peers.

When an ISSU-aware client establishes its session with the peer, an ISSU negotiation takes place. The ISSU infrastructure uses the registered information to negotiate the capabilities and the message version to be used during the session.

## Examples

The following example shows how to display the ISSU capability types for the IP host ISSU client (clientid=2082):

```
Switch#show issu capability types 2082
Client_ID = 2082,  Entity_ID = 1 :
     Cap_Type = 0
Switch#
```

The following example shows how to display the ISSU capabilities entries for the IP host ISSU client (clientid=2082):

```
Switch#show issu capability entries 2082
Client_ID = 2082,  Entity_ID = 1 :
    Cap_Entry = 1 :
                    Cap_Type = 0
Switch#
```

The following example shows how to display the ISSU capabilities groups for the IP host ISSU client (clientid=2082):

```
Switch#show issu capability groups 2082
Client_ID = 2082,  Entity_ID = 1 :
    Cap_Group = 1 :
          Cap_Entry = 1
                      Cap_Type = 0
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show issu clients | Displays the ISSU clients. |

# show issu clients

To display the ISSU clients, use the **show issu clients** command.

**show issu clients** [*peer_uid*]

**Syntax Description**

| | |
|---|---|
| *peer_uid* | (Optional) Displays a list of clients registered to ISSU infrastructure at the peer supervisor engine. |

**Defaults**

Displays a list of clients registered to the ISSU infrastructure at the supervisor engine where the command is entered.

**Command Modes**

User EXEC

**Command History**

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

**Usage Guidelines**

To implement ISSU versioning functionality, a client must first register itself, client capability, and client message information with the ISSU infrastructure during the system initialization.

**Examples**

The following example shows how to display the ISSU clients:

```
Switch# show issu clients
 Client_ID = 2,  Client_Name = ISSU Proto client,  Entity_Count = 1
 Client_ID = 3,  Client_Name = ISSU RF,  Entity_Count = 1
 Client_ID = 4,  Client_Name = ISSU CF client,  Entity_Count = 1
 Client_ID = 5,  Client_Name = ISSU Network RF client,  Entity_Count = 1
 Client_ID = 7,  Client_Name = ISSU CONFIG SYNC,  Entity_Count = 1
 Client_ID = 8,  Client_Name = ISSU ifIndex sync,  Entity_Count = 1
 Client_ID = 9,  Client_Name = ISSU IPC client,  Entity_Count = 1
 Client_ID = 10,  Client_Name = ISSU IPC Server client,  Entity_Count = 1
 Client_ID = 11,  Client_Name = ISSU Red Mode Client,  Entity_Count = 1
 Client_ID = 100,  Client_Name = ISSU rfs client,  Entity_Count = 1
 Client_ID = 110,  Client_Name = ISSU ifs client,  Entity_Count = 1
 Client_ID = 200,  Client_Name = ISSU Event Manager client,  Entity_Count = 1
 Client_ID = 2002,  Client_Name = CEF Push ISSU client,  Entity_Count = 1
 Client_ID = 2003,  Client_Name = ISSU XDR client,  Entity_Count = 1
 Client_ID = 2004,  Client_Name = ISSU SNMP client,  Entity_Count = 1
 Client_ID = 2010,  Client_Name = ARP HA,  Entity_Count = 1
 Client_ID = 2012,  Client_Name = ISSU HSRP Client,  Entity_Count = 1
 Client_ID = 2021,  Client_Name = XDR Int Priority ISSU client,  Entity_Count = 1
 Client_ID = 2022,  Client_Name = XDR Proc Priority ISSU client,  Entity_Count = 1
 Client_ID = 2023,  Client_Name = FIB HWIDB ISSU client,  Entity_Count = 1
 Client_ID = 2024,  Client_Name = FIB IDB ISSU client,  Entity_Count = 1
 Client_ID = 2025,  Client_Name = FIB HW subblock ISSU client,  Entity_Count = 1
 Client_ID = 2026,  Client_Name = FIB SW subblock ISSU client,  Entity_Count = 1
 Client_ID = 2027,  Client_Name = Adjacency ISSU client,  Entity_Count = 1
 Client_ID = 2028,  Client_Name = FIB IPV4 ISSU client,  Entity_Count = 1
```

```
 Client_ID = 2054,  Client_Name = ISSU process client,  Entity_Count = 1
 Client_ID = 2058,  Client_Name = ISIS ISSU RTR client,  Entity_Count = 1
 Client_ID = 2059,  Client_Name = ISIS ISSU UPD client,  Entity_Count = 1
 Client_ID = 2067,  Client_Name = ISSU PM Client,  Entity_Count = 1
 Client_ID = 2068,  Client_Name = ISSU PAGP_SWITCH Client,  Entity_Count = 1
 Client_ID = 2070,  Client_Name = ISSU Port Security client,  Entity_Count = 1
 Client_ID = 2071,  Client_Name = ISSU Switch VLAN client,  Entity_Count = 1
 Client_ID = 2072,  Client_Name = ISSU dot1x client,  Entity_Count = 1
 Client_ID = 2073,  Client_Name = ISSU STP,  Entity_Count = 1
 Client_ID = 2077,  Client_Name = ISSU STP MSTP,  Entity_Count = 1
 Client_ID = 2078,  Client_Name = ISSU STP IEEE,  Entity_Count = 1
 Client_ID = 2079,  Client_Name = ISSU STP RSTP,  Entity_Count = 1
 Client_ID = 2081,  Client_Name = ISSU DHCP Snooping client,  Entity_Count = 1
 Client_ID = 2082,  Client_Name = ISSU IP Host client,  Entity_Count = 1
 Client_ID = 2083,  Client_Name = ISSU Inline Power client,  Entity_Count = 1
 Client_ID = 2084,  Client_Name = ISSU IGMP Snooping client,  Entity_Count = 1
 Client_ID = 4001,  Client_Name = ISSU C4K Chassis client,  Entity_Count = 1
 Client_ID = 4002,  Client_Name = ISSU C4K Port client,  Entity_Count = 1
 Client_ID = 4003,  Client_Name = ISSU C4K Rkios client,  Entity_Count = 1
 Client_ID = 4004,  Client_Name = ISSU C4K HostMan client,  Entity_Count = 1
 Client_ID = 4005,  Client_Name = ISSU C4k GaliosRedundancy client,  Entity_Count = 1

Base Clients:
 Client_Name = ISSU Proto client
 Client_Name = ISSU RF
 Client_Name = ISSU CF client
 Client_Name = ISSU Network RF client
 Client_Name = ISSU CONFIG SYNC
 Client_Name = ISSU ifIndex sync
 Client_Name = ISSU IPC client
 Client_Name = ISSU IPC Server client
 Client_Name = ISSU Red Mode Client
 Client_Name = ISSU rfs client
 Client_Name = ISSU ifs client
 Client_Name = ISSU Event Manager client
 Client_Name = CEF Push ISSU client
 Client_Name = ISSU XDR client
 Client_Name = ARP HA
 Client_Name = XDR Int Priority ISSU client
 Client_Name = XDR Proc Priority ISSU client
 Client_Name = FIB HWIDB ISSU client
 Client_Name = FIB IDB ISSU client
 Client_Name = FIB HW subblock ISSU client
 Client_Name = FIB SW subblock ISSU client
 Client_Name = Adjacency ISSU client
 Client_Name = FIB IPV4 ISSU client
 Client_Name = ISSU process client
 Client_Name = ISSU PM Client
 Client_Name = ISSU C4K Chassis client
 Client_Name = ISSU C4K Port client
 Client_Name = ISSU C4K Rkios client
 Client_Name = ISSU C4K HostMan client
 Client_Name = ISSU C4k GaliosRedundancy client
```

## Related Commands

| Command | Description |
|---|---|
| show issu capability | Displays the ISSU capability for a client. |
| show issu entities | Displays the ISSU entity information. |

# show issu comp-matrix

To display information regarding the In Service Software Upgrade (ISSU) compatibility matrix, use the **show issu comp-matrix** command.

**show issu comp-matrix** {**negotiated** | **stored** | **xml**}

## Syntax Description

| | |
|---|---|
| **negotiated** | Displays negotiated compatibility matrix information. |
| **stored** | Displays stored compatibility matrix information. |
| **xml** | Displays negotiated compatibility matrix information in XML format. |

## Defaults

This command has no default settings.

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Before attempting an ISSU, you should know the compatibility level between the old and the new Cisco IOS software versions on the active and the standby-supervisor engines. ISSU will not work if the two versions are incompatible.

The compatibility matrix is available on Cisco.com so that you can also veiw in advance whether an upgrade can be performed with the ISSU process. The compatibility matrix during the ISSU process and later by entering the **show issu comp-matrix** command. To display information on the negotiation of the compatibility matrix data between two software versions on a given system, use the **show issu comp-matrix negotiated** command.

Compatibility matrix data is stored with each Cisco IOS software image that supports ISSU capability. To display stored compatibility matrix information, use the **show issu comp-matrix stored** command.

The compatibility matrix information are built-in any IOS ISSU image. The ISSU infrastructure performs a matrix lookup as soon as the communication with the standby supervisor engine is established. There are three possible results from the lookup operation:

- Compatible—The Base-level system infrastructure and all optional HA-aware subsystems are compatible. In-service upgrade or downgrade between these versions will succeed with minimal service impact.
- Base-Level Compatible—One or more of the optional HA-aware subsystems are not compatible. Although an in-service upgrade or downgrade between these versions will succeed, some subsystems will not be able to maintain their state during the switchover. Prior to attempting an in-service upgrade or downgrade, the impact of this on operation and service of the switch must be considered carefully.

- Incompatible—A set of core system infrastructure must be able to execute in a stateful manner for SSO to function correctly. If any of these "required" features or subsystems is not compatible in two different IOS images, the two versions of the Cisco IOS images are declared "Incompatible". This means that an in-service upgrade or downgrade between these versions is not possible. The systems operates in RPR mode during the period when the versions of IOS at the active and standby supervisor engines differ.

## Examples

This example displays negotiated compatibility matrix information:

```
Switch# show issu comp-matrix negotiated

CardType: WS-C4507R(112), Uid: 2, Image Ver: 12.2(31)SGA
Image Name: cat4500-ENTSERVICES-M

Cid     Eid     Sid     pSid    pUid      Compatibility
=====================================================
2       1       262151  3       1         COMPATIBLE
3       1       262160  5       1         COMPATIBLE
4       1       262163  9       1         COMPATIBLE
5       1       262186  25      1         COMPATIBLE
7       1       262156  10      1         COMPATIBLE
8       1       262148  7       1         COMPATIBLE
9       1       262155  1       1         COMPATIBLE
10      1       262158  2       1         COMPATIBLE
11      1       262172  6       1         COMPATIBLE
100     1       262166  13      1         COMPATIBLE
110     113     262159  14      1         COMPATIBLE
200     1       262167  24      1         COMPATIBLE
2002    1       -       -       -         UNAVAILABLE
2003    1       262185  23      1         COMPATIBLE
2004    1       262175  16      1         COMPATIBLE
2008    1       262147  26      1         COMPATIBLE
2008    1       262168  27      1         COMPATIBLE
2010    1       262171  32      1         COMPATIBLE
2012    1       262180  31      1         COMPATIBLE
2021    1       262170  41      1         COMPATIBLE
2022    1       262152  42      1         COMPATIBLE
2023    1       -       -       -         UNAVAILABLE
2024    1       -       -       -         UNAVAILABLE
2025    1       -       -       -         UNAVAILABLE
2026    1       -       -       -         UNAVAILABLE
2027    1       -       -       -         UNAVAILABLE
2028    1       -       -       -         UNAVAILABLE
2054    1       262169  8       1         COMPATIBLE
2058    1       262154  29      1         COMPATIBLE
2059    1       262179  30      1         COMPATIBLE
2067    1       262153  12      1         COMPATIBLE
2068    1       196638  40      1         COMPATIBLE
2070    1       262145  21      1         COMPATIBLE
2071    1       262178  11      1         COMPATIBLE
2072    1       262162  28      1         COMPATIBLE
2073    1       262177  33      1         COMPATIBLE
2077    1       262165  35      1         COMPATIBLE
2078    1       196637  34      1         COMPATIBLE
2079    1       262176  36      1         COMPATIBLE
2081    1       262150  37      1         COMPATIBLE
2082    1       262161  39      1         COMPATIBLE
2083    1       262184  20      1         COMPATIBLE
2084    1       262183  38      1         COMPATIBLE
4001    101     262181  17      1         COMPATIBLE
4002    201     262164  18      1         COMPATIBLE
```

```
4003    301     262182  19      1         COMPATIBLE
4004    401     262146  22      1         COMPATIBLE
4005    1       262149  4       1         COMPATIBLE

Message group summary:
Cid     Eid     GrpId     Sid     pSid    pUid    Nego Result
============================================================
2       1       1         262151  3       1       Y
3       1       1         262160  5       1       Y
4       1       1         262163  9       1       Y
5       1       1         262186  25      1       Y
7       1       1         262156  10      1       Y
8       1       1         262148  7       1       Y
9       1       1         262155  1       1       Y
10      1       1         262158  2       1       Y
11      1       1         262172  6       1       Y
100     1       1         262166  13      1       Y
110     113     115       262159  14      1       Y
200     1       1         262167  24      1       Y
2002    1       2         -       -       -       N - did not negotiate
2003    1       1         262185  23      1       Y
2004    1       1         262175  16      1       Y
2008    1       1         262147  26      1       Y
2008    1       2         262168  27      1       Y
2010    1       1         262171  32      1       Y
2012    1       1         262180  31      1       Y
2021    1       1         262170  41      1       Y
2022    1       1         262152  42      1       Y
2023    1       1         -       -       -       N - did not negotiate
2024    1       1         -       -       -       N - did not negotiate
2025    1       1         -       -       -       N - did not negotiate
2026    1       1         -       -       -       N - did not negotiate
2027    1       1         -       -       -       N - did not negotiate
2028    1       1         -       -       -       N - did not negotiate
2054    1       1         262169  8       1       Y
2058    1       1         262154  29      1       Y
2059    1       1         262179  30      1       Y
2067    1       1         262153  12      1       Y
2068    1       1         196638  40      1       Y
2070    1       1         262145  21      1       Y
2071    1       1         262178  11      1       Y
2072    1       1         262162  28      1       Y
2073    1       1         262177  33      1       Y
2077    1       1         262165  35      1       Y
2078    1       1         196637  34      1       Y
2079    1       1         262176  36      1       Y
2081    1       1         262150  37      1       Y
2082    1       1         262161  39      1       Y
2083    1       1         262184  20      1       Y
2084    1       1         262183  38      1       Y
4001    101     1         262181  17      1       Y
4002    201     1         262164  18      1       Y
4003    301     1         262182  19      1       Y
4004    401     1         262146  22      1       Y
4005    1       1         262149  4       1       Y

List of Clients:
Cid       Client Name              Base/Non-Base
=============================================
2         ISSU Proto client        Base
3         ISSU RF                  Base
4         ISSU CF client           Base
5         ISSU Network RF client   Base
7         ISSU CONFIG SYNC         Base
```

```
8         ISSU ifIndex sync        Base
9         ISSU IPC client          Base
10        ISSU IPC Server client   Base
11        ISSU Red Mode Client     Base
100       ISSU rfs client          Base
110       ISSU ifs client          Base
200       ISSU Event Manager clientBase
2002      CEF Push ISSU client     Base
2003      ISSU XDR client          Base
2004      ISSU SNMP client         Non-Base
2008      ISSU Tableid Client      Base
2010      ARP HA                   Base
2012      ISSU HSRP Client         Non-Base
2021      XDR Int Priority ISSU cliBase
2022      XDR Proc Priority ISSU clBase
2023      FIB HWIDB ISSU client    Base
2024      FIB IDB ISSU client      Base
2025      FIB HW subblock ISSU clieBase
2026      FIB SW subblock ISSU clieBase
2027      Adjacency ISSU client    Base
2028      FIB IPV4 ISSU client     Base
2054      ISSU process client      Base
2058      ISIS ISSU RTR client     Non-Base
2059      ISIS ISSU UPD client     Non-Base
2067      ISSU PM Client           Base
2068      ISSU PAGP_SWITCH Client  Non-Base
2070      ISSU Port Security clientNon-Base
2071      ISSU Switch VLAN client  Non-Base
2072      ISSU dot1x client        Non-Base
2073      ISSU STP                 Non-Base
2077      ISSU STP MSTP            Non-Base
2078      ISSU STP IEEE            Non-Base
2079      ISSU STP RSTP            Non-Base
2081      ISSU DHCP Snooping clientNon-Base
2082      ISSU IP Host client      Non-Base
2083      ISSU Inline Power client Non-Base
2084      ISSU IGMP Snooping clientNon-Base
4001      ISSU C4K Chassis client  Base
4002      ISSU C4K Port client     Base
4003      ISSU C4K Rkios client    Base
4004      ISSU C4K HostMan client  Base
4005      ISSU C4k GaliosRedundancyBase
```

This example displays stored compatibility matrix information:

```
Switch> show issu comp-matrix stored

Number of Matrices in Table = 1

        (1) Matrix for cat4500-ENTSERVICES-M(112) - cat4500-ENTSERVICES-M(112)
        ========================================
        Start Flag (0xDEADBABE)

                My Image ver:  12.2(31)SGA
                Peer Version    Compatibility
                ------------    -------------
                12.2(31)SGA             Comp(3)
```

**Related Commands**

| Command | Description |
|---|---|
| **show issu clients** | Displays the ISSU clients. |
| **show issu sessions** | Displays ISSU session information for a specified client. |

# show issu endpoints

To display the ISSU endpoint information, use the **show issu endpoints** command.

**show issu endpoints**

## Syntax Description

This command has no arguments or keywords

## Defaults

This command has no default settings.

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Endpoint is an execution unit within a redundancy domain. There are only 2 endpoints on the Catalyst 4500 series switch redundant chassis: 1 and 2; they correspond to the slot numbers for the supervisor engine. The ISSU infrastructure communicates between these two endpoints to establish session and to perform session negotiation for ISSU clients.

## Examples

The following example shows how to display the ISSU endpoints:

```
Switch# show issu endpoints
My_Unique_ID = 1/0x1,  Client_Count = 46

 This endpoint communicates with 1 peer endpoints :
   Peer_Unique_ID      CAP      VER    XFORM      ERP        Compatibility
          2/0x2        1        1        1        1                 Same

 Shared Negotiation Session Info :
    Nego_Session_ID = 15
    Nego_Session_Name = shared nego session
    Transport_Mtu = 4096
    Ses_In_Use = 2
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show issu clients | Displays the ISSU clients. |

# show issu entities

To display the ISSU entity information, use the **show issu entities** command.

**show issu entities** [*client_id*]

## Syntax Description

| | |
|---|---|
| *client_id* | (Optional) ISSU client ID. |

## Defaults

This command has no default settings.

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Entity is a logical group of sessions with some common attributes (like capability list and message type). Currently, most ISSU clients on the Catalyst 4500 series switch have only one entity.

## Examples

The following example shows how to display the entity information for a specified ISSU client:

```
Switch#show issu entities 2072
Client_ID = 2072 :
     Entity_ID = 1,  Entity_Name = ISSU dot1x entity :
        MsgType MsgGroup CapType CapEntry CapGroup
         Count    Count   Count   count    Count
          28        1       1       1        1
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show issu clients** | Displays the ISSU clients. |

# show issu fsm

**Note** This command is not intended for end-users.

To display the ISSU finite state machine (FSM) information corresponding to an ISSU session, use the **show issu fsm** command.

**show issu fsm** [*session_id*]

## Syntax Description

| | |
|---|---|
| *session_id* | (Optional) Provides detailed information about the FSM for the specified session. |

## Defaults

This command has no default settings.

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Examples

The following example displays and verifies the ISSU state after LOADVERSION:

```
Switch# show issu fsm 26
Session_ID = 26 :
   FSM_Name          Curr_State      Old_State       Error_Reason
   FSM_L1            TRANS           A_VER           none
   FSM_L2_HELLO      EXIT            RCVD            none
   FSM_L2_A_CAP      A_EXIT          A_RSP           none
   FSM_L2_P_CAP      P_INIT          unknown         none
   FSM_L2_A_VER      A_EXIT          A_RES_RSP       none
   FSM_L2_P_VER      P_INIT          unknown         none
   FSM_L2_TRANS      COMP            COMP            none
 Current FSM is FSM_L2_TRANS
 Session is compatible
 Negotiation started at 00:01:07.688, duration is 0.148 seconds
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show issu clients | Displays the ISSU clients. |
| show issu sessions | Displays ISSU session information for a specified client. |

# show issu message

To display checkpoint messages for a specified ISSU client, use the **show issu message** command.

**show issu message** {**groups** | **types**} [*client_id*]

## Syntax Description

| | |
|---|---|
| **groups** | Displays information on Message Group supported by the specified client. |
| **types** | Displays information on all Message Types supported by the specified client. |
| *client_id* | (Optional) Specifies a client ID. |

## Defaults

If client ID is not specified, displays message groups or message types information for all clients registered to the ISSU infrastructure.

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Messages are sync-data (also known as checkpoint data) sent between two endpoints

When an ISSU-aware client establishes its session with a peer, an ISSU negotiation takes place. The ISSU infrastructure uses the registered information to negotiate the capabilities and the message version to be used during the session.

## Examples

The following example shows how to display the message groups for Client_id 2082:

```
Switch#show issu message groups 2082
Client_ID = 2082,  Entity_ID = 1 :
    Message_Group = 1 :
                    Message_Type = 1,  Version_Range = 1 ~ 2
                    Message_Type = 2,  Version_Range = 1 ~ 2
Switch#
```

The following example shows how to display the message types for Client_id 2082:

```
Switch#show issu message types 2082
Client_ID = 2082,  Entity_ID = 1 :
    Message_Type = 1,  Version_Range = 1 ~ 2
          Message_Ver = 1,    Message_Mtu = 12
          Message_Ver = 2,    Message_Mtu = 8
    Message_Type = 2,  Version_Range = 1 ~ 2
          Message_Ver = 1,    Message_Mtu = 32
          Message_Ver = 2,    Message_Mtu = 28
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| show issu clients | Displays the ISSU clients. |

# show issu negotiated

To display the negotiated capability and message version information of the ISSU clients, use the **show issu negotiated** command.

**show issu negotiated** {**capability** | **version**} [*session_id*]

## Syntax Description

| | |
|---|---|
| **capability** | Displays all negotiated capabilities. |
| **version** | Displays details of all negotiated messages. |
| *session_id* | (Optional) Specifies the ISSU session ID for which the capability or version information is displayed. |

## Defaults

Displays negotiated capability or version information for all ISSU sessions.

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Examples

The following example shows how to display the message types for a specific group:

```
Switch# show issu negotiated capability 26
 Session_ID = 26 :
     Cap_Type = 0,     Cap_Result = 1     No cap value assigned

Switch# show issu negotiated version 26
 Session_ID = 26 :
     Message_Type = 1,  Negotiated_Version = 1,  Message_MTU = 44
     Message_Type = 2,  Negotiated_Version = 1,  Message_MTU = 4
```

## Related Commands

| Command | Description |
|---|---|
| **show issu sessions** | Displays ISSU session information for a specified client. |

# show issu rollback-timer

To display ISSU rollback-timer status, use the **show issu rollback-timer** command.

**show issu rollback-timer**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Priviledged EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Examples

The following example shows how to display the rollback-timer status:

```
Switch#show issu rollback-timer
        Rollback Process State = Not in progress
      Configured Rollback Time = 45:00
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| issu acceptversion | Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process. |
| issu runversion | Forces a change from the active supervisor engine to the standby supervisor engine and causes the newly active supervisor engine to run the new image specified in the **issu loadversion** command. |

# show issu sessions

To display ISSU session information for a specified client, use the **show issu sessions** command.

**show issu sessions** [*client_id*]

## Syntax Description

| | |
|---|---|
| *client_id* | (Optional) Specifies the ISSU client ID. |

## Defaults

Displays session information for all clients registered to the ISSU infrastructure.

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Session is bidirectional and a reliable connection is established between two endpoints. Sync-data and negotiation messages are sent to the peer endpoint through a session. On a Catalyst 4500 series switch, each ISSU-aware client has a maximum of one session at each endpoint.

When an ISSU-aware client establishes its session with the peer, an ISSU negotiation takes place. The ISSU infrastructure uses the registered information to negotiate the capabilities and the message version to be used during the session.

## Examples

The following example shows how to display the rollback-timer status:

```
Switch#show issu sessions 2072
Client_ID = 2072,  Entity_ID = 1 :

 *** Session_ID = 26,  Session_Name = dot1x :

    Peer    Peer  Negotiate  Negotiated   Cap      Msg     Session
  UniqueID  Sid    Role       Result    GroupID  GroupID  Signature
     2       26   PRIMARY   COMPATIBLE    1        1         0
                           (no policy)

    Negotiation Session Info for This Message Session:
         Nego_Session_ID = 26
         Nego_Session_Name = dot1x
         Transport_Mtu = 17884
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show issu clients** | Displays the ISSU clients. |

# show issu state

To display the ISSU state and current booted image name during the ISSU process, use the **show issu state** command.

**show issu state** [*slot_number*] [**detail**]

## Syntax Description

| | |
|---|---|
| *slot_number* | (Optional) Specifies the slot number whose ISSU state needs to be displayed (1 or 2). |
| **detail** | (Optional) Provides detailed information about the state of the active and standby supervisor engines. |

## Defaults

The command displays the ISSU state and current booted image name of both the active and standby supervisor engines.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

It might take several seconds after the **issu loadversion** command is entered for Cisco IOS software to load onto the standby supervisor engine and the standby supervisor engine to transition to SSO mode. If you enter the **show issu state** command too soon, you might not see the information you need.

## Examples

The following example displays and verifies the ISSU state after LOADVERSION:

```
Switch# show issu state detail
                         Slot = 1
                    RP State = Active
                   ISSU State = Load Version
                Boot Variable = bootflash:old_image,12
              Operating Mode = Stateful Switchover
            Primary Version = bootflash:old_image
          Secondary Version = bootflash:new_image
            Current Version = bootflash:old_image

                         Slot = 2
                    RP State = Standby
                   ISSU State = Load Version
                Boot Variable = bootflash:new_image,12;bootflash:old_image,12
              Operating Mode = Stateful Switchover
            Primary Version = bootflash:old_image
          Secondary Version = bootflash:new_image
            Current Version = bootflash:new_image

Switch#
```

## Related Commands

| Command | Description |
|---|---|
| issu abortversion | Cancels the ISSU upgrade or the downgrade process in progress and restores the switch to its state before the start of the process. |
| issu acceptversion | Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process. |
| issu commitversion | Loads the new Cisco IOS software image into the new standby supervisor engine. |
| issu loadversion | Starts the ISSU process. |
| issu runversion | Forces a change from the active supervisor engine to the standby supervisor engine and causes the newly active supervisor engine to run the new image specified. |

# show l2protocol-tunnel

To display information about the Layer 2 protocol tunnel ports, use the **show l2protocol-tunnel** command. This command displays information for the interfaces with protocol tunneling enabled.

**show l2protocol-tunnel** [**interface** *interface-id*] [[**summary**] | {**begin** | **exclude** | **include**} *expression*]

## Syntax Description

| | |
|---|---|
| **interface** *interface-id* | (Optional) Specifies the interface for which protocol tunneling information appears. Valid interfaces are physical ports and port channels; the port channel range is 1 to 64. |
| **summary** | (Optional) Displays only Layer 2 protocol summary information. |
| **begin** | (Optional) Displays information beginning with the line that matches the *expression*. |
| **exclude** | (Optional) Displays information that excludes lines that match the *expression*. |
| **include** | (Optional) Displays the lines that match the specified *expression*. |
| *expression* | (Optional) Expression in the output to use as a reference point. |

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | This command was first introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Usage Guidelines

After enabling Layer 2 protocol tunneling on an access or 802.1Q tunnel port with the **l2protocol-tunnel** command, you can configure some or all of these parameters:

- Protocol type to be tunneled
- Shutdown threshold
- Drop threshold

If you enter the **show l2protocol-tunnel** [**interface** *interface-id*] command, only information about the active ports on which all the parameters are configured appears.

If you enter the **show l2protocol-tunnel summary** command, only information about the active ports on which some or all of the parameters are configured appears.

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

This is an example of output from the **show l2protocol-tunnel** command:

```
Switch> show l2protocol-tunnel
COS for Encapsulated Packets: 5

Port    Protocol Shutdown  Drop      Encapsulation Decapsulation Drop
                 Threshold Threshold Counter       Counter       Counter
------- -------- --------- --------- ------------- ------------- -------------
Fa0/10  ---           ----      ----          ----          ----          ----
        stp           ----      ---- 9847          1866          0
        vtp           ----      ---- 77            12            0
        pagp          ----      ---- 859           860           0
        lacp          ----      ---- 0             0             0
        udld          ----      ---- 219           211           0
Fa0/11  cdp           1100      ---- 2356          2350          0
        stp           1100      ---- 116           13            0
        vtp           1100      ---- 3             67            0
        pagp          ----       900 856           5848          0
        lacp          ----       900 0             0             0
        udld          ----       900 0             0             0
Fa0/12  cdp           ----      ---- 2356          0             0
        stp           ----      ---- 11787         0             0
        vtp           ----      ---- 81            0             0
        pagp          ----      ---- 0             0             0
        lacp          ----      ---- 849           0             0
        udld          ----      ---- 0             0             0
Fa0/13  cdp           ----      ---- 2356          0             0
        stp           ----      ---- 11788         0             0
        vtp           ----      ---- 81            0             0
        pagp          ----      ---- 0             0             0
        lacp          ----      ---- 849           0             0
        udld          ----      ---- 0             0             0
Switch#
```

This is an example of output from the **show l2protocol-tunnel summary** command:

```
Switch> show l2protocol-tunnel summary
COS for Encapsulated Packets: 5

Port    Protocol    Shutdown         Drop            Status
                    Threshold        Threshold
                    (cdp/stp/vtp)    (cdp/stp/vtp)
                    (pagp/lacp/udld) (pagp/lacp/udld)
------- ----------- ---------------- ---------------- ----------
Fa0/10  --- stp vtp ----/----/----   ----/----/----   up
     pagp lacp udld ----/----/----   ----/----/----
Fa0/11  cdp stp vtp 1100/1100/1100   ----/----/----   up
     pagp lacp udld ----/----/----    900/ 900/ 900
Fa0/12  cdp stp vtp ----/----/----   ----/----/----   up
     pagp lacp udld ----/----/----   ----/----/----
Fa0/13  cdp stp vtp ----/----/----   ----/----/----   up
     pagp lacp udld ----/----/----   ----/----/----
Fa0/14  cdp stp vtp ----/----/----   ----/----/----   down
     pagp ---- udld ----/----/----   ----/----/----
Fa0/15  cdp stp vtp ----/----/----   ----/----/----   down
     pagp ---- udld ----/----/----   ----/----/----
Fa0/16  cdp stp vtp ----/----/----   ----/----/----   down
     pagp lacp udld ----/----/----   ----/----/----
Fa0/17  cdp stp vtp ----/----/----   ----/----/----   down
     pagp lacp udld ----/----/----   ----/----/----
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| l2protocol-tunnel | Enables protocol tunneling on an interface. |
| l2protocol-tunnel cos | Configures the class of service (CoS) value for all tunneled Layer 2 protocol packets. |

# show lacp

To display LACP information, use the **show lacp** command.

**show lacp** [*channel-group*] {**counters** | **internal** | **neighbors** | **sys-id**}

## Syntax Description

| | |
|---|---|
| *channel-group* | (Optional) Number of the channel group; valid values are from 1 to 64. |
| **counters** | Displays the LACP statistical information. |
| **internal** | Displays the internal information. |
| **neighbors** | Displays the neighbor information. |
| **sys-id** | Displays the LACP system identification. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

This command is not supported on systems that are configured with a Supervisor Engine I.

If you do not specify a *channel-group* value, all channel groups are displayed.

You can enter the optional *channel-group* value to specify a channel group for all keywords, except the **sys-id** keyword.

## Examples

This example shows how to display LACP statistical information for a specific channel group:

```
Switch# show lacp 1 counters
              LACPDUs          Marker       LACPDUs
Port       Sent   Recv     Sent   Recv     Pkts Err
---------------------------------------------------
Channel group: 1
  Fa4/1    8      15       0      0         3    0
  Fa4/2    14     18       0      0         3    0
  Fa4/3    14     18       0      0         0
  Fa4/4    13     18       0      0         0
Switch#
```

The output displays the following information:

- The LACPDUs Sent and Recv columns display the LACPDUs sent and received on each specific interface.
- The LACPDUs Pkts and Err columns display the marker protocol packets.

This example shows how to display internal information for the interfaces belonging to a specific channel:

```
Switch# show lacp 1 internal
Flags:  S - Device sends PDUs at slow rate. F - Device sends PDUs at fast rate.
        A - Device is in Active mode.       P - Device is in Passive mode.

Channel group 1
                            LACPDUs     LACP Port    Admin   Oper    Port     Port
Port      Flags     State   Interval    Priority     Key     Key     Number   State
Fa4/1     saC       bndl    30s         32768        100     100     0xc1     0x75
Fa4/2     saC       bndl    30s         32768        100     100     0xc2     0x75
Fa4/3     saC       bndl    30s         32768        100     100     0xc3     0x75
Fa4/4     saC       bndl    30s         32768        100     100     0xc4     0x75
Switch#
```

Table 2-22 lists the output field definitions.

***Table 2-22 show lacp internal Command Output Fields***

| Field | Description |
|---|---|
| State | State of the specific port at the current moment is displayed; allowed values are as follows:<br>• *bndl*—Port is attached to an aggregator and bundled with other ports.<br>• *susp*—Port is in a suspended state; it is not attached to any aggregator.<br>• *indep*—Port is in an independent state (not bundled but able to switch data traffic. In this case, LACP is not running on the partner port).<br>• *hot-sby*—Port is in a Hot-standby state.<br>• *down*—Port is down. |
| LACPDUs Interval | Interval setting. |
| LACP Port Priority | Port priority setting. |
| Admin Key | Administrative key. |
| Oper Key | Operator key. |
| Port Number | Port number. |
| Port State | State variables for the port encoded as individual bits within a single octet with the following meaning [1]:<br>• **bit0**: *LACP_Activity*<br>• **bit1**: *LACP_Timeout*<br>• **bit2**: *Aggregation*<br>• **bit3**: *Synchronization*<br>• **bit4**: *Collecting*<br>• **bit5**: *Distributing*<br>• **bit6**: *Defaulted*<br>• **bit7**: *Expired* |

This example shows how to display LACP neighbors information for a specific port channel:

```
Switch# show lacp 1 neighbor
Flags:  S - Device sends PDUs at slow rate. F - Device sends PDUs at fast rate.
        A - Device is in Active mode.       P - Device is in Passive mode.

Channel group 1 neighbors
          Partner                 Partner
Port      System ID               Port Number     Age     Flags
Fa4/1     8000,00b0.c23e.d84e     0x81            29s     P
Fa4/2     8000,00b0.c23e.d84e     0x82            0s      P
Fa4/3     8000,00b0.c23e.d84e     0x83            0s      P
Fa4/4     8000,00b0.c23e.d84e     0x84            0s      P

          Port          Admin     Oper      Port
          Priority      Key       Key       State
Fa4/1     32768         200       200       0x81
Fa4/2     32768         200       200       0x81
Fa4/3     32768         200       200       0x81
Fa4/4     32768         200       200       0x81
Switch#
```

In the case where no PDUs have been received, the default administrative information is displayed in braces.

This example shows how to display the LACP system identification:

```
Switch> show lacp sys-id
8000,AC-12-34-56-78-90
Switch>
```

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.

## Related Commands

| Command | Description |
|---|---|
| lacp port-priority | Sets the LACP priority for the physical interfaces. |
| lacp system-priority | Sets the priority of the system for LACP. |

# show mac access-group interface

To display the ACL configuration on a Layer 2 interface, use the **show mac access-group interface** command.

**show mac access-group interface** [*interface interface-number*]

## Syntax Description

| | |
|---|---|
| *interface* | (Optional) Specifies the interface type; valid values are **ethernet**, **fastethernet**, **gigabitethernet**, **tengigabitethernet**, **pos**, **atm**, **port-channel**, and **ge-wan**. |
| *interface-number* | (Optional) Specifies the port number. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The valid values for the port number depend on the chassis used.

## Examples

This example shows how to display the ACL configuration on interface fast 6/1:

```
Switch# show mac access-group interface fast 6/1
Interface FastEthernet6/1:
   Inbound access-list is simple-mac-acl
   Outbound access-list is not set
```

## Related Commands

| Command | Description |
|---|---|
| access-group mode | Specifies the override modes (for example, VACL overrides PACL) and the non-override modes (for example, merge or strict mode). |

# show mac-address-table address

To display MAC address table information for a specific MAC address, use the **show mac-address-table address** command.

**show mac-address-table address** *mac_addr* [**interface** *type slot/port* | **protocol** *protocol* | **vlan** *vlan_id*]

## Syntax Description

| | |
|---|---|
| *mac_addr* | 48-bit MAC address; the valid format is H.H.H. |
| **interface** *type slot/port* | (Optional) Displays information for a specific interface; valid values for *type* are **fastethernet**, **gigabitethernet**, and **tengigabitethernet**. |
| **protocol** *protocol* | (Optional) Specifies a protocol. See the "Usage Guidelines" section for more information. |
| **vlan** *vlan_id* | (Optional) Displays entries for the specific VLAN only; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Added support for extended VLAN addresses. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Usage Guidelines

For the MAC address table entries that are used by the routed ports, the routed port name is displayed in the "vlan" column not the internal VLAN number.

The keyword definitions for the *protocol* variable are as follows:

- **ip** specifies the IP protocol.
- **ipx** specifies the IPX protocols.
- **assigned** specifies the assigned protocol entries.
- **other** specifies the other protocol entries.

## Examples

This example shows how to display MAC address table information for a specific MAC address:

```
Switch# show mac-address-table address 0030.94fc.0dff
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0030.94fc.0dff    static ip,ipx,assigned,other  Switch
Fa6/1   0030.94fc.0dff    static ip,ipx,assigned,other  Switch
Fa6/2   0030.94fc.0dff    static ip,ipx,assigned,other  Switch
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show mac-address-table aging-time** | Displays MAC address table aging information. |
| **show mac-address-table count** | Displays the number of entries currently in the MAC address table. |
| **show mac-address-table dynamic** | Displays the dynamic MAC address table entries only. |
| **show mac-address-table interface** | Displays the MAC address table information for a specific interface. |
| **show mac-address-table multicast** | Displays information about the multicast MAC address table. |
| **show mac-address-table protocol** | Displays the MAC address table information that is based on the protocol. |
| **show mac-address-table static** | Displays the static MAC address table entries only. |
| **show mac-address-table vlan** | Displays information about the MAC address table for a specific VLAN. |

# show mac-address-table aging-time

To display the MAC address aging time, use the **show mac-address-table aging-time** command.

**show mac-address-table aging-time** [**vlan** *vlan_id*]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan_id* | (Optional) Specifies a VLAN; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended addressing was added. |

## Examples

This example shows how to display the currently configured aging time for all VLANs:

```
Switch# show mac-address-table aging-time
Vlan    Aging Time
----    ----------
100     300
200     1000

Switch#
```

This example shows how to display the currently configured aging time for a specific VLAN:

```
Switch# show mac-address-table aging-time vlan 100
Vlan    Aging Time
----    ----------
 100    300

Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show mac-address-table address** | Displays the information about the MAC-address table. |
| **show mac-address-table count** | Displays the number of entries currently in the MAC address table. |
| **show mac-address-table dynamic** | Displays the dynamic MAC address table entries only. |
| **show mac-address-table interface** | Displays the MAC address table information for a specific interface. |
| **show mac-address-table multicast** | Displays information about the multicast MAC address table. |

| Command | Description |
|---|---|
| show mac-address-table protocol | Displays the MAC address table information that is based on the protocol. |
| show mac-address-table static | Displays the static MAC address table entries only. |
| show mac-address-table vlan | Displays information about the MAC address table for a specific VLAN. |

# show mac-address-table count

To display the number of entries currently in the MAC address table, use the **show mac-address-table count** command.

**show mac-address-table count** [**vlan** *vlan_id*]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan_id* | (Optional) Specifies a VLAN; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Added support for extended VLAN addresses. |

## Examples

This example shows how to display the entry count for a specific VLAN:

```
Switch# show mac-address-table count vlan 1
MAC Entries for Vlan 1:
Dynamic Unicast Address Count:                 0
Static Unicast Address (User-defined) Count:   0
Static Unicast Address (System-defined) Count: 1
Total Unicast MAC Addresses In Use:            1
Total Unicast MAC Addresses Available:         32768
Multicast MAC Address Count:                   1
Total Multicast MAC Addresses Available:       16384
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show mac-address-table address** | Displays the information about the MAC-address table. |
| **show mac-address-table aging-time** | Displays MAC address table aging information. |
| **show mac-address-table dynamic** | Displays the dynamic MAC address table entries only. |
| **show mac-address-table interface** | Displays the MAC address table information for a specific interface. |
| **show mac-address-table multicast** | Displays information about the multicast MAC address table. |
| **show mac-address-table protocol** | Displays the MAC address table information that is based on the protocol. |

| Command | Description |
|---|---|
| show mac-address-table static | Displays the static MAC address table entries only. |
| show mac-address-table vlan | Displays information about the MAC address table for a specific VLAN. |

# show mac-address-table dynamic

To display the dynamic MAC address table entries only, use the **show mac-address-table dynamic** command.

**show mac-address-table dynamic** [**address** *mac_addr* | **interface** *type slot/port* | **protocol** *protocol* | **vlan** *vlan_id*]

## Syntax Description

| | |
|---|---|
| **address** *mac_addr* | (Optional) Specifies a 48-bit MAC address; the valid format is H.H.H. |
| **interface** *type slot/port* | (Optional) Specifies an interface to match; valid values for *type* are **fastethernet**, **gigabitethernet**, and **tengigabitethernet**. |
| **protocol** *protocol* | (Optional) Specifies a protocol. See the "Usage Guidelines" section for more information. |
| **vlan** *vlan_id* | (Optional) Displays entries for a specific VLAN; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Added support for extended VLAN addresses. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Usage Guidelines

The keyword definitions for the *protocol* argument are as follows:

- **assigned** specifies assigned protocol entries.
- **ip** specifies IP protocol.
- **ipx** specifies IPX protocols.
- **other** specifies other protocol entries.

The **show mac-address-table dynamic** command output for an EtherChannel interface changes the port number designation (such as, 5/7) to a port group number (such as, Po80).

For the MAC address table entries that are used by the routed ports, the routed port name is displayed in the "vlan" column not the internal VLAN number.

## Examples

This example shows how to display all the dynamic MAC address entries:

```
Switch# show mac-address-table dynamic
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0000.0000.0201   dynamic ip                     FastEthernet6/15
   1    0000.0000.0202   dynamic ip                     FastEthernet6/15
   1    0000.0000.0203   dynamic ip,assigned            FastEthernet6/15
   1    0000.0000.0204   dynamic ip,assigned            FastEthernet6/15
   1    0000.0000.0205   dynamic ip,assigned            FastEthernet6/15
   2    0000.0000.0101   dynamic ip                     FastEthernet6/16
   2    0000.0000.0102   dynamic ip                     FastEthernet6/16
   2    0000.0000.0103   dynamic ip,assigned            FastEthernet6/16
   2    0000.0000.0104   dynamic ip,assigned            FastEthernet6/16
   2    0000.0000.0105   dynamic ip,assigned            FastEthernet6/16
Switch#
```

This example shows how to display the dynamic MAC address entries with a specific protocol type (in this case, assigned):

```
Switch# show mac-address-table dynamic protocol assigned
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0000.0000.0203   dynamic ip,assigned            FastEthernet6/15
   1    0000.0000.0204   dynamic ip,assigned            FastEthernet6/15
   1    0000.0000.0205   dynamic ip,assigned            FastEthernet6/15
   2    0000.0000.0103   dynamic ip,assigned            FastEthernet6/16
   2    0000.0000.0104   dynamic ip,assigned            FastEthernet6/16
   2    0000.0000.0105   dynamic ip,assigned            FastEthernet6/16
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show mac-address-table protocol** | Displays the MAC address table information that is based on the protocol. |
| **show mac-address-table static** | Displays the static MAC address table entries only. |
| **show mac-address-table vlan** | Displays information about the MAC address table for a specific VLAN. |

# show mac-address-table interface

To display the MAC address table information for a specific interface, use the **show mac-address-table interface** command.

**show mac-address-table interface** *type slot/port*

## Syntax Description

| | |
|---|---|
| *type* | Interface type; valid values are **ethernet**, **fastethernet**, **gigabitethernet**, and **tengigabitethernet**. |
| *slot/port* | Number of the slot and port. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Usage Guidelines

For the MAC address table entries that are used by the routed ports, the routed port name is displayed in the "vlan" column not the internal VLAN number.

## Examples

This example shows how to display MAC address table information for a specific interface:

```
Switch# show mac-address-table interface fastethernet6/16
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   2    0000.0000.0101   dynamic other                  FastEthernet6/16
   2    0000.0000.0102   dynamic other                  FastEthernet6/16
   2    0000.0000.0103   dynamic other                  FastEthernet6/16
   2    0000.0000.0104   dynamic other                  FastEthernet6/16
   2    0000.0000.0105   dynamic other                  FastEthernet6/16
   2    0000.0000.0106   dynamic other                  FastEthernet6/16

Multicast Entries
 vlan    mac address     type    ports
-------+---------------+-------+-----------------------------------------------
   2    ffff.ffff.ffff   system Fa6/16
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show mac-address-table address | Displays the information about the MAC-address table. |
| show mac-address-table aging-time | Displays MAC address table aging information. |
| show mac-address-table count | Displays the number of entries currently in the MAC address table. |
| show mac-address-table dynamic | Displays the dynamic MAC address table entries only. |
| show mac-address-table multicast | Displays information about the multicast MAC address table. |
| show mac-address-table protocol | Displays the MAC address table information that is based on the protocol. |
| show mac-address-table static | Displays the static MAC address table entries only. |
| show mac-address-table vlan | Displays information about the MAC address table for a specific VLAN. |

# show mac-address-table multicast

To display information about the multicast MAC address table, use the **show mac-address-table multicast** command.

**show mac-address-table multicast** [**count** | {**igmp-snooping** [**count**]} | {**user** [**count**]} | {**vlan** *vlan_num*}]

## Syntax Description

| | |
|---|---|
| **count** | (Optional) Displays the number of multicast entries. |
| **igmp-snooping** | (Optional) Displays only the addresses learned by IGMP snooping. |
| **user** | (Optional) Displays only the user-entered static addresses. |
| **vlan** *vlan_num* | (Optional) Displays information for a specific VLAN only; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Added support for extended VLAN addresses. |

## Usage Guidelines

For the MAC address table entries that are used by the routed ports, the routed port name is displayed in the “vlan” column not the the internal VLAN number.

## Examples

This example shows how to display multicast MAC address table information for a specific VLAN:

```
Switch# show mac-address-table multicast vlan 1
Multicast Entries
 vlan    mac address     type    ports
-------+---------------+-------+-----------------------------------------
   1    ffff.ffff.ffff   system Switch,Fa6/15
Switch#
```

This example shows how to display the number of multicast MAC entries for all VLANs:

```
Switch# show mac-address-table multicast count
MAC Entries for all vlans:
Multicast MAC Address Count:                 141
Total Multicast MAC Addresses Available:     16384
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show mac-address-table address | Displays the information about the MAC-address table. |
| show mac-address-table aging-time | Displays MAC address table aging information. |
| show mac-address-table count | Displays the number of entries currently in the MAC address table. |
| show mac-address-table dynamic | Displays the dynamic MAC address table entries only. |
| show mac-address-table interface | Displays the MAC address table information for a specific interface. |
| show mac-address-table protocol | Displays the MAC address table information that is based on the protocol. |
| show mac-address-table static | Displays the static MAC address table entries only. |
| show mac-address-table vlan | Displays information about the MAC address table for a specific VLAN. |

# show mac-address-table notification

To display the MAC address table notification status and history, use the **show mac-address-table notification** command.

**show mac-address-table notification** [**change**] [**interface** [*interface-id*]] | [**mac-move**] | [**threshold**]

## Syntax Description

| | |
|---|---|
| **change** | (Optional) Displays the MAC address change notification status. |
| **interface** | (Optional) Displays MAC change information for an interfaces. |
| *interface-id* | (Optional) Displays the information for a specific interface. Valid interfaces include physical ports and port channels. |
| **mac-move** | (Optional) Displays MAC move notification status. |
| **threshold** | (Optional) Displays the MAC threshold notification status. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Use the **show mac-address-table notification change** command to display whether the MAC change feature is enabled or disabled, the MAC change notification interval, the maximum number of entries allowed in the history table, and the history table contents.

Use the **interface** keyword to display the flags for all interfaces. If the *interface-id* is included, only the flags for that interface are displayed.

## Examples

This example shows how to display all the MAC address notification information:

```
Switch# show mac-address-table notification change
MAC Notification Feature is Enabled on the switch
Interval between Notification Traps : 1 secs
Number of MAC Addresses Added : 5
Number of MAC Addresses Removed : 1
Number of Notifications sent to NMS : 3
Maximum Number of entries configured in History Table : 500
Current History Table Length : 3
MAC Notification Traps are Enabled
History Table contents
----------------------
History Index 1, Entry Timestamp 478433, Despatch Timestamp 478433
MAC Changed Message :
Operation: Added   Vlan: 1     MAC Addr: 1234.5678.9ab0 Dot1dBasePort: 323
```

```
History Index 2, Entry Timestamp 481834, Despatch Timestamp 481834
MAC Changed Message :
Operation: Added   Vlan: 1     MAC Addr: 1234.5678.9ab1 Dot1dBasePort: 323
Operation: Added   Vlan: 1     MAC Addr: 1234.5678.9ab2 Dot1dBasePort: 323
Operation: Added   Vlan: 1     MAC Addr: 1234.5678.9ab3 Dot1dBasePort: 323
Operation: Added   Vlan: 1     MAC Addr: 1234.5678.9ab4 Dot1dBasePort: 323
History Index 3, Entry Timestamp 484334, Despatch Timestamp 484334
MAC Changed Message :
Operation: Deleted Vlan: 1     MAC Addr: 1234.5678.9ab0 Dot1dBasePort: 323
Switch#
```

This example shows how to display the MAC address change status on the FastEthernet interface 7/1:

```
Switch# show mac-address-table notification change interface FastEthernet 7/1
MAC Notification Feature is Enabled on the switch
Interface            MAC Added Trap MAC Removed Trap
---------            -------------- ----------------
FastEthernet7/1      Enabled        Disabled

Switch#
```

This example shows how to display the MAC address move status:

```
Switch# show mac-address-table notification mac-move
MAC Move Notification: Enabled
Switch#
```

This example shows how to display the MAC address table utilization status:

```
Switch# show mac-address-table notification threshold
Status       limit        Interval
-------------+-----------+-------------
   enabled        50           120
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| clear mac-address-table | Clears the address entries from the Layer 2 MAC address table. |
| mac-address-table notification | Enables MAC address notification on a switch. |
| snmp-server enable traps | Enables SNMP notifications (traps or informs). |
| snmp trap mac-notification change | Enables SNMP MAC address notifications. |

# show mac-address-table protocol

To display the MAC address table information that is based on the protocol, use the **show mac-address-table protocol** command.

**show mac-address-table protocol** {**assigned** | **ip** | **ipx** | **other**}

## Syntax Description

| | |
|---|---|
| **assigned** | Specifies the assigned protocol entries. |
| **ip** | Specifies the IP protocol entries. |
| **ipx** | Specifies the IPX protocol entries. |
| **other** | Specifies the other protocol entries. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

For the MAC address table entries that are used by the routed ports, the routed port name is displayed in the “vlan” column not the the internal VLAN number.

## Examples

This example shows how to display the MAC address table entries that have a specific protocol type (in this case, assigned):

```
Switch# show mac-address-table protocol assigned
vlan   mac address     type    protocol  qos             ports
-----+---------------+--------+---------+---+--------------------------------
 200  0050.3e8d.6400  static   assigned  --  Switch
 100  0050.3e8d.6400  static   assigned  --  Switch
   5  0050.3e8d.6400  static   assigned  --  Switch
4092  0000.0000.0000  dynamic  assigned  --  Switch
   1  0050.3e8d.6400  static   assigned  --  Switch
   4  0050.3e8d.6400  static   assigned  --  Switch
4092  0050.f0ac.3058  static   assigned  --  Switch
4092  0050.f0ac.3059  dynamic  assigned  --  Switch
   1  0010.7b3b.0978  dynamic  assigned  --  Fa5/9
Switch#
```

This example shows the other output for the previous example:

```
Switch# show mac-address-table protocol other
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0000.0000.0201   dynamic other                  FastEthernet6/15
   1    0000.0000.0202   dynamic other                  FastEthernet6/15
   1    0000.0000.0203   dynamic other                  FastEthernet6/15
   1    0000.0000.0204   dynamic other                  FastEthernet6/15
   1    0030.94fc.0dff    static ip,ipx,assigned,other  Switch
   2    0000.0000.0101   dynamic other                  FastEthernet6/16
   2    0000.0000.0102   dynamic other                  FastEthernet6/16
   2    0000.0000.0103   dynamic other                  FastEthernet6/16
   2    0000.0000.0104   dynamic other                  FastEthernet6/16
Fa6/1   0030.94fc.0dff    static ip,ipx,assigned,other  Switch
Fa6/2   0030.94fc.0dff    static ip,ipx,assigned,other  Switch

Multicast Entries
 vlan    mac address     type    ports
-------+---------------+-------+-----------------------------------------
   1    ffff.ffff.ffff   system Switch,Fa6/15
   2    ffff.ffff.ffff   system Fa6/16
1002    ffff.ffff.ffff   system
1003    ffff.ffff.ffff   system
1004    ffff.ffff.ffff   system
1005    ffff.ffff.ffff   system
Fa6/1   ffff.ffff.ffff   system Switch,Fa6/1
Fa6/2   ffff.ffff.ffff   system Switch,Fa6/2
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show mac-address-table address** | Displays the information about the MAC-address table. |
| **show mac-address-table aging-time** | Displays MAC address table aging information. |
| **show mac-address-table count** | Displays the number of entries currently in the MAC address table. |
| **show mac-address-table dynamic** | Displays the dynamic MAC address table entries only. |
| **show mac-address-table interface** | Displays the MAC address table information for a specific interface. |
| **show mac-address-table multicast** | Displays information about the multicast MAC address table. |
| **show mac-address-table static** | Displays the static MAC address table entries only. |
| **show mac-address-table vlan** | Displays information about the MAC address table for a specific VLAN. |

# show mac-address-table static

To display the static MAC address table entries only, use the **show mac-address-table static** command.

**show mac-address-table static** [**address** *mac_addr* | **interface** *type number* | **protocol** *protocol* | **vlan** *vlan_id*]

## Syntax Description

| | |
|---|---|
| **address** *mac_addr* | (Optional) Specifies a 48-bit MAC address to match; the valid format is H.H.H. |
| **interface** *type number* | (Optional) Specifies an interface to match; valid values for *type* are **fastethernet**, **gigabitethernet**, and **tengigabitethernet**. |
| **protocol** *protocol* | (Optional) Specifies a protocol. See the "Usage Guidelines" section for more information. |
| **vlan** *vlan_id* | (Optional) Displays the entries for a specific VLAN; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Added support for extended VLAN addresses. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Usage Guidelines

For the MAC address table entries that are used by the routed ports, the routed port name is displayed in the "vlan" column not the internal VLAN number.

The keyword definitions for the *protocol* argument are as follows:

- **assigned** specifies the assigned protocol entries.
- **ip** specifies the IP protocol.
- **ipx** specifies the IPX protocols.
- **other** specifies the other protocol entries.

## Examples

This example shows how to display all the static MAC address entries:

```
Switch# show mac-address-table static
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0030.94fc.0dff    static ip,ipx,assigned,other  Switch
Fa6/1   0030.94fc.0dff    static ip,ipx,assigned,other  Switch
Fa6/2   0030.94fc.0dff    static ip,ipx,assigned,other  Switch

Multicast Entries
 vlan    mac address     type    ports
-------+---------------+-------+-----------------------------------------
   1    ffff.ffff.ffff   system Switch,Fa6/15
   2    ffff.ffff.ffff   system Fa6/16
1002    ffff.ffff.ffff   system
1003    ffff.ffff.ffff   system
1004    ffff.ffff.ffff   system
1005    ffff.ffff.ffff   system
Fa6/1   ffff.ffff.ffff   system Switch,Fa6/1
Fa6/2   ffff.ffff.ffff   system Switch,Fa6/2
.
.
Switch#
```

This example shows how to display the static MAC address entries with a specific protocol type (in this case, assigned):

```
Switch# show mac-address-table static protocol assigned
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0030.94fc.0dff    static ip,ipx,assigned,other  Switch
Fa6/1   0030.94fc.0dff    static ip,ipx,assigned,other  Switch
Fa6/2   0030.94fc.0dff    static ip,ipx,assigned,other  Switch

Multicast Entries
 vlan    mac address     type    ports
-------+---------------+-------+-----------------------------------------
   1    ffff.ffff.ffff   system Switch,Fa6/15
   2    ffff.ffff.ffff   system Fa6/16
1002    ffff.ffff.ffff   system
1003    ffff.ffff.ffff   system
1004    ffff.ffff.ffff   system
1005    ffff.ffff.ffff   system
Fa6/1   ffff.ffff.ffff   system Switch,Fa6/1
Fa6/2   ffff.ffff.ffff   system Switch,Fa6/2
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show mac-address-table address** | Displays the information about the MAC-address table. |
| **show mac-address-table aging-time** | Displays MAC address table aging information. |
| **show mac-address-table count** | Displays the number of entries currently in the MAC address table. |
| **show mac-address-table dynamic** | Displays the dynamic MAC address table entries only. |
| **show mac-address-table interface** | Displays the MAC address table information for a specific interface. |

| Command | Description |
|---|---|
| **show mac-address-table multicast** | Displays information about the multicast MAC address table. |
| **show mac-address-table protocol** | Displays the MAC address table information that is based on the protocol. |
| **show mac-address-table vlan** | Displays information about the MAC address table for a specific VLAN. |

# show mac-address-table vlan

To display information about the MAC address table for a specific VLAN, use the **show mac-address-table vlan** command.

**show mac-address-table** [**vlan** *vlan_id*] [**protocol** *protocol*]

## Syntax Description

| | |
|---|---|
| **vlan** *vlan_id* | (Optional) Displays the entries for a specific VLAN; valid values are from 1 to 4094. |
| **protocol** *protocol* | (Optional) Specifies a protocol. See the "Usage Guidelines" section for more information. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended addressing was added. |

## Usage Guidelines

For the MAC address table entries used by the routed ports, the routed port name is displayed in the "vlan" column not the the internal VLAN number.

The keyword definitions for the *protocol* variable are as follows:

- **assigned** specifies the assigned protocol entries.
- **ip** specifies the IP protocol.
- **ipx** specifies the IPX protocols.
- **other** specifies the other protocol entries.

## Examples

This example shows how to display information about the MAC address table for a specific VLAN:

```
Switch# show mac-address-table vlan 1
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0000.0000.0201   dynamic ip                    FastEthernet6/15
   1    0000.0000.0202   dynamic ip                    FastEthernet6/15
   1    0000.0000.0203   dynamic other                 FastEthernet6/15
   1    0000.0000.0204   dynamic other                 FastEthernet6/15
   1    0030.94fc.0dff    static ip,ipx,assigned,other  Switch

Multicast Entries
 vlan    mac address     type    ports
-------+---------------+-------+-----------------------------------------
   1    ffff.ffff.ffff   system Switch,Fa6/15
Switch#
```

This example shows how to display MAC address table information for a specific protocol type:

```
Switch# show mac-address-table vlan 100 protocol other
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0000.0000.0203   dynamic other                 FastEthernet6/15
   1    0000.0000.0204   dynamic other                 FastEthernet6/15
   1    0030.94fc.0dff    static ip,ipx,assigned,other  Switch

Multicast Entries
 vlan    mac address     type    ports
-------+---------------+-------+-----------------------------------------
   1    ffff.ffff.ffff   system Switch,Fa6/15
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show mac-address-table address** | Displays the information about the MAC-address table. |
| **show mac-address-table aging-time** | Displays MAC address table aging information. |
| **show mac-address-table count** | Displays the number of entries currently in the MAC address table. |
| **show mac-address-table dynamic** | Displays the dynamic MAC address table entries only. |
| **show mac-address-table interface** | Displays the MAC address table information for a specific interface. |
| **show mac-address-table multicast** | Displays information about the multicast MAC address table. |
| **show mac-address-table protocol** | Displays the MAC address table information that is based on the protocol. |
| **show mac-address-table static** | Displays the static MAC address table entries only. |

# show module

To display information about the module, use the **show module** command.

**show module** [*mod* | **all**]

## Syntax Description

| | |
|---|---|
| *mod* | (Optional) Number of the module; valid values vary from chassis to chassis. |
| **all** | (Optional) Displays information for all modules. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Enhanced the output of the **show idprom interface command** to include the 10-Gigabit Ethernet interface. |

## Usage Guidelines

In the Mod Sub-Module fields in the command output, the **show module** command displays the supervisor engine number but appends the uplink daughter card's module type and information.

If the PoE consumed by the module is more than 50 W above the administratively allocated PoE, the "Status" displays as "PwrOver." If the PoE consumed by the module is more than 50 W above the PoE module limit, the "Status" displays as "PwrFault."

## Examples

This example shows how to display information for all the modules.

This example shows the **show module** command output for a system with inadequate power for all installed modules. The system does not have enough power for Module 5; the "Status" displays it as "PwrDeny."

```
Switch# show module all
Mod  Ports Card Type                                Model             Serial No.
----+-----+---------------------------------------+-----------------+-----------
 1      2  1000BaseX (GBIC) Supervisor(active)    WS-X4014          JAB054109GH
 2      6  1000BaseX (GBIC)                       WS-X4306          00000110
 3     18  1000BaseX (GBIC)                       WS-X4418          JAB025104WK
 5      0  Not enough power for module            WS-X4148-FX-MT    00000000000
 6     48  10/100BaseTX (RJ45)                    WS-X4148          JAB023402RP

 M MAC addresses                   Hw  Fw           Sw               Status
--+--------------------------------+---+------------+----------------+---------
 1 005c.9d1a.f9d0 to 005c.9d1a.f9df 0.5 12.1(11br)EW 12.1(20020313:00 Ok
 2 0010.7bab.9920 to 0010.7bab.9925 0.2                               Ok
 3 0050.7356.2b36 to 0050.7356.2b47 1.0                               Ok
 5 0001.64fe.a930 to 0001.64fe.a95f 0.0                               PwrDeny

 6 0050.0f10.28b0 to 0050.0f10.28df 1.0                               Ok
Switch#
```

This example shows how to display information for a specific module:

```
Switch# show module mod2
Mod Ports Card Type                                 Model              Serial No.
--- ----- ---------------------------------------- ------------------ -----------
  2    2  Catalyst 4000 supervisor 2 (Active)     WS-X6K-SUP2-2GE    SAD04450LF1
Mod MAC addresses                     Hw    Fw           Sw           Status
--- --------------------------------- ------ ------------ ------------ -------
  2  0001.6461.39c0 to 0001.6461.39c1   1.1   6.1(3)       6.2(0.97)    Ok
Mod Sub-Module                  Model           Serial          Hw     Status
--- --------------------------- --------------- --------------- ------- -------
  2 Policy Feature Card 2       WS-F6K-PFC2     SAD04440HVU     1.0    Ok
  2 Cat4k MSFC 2 daughterboard  WS-F6K-MSFC2    SAD04430J9K     1.1    Ok
Switch#
```

This example shows how to display information for all the modules on the switch:

```
Switch# show module
Chassis Type : WS-C4506

Power consumed by backplane : 0 Watts

Mod Ports Card Type                                 Model              Serial No.
---+-----+---------------------------------------+------------------+-----------
 1     6  XG (X2), 1000BaseX (SFP) Supervisor(ac WS-X4517            ""
 3     6  1000BaseX (GBIC)                       WS-X4306           00000110

 M MAC addresses                   Hw  Fw           Sw               Status
--+--------------------------------+---+------------+----------------+---------
 1 0004.dd46.7700 to 0004.dd46.7705 0.0 12.2(20r)EW( 12.2(20040513:16 Ok
 3 0010.7bab.9920 to 0010.7bab.9925 0.2                               Ok
Switch#
```

# show monitor

To display information about the SPAN session, use the **show monitor** command.

**show monitor** [**session**] [**range** *session-range* | **local** | **remote** | **all** | *session-number*] [**detail**]

## Syntax Description

| | |
|---|---|
| **session** | (Optional) Displays the SPAN information for a session. |
| **range** | (Optional) Displays information for a range of sessions. |
| *session-range* | (Optional) Specifies a range of sessions. |
| **local** | (Optional) Displays all local SPAN sessions. |
| **remote** | (Optional) Displays the RSPAN source and destination sessions. |
| **all** | (Optional) Displays the SPAN and RSPAN sessions. |
| *session-number* | (Optional) Session number; valid values are from1 to 6. |
| **detail** | (Optional) Displays the detailed SPAN information for a session. |

## Defaults

The **detail** keyword only displays lines with a nondefault configuration.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(13)EW | Added support for differing directions within a single user session. |
| 12.1(19)EW | Output enhanced to display configuration status of SPAN enhancements. |
| 12.1(20)EW | Added support to display configuration state for remote SPAN and learning. |
| 12.2(20)EW | Added support to display ACLs that are applied to SPAN sessions. |

## Examples

This example shows how to display whether ACLs are applied to a given SPAN session on a Catalyst 4500 series switch:

```
Switch# show monitor

Session 1
---------
Type              : Local Session
Source Ports      :
    Both          : Fa6/1
Destination Ports : Fa6/2
    Encapsulation : Native
          Ingress : Disabled
        Learning  : Disabled
Filter VLANs      : 1
IP Access-group   : 10
```

This example shows how to display SPAN information for session 2:

```
Switch# show monitor session 2
Session 2
------------
Type : Remote Source Session
Source Ports:
    RX Only:       Fa1/1-3
Dest RSPAN VLAN:  901
Ingress : Enabled, default VLAN=2
Learning : Disabled
Switch#
```

This example shows how to display the detailed SPAN information for session 1:

```
Switch# show monitor session 1 detail
Session 1
---------
Type              : Local Session
Source Ports      :
    RX Only       : None
    TX Only       : None
    Both          : Gi1/1, CPU
Source VLANs      :
    RX Only       : None
    TX Only       : None
    Both          : None
Source RSPAN VLAN : Fa6/1
Destination Ports : Fa6/1
    Encapsulation : DOT1Q
          Ingress : Enabled, default VLAN = 2
Filter VLANs      : None
  Filter Types RX : Good
  Filter Types TX : None
Dest Rspan Vlan : 901
Ingress : Enabled, default VLAN=2
Learning : Disabled
IP Access-group : None
Switch#
```

This example shows how to display SPAN information for session 1 beginning with the line that starts with Destination:

```
Switch# show monitor session 1 | begin Destination
Destination Ports: None
Filter VLANs:      None
Switch#
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| monitor session | Enables the SPAN sessions on interfaces or VLANs. |

# show pagp

To display information about the port channel, use the **show pagp** command.

**show pagp** [*group-number*] {**counters** | **dual-active** | **internal** | **neighbor**}

## Syntax Description

| | |
|---|---|
| *group-number* | (Optional) Channel-group number; valid values are from 1 to 64. |
| **counters** | Specifies the traffic counter information. |
| **dual-active** | Specifies the dual-active information. |
| **internal** | Specifies the PAgP internal information. |
| **neighbor** | Specifies the PAgP neighbor information. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

You can enter any **show pagp** command to display the active PAgP port-channel information. To display the nonactive information, enter the **show pagp** command with a group.

## Examples

This example shows how to display information about the PAgP counter:

```
Switch# show pagp counters
           Information        Flush
Port       Sent   Recv     Sent   Recv
--------------------------------------
Channel group: 1
  Fa5/4    2660   2452     0      0
  Fa5/5    2676   2453     0      0
Channel group: 2
  Fa5/6    289    261      0      0
  Fa5/7    290    261      0      0
Switch#
```

This example shows how to display PAgP dual-active information:

```
Switch# show pagp dual-active
PAgP dual-active detection enabled: Yes
PAgP dual-active version: 1.1
```

```
Channel group 30
Dual-Active Partner Partner Partner
Port Detect Capable Name Port Version
Te3/1 Yes VS1-Reg2 Te1/1/7 1.1
Te4/1 Yes VS1-Reg2 Te2/2/8 1.1

Channel group 32
Dual-Active Partner Partner Partner
Port Detect Capable Name Port Version
Gi1/43 Yes VS3 Gi1/1/43 1.1
Gi1/44 Yes VS3 Gi1/1/44 1.1
Gi1/45 Yes VS3 Gi1/1/45 1.1
Gi1/46 Yes VS3 Gi2/1/46 1.1
Gi1/47 Yes VS3 Gi2/1/47 1.1
Gi1/48 Yes VS3 Gi2/1/48 1.1
Gi2/3 Yes VS3 Gi1/1/1 1.1
Gi2/4 Yes VS3 Gi2/1/1 1.1
Switch#
```

This example shows how to display internal PAgP information:

```
Switch# 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
                              Hello    Partner  PAgP     Learning
Port      Flags State   Timers  Interval Count   Priority  Method     IfIndx
Fa5/4     SC    U6/S7           30s      1         128      Any          129
Fa5/5     SC    U6/S7           30s      1         128      Any          129
Switch#
```

This example shows how to display PAgP neighbor information for all neighbors:

```
Switch# show pagp 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
          Partner              Partner          Partner         Partner Group
Port      Name                 Device ID        Port       Age  Flags   Cap.
Fa5/4     JAB031301            0050.0f10.230c   2/45         2s SAC     2D
Fa5/5     JAB031301            0050.0f10.230c   2/46        27s SAC     2D

Channel group 2 neighbors
          Partner              Partner          Partner         Partner Group
Port      Name                 Device ID        Port       Age  Flags   Cap.
Fa5/6     JAB031301            0050.0f10.230c   2/47        10s SAC     2F
Fa5/7     JAB031301            0050.0f10.230c   2/48        11s SAC     2F

Switch#
```

## Related Commands

| Command | Description |
|---|---|
| pagp learn-method | Learns the input interface of the incoming packets. |
| pagp port-priority | Selects a port in hot standby mode. |

# show policy-map

To display information about the policy map, use the **show policy-map** command.

**show policy-map** [*policy_map_name*]

## Syntax Description

| | |
|---|---|
| *policy_map_name* | (Optional) Name of the policy map. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display information for all the policy maps:

```
Switch# show policy-map
Policy Map ipp5-policy
  class  ipp5
   set ip precedence 6
Switch#
```

This example shows how to display information for a specific policy map:

```
Switch# show policy ipp5-policy
Policy Map ipp5-policy
  class  ipp5
   set ip precedence 6
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **class-map** | Creates a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode |
| **policy-map** | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode |
| **show class-map** | Displays class map information. |
| **show policy-map interface** | Displays the statistics and configurations of the input and output policies that are attached to an interface. |

# show policy-map control-plane

To display the configuration either of a class or of all classes for the policy map of a control plane, use the **show policy-map control-plane** command.

**show policy-map control-plane** [**input** [**class** *class-name*] | [**class** *class-name*]]

## Syntax Description

| | |
|---|---|
| **input** | (Optional) Displays statistics for the attached input policy. |
| **class** *class-name* | (Optional) Displays the name of the class. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

The **show policy-map control-plane** command displays information for aggregate control-plane services that control the number or rate of packets that are going to the process level.

## Examples

This example shows that the policy map TEST is associated with the control plane. This policy map polices traffic that matches the class-map TEST, while allowing all other traffic (that matches the class-map class-default) to go through as is. Table 2-23 describes the fields shown in the display.

```
Switch# show policy-map control-plane

Control Plane

  Service-policy input: system-cpp-policy

    Class-map: system-cpp-eapol (match-all)
      0 packets
      Match: access-group name system-cpp-eapol

    Class-map: system-cpp-bpdu-range (match-all)
      0 packets
      Match: access-group name system-cpp-bpdu-range

    Class-map: system-cpp-cdp (match-all)
      28 packets
      Match: access-group name system-cpp-cdp
      police: Per-interface
        Conform: 530 bytes Exceed: 0 bytes
```

```
    Class-map: system-cpp-garp (match-all)
      0 packets
      Match: access-group name system-cpp-garp

    Class-map: system-cpp-sstp (match-all)
      0 packets
      Match: access-group name system-cpp-sstp

    Class-map: system-cpp-cgmp (match-all)
      0 packets
      Match: access-group name system-cpp-cgmp

    Class-map: system-cpp-ospf (match-all)
      0 packets
      Match: access-group name system-cpp-ospf

    Class-map: system-cpp-igmp (match-all)
      0 packets
      Match: access-group name system-cpp-igmp

    Class-map: system-cpp-pim (match-all)
      0 packets
      Match: access-group name system-cpp-pim

    Class-map: system-cpp-all-systems-on-subnet (match-all)
      0 packets
      Match: access-group name system-cpp-all-systems-on-subnet

    Class-map: system-cpp-all-routers-on-subnet (match-all)
      0 packets
      Match: access-group name system-cpp-all-routers-on-subnet

    Class-map: system-cpp-ripv2 (match-all)
      0 packets
      Match: access-group name system-cpp-ripv2

    Class-map: system-cpp-ip-mcast-linklocal (match-all)
      0 packets
      Match: access-group name system-cpp-ip-mcast-linklocal

    Class-map: system-cpp-dhcp-cs (match-all)
      0 packets
      Match: access-group name system-cpp-dhcp-cs

    Class-map: system-cpp-dhcp-sc (match-all)
      0 packets
      Match: access-group name system-cpp-dhcp-sc

    Class-map: system-cpp-dhcp-ss (match-all)
      0 packets
      Match: access-group name system-cpp-dhcp-ss

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
Switch#
```

*Table 2-23 show policy-map control-plane Field Descriptions*

| Field | Description |
|---|---|
| **Fields Associated with Classes or Service Policies** | |
| Service-policy input | Name of the input service policy that is applied to the control plane. (If configured, this field will also show the output service policy.) |
| Class-map | Class of traffic being displayed. Traffic is displayed for each configured class. The choice for implementing class matches (for example, match-all or match-any) can also appear next to the traffic class. |
| Match | Match criteria for the specified class of traffic.<br>**Note** For more information about the variety of match criteria options available, refer to the chapter "Configuring the Modular Quality of Service Command-Line Interface" in the *Cisco IOS Quality of Service Solutions Configuration Guide*. |
| **Fields Associated with Traffic Policing** | |
| police | **police** command has been configured to enable traffic policing. |
| conformed | Action to be taken on packets conforming to a specified rate; displays the number of packets and bytes on which the action was taken. |
| exceeded | Action to be taken on packets exceeding a specified rate; displays the number of packets and bytes on which the action was taken. |

## Related Commands

| Command | Description |
|---|---|
| **control-plane** | Enters control-plane configuration mode. |
| **service-policy input (control-plane)** | Attaches a policy map to a control plane for aggregate control plane services. |

# show policy-map interface

To display the statistics and configurations of the input and output policies that are attached to an interface, use the **show policy-map interface** command.

**show policy-map interface** [{**fastethernet** *interface-number*} | {**gigabitethernet** *interface-number*} | {**port-channel** *number*} | {**vlan** *vlan_id*}] [**input** | **output**]

## Syntax Description

| | |
|---|---|
| **fastethernet** *interface-number* | (Optional) Specifies the Fast Ethernet 802.3 interface. |
| **gigabitethernet** *interface-number* | (Optional) Specifies the Gigabit Ethernet 802.3z interface. |
| **port-channel** *number* | (Optional) Specifies the port channel. |
| **vlan** *vlan_id* | (Optional) Specifies the VLAN ID; valid values are from 1 to 4094. |
| **input** | (Optional) Specifies input policies only. |
| **output** | (Optional) Specifies output policies only. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Added support for extended VLAN addresses. |
| 12.2(25)SG | Displays results for full flow policing. |

## Examples

This example shows how to display the statistics and configurations of all input and output policies attached to an interface:

```
Switch# show policy-map interface

 FastEthernet6/1

  service-policy input:ipp5-policy

    class-map:ipp5 (match-all)
      0 packets
      match:ip precedence 5
      set:
        ip precedence 6

    class-map:class-default (match-any)
      0 packets
      match:any
        0 packets
```

```
  service-policy output:ipp5-policy

    class-map:ipp5 (match-all)
      0 packets
      match:ip precedence 5
      set:
        ip precedence 6

    class-map:class-default (match-any)
      0 packets
      match:any
        0 packets
Switch#
```

This example shows how to display the input policy statistics and configurations for a specific interface:

```
Switch# show policy-map interface fastethernet 5/36 input
service-policy input:ipp5-policy

    class-map:ipp5 (match-all)
      0 packets
      match:ip precedence 5
      set:
        ip precedence 6

    class-map:class-default (match-any)
      0 packets
      match:any
        0 packets
Switch#
```

With the following configuration, each flow is policed to a 1000000 bps with an allowed 9000-byte burst value.

**Note** If you use the **match flow ip source-address|destination-address** command, these two flows are consolidated into one flow and they have the same source and destination address.

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# class-map c1
Switch(config-cmap)# match flow ip source-address ip destination-address ip protocol l4
source-port l4 destination-port
Switch(config-cmap)# exit
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# police 1000000 9000
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface fastEthernet 6/1
Switch(config-if)# service-policy input p1
Switch(config-if)# end
Switch# write memory
Switch# show policy-map interface
FastEthernet6/1

class-map c1
   match flow  ip source-address ip destination-address ip protocol l4 source-port l4
destination-port
!
 policy-map p1
    class c1
```

```
       police 1000000 bps 9000 byte conform-action transmit exceed-action drop
!
interface FastEthernet 6/1
  service-policy input p1

Switch# show policy-map p1
  Policy Map p1
    Class c1
      police 1000000 bps 9000 byte conform-action transmit exceed-action drop

Switch# show policy-map interface
 FastEthernet6/1

  Service-policy input: p1

    Class-map: c1 (match-all)
      15432182 packets
      Match: flow  ip source-address ip destination-address ip protocol l4 source-port l4
destination-port
      police: Per-interface
        Conform: 64995654 bytes Exceed: 2376965424 bytes


    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| class-map | Creates a class map to be used for matching packets to the class whose name you specify and to be used enter class-map configuration mode. |
| policy-map | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| show class-map | Displays class map information. |
| show qos | Displays QoS information. |

# show policy-map interface vlan

To show the QoS policy-map information applied to a specific VLAN on an interface, use the **show policy-map interface vlan** command.

**show policy-map interface vlan** *interface-id* **vlan** *vlan-id*

## Syntax Description

| | |
|---|---|
| **interface** *interface-id* | (Optional) Displays QoS policy-map information for a specific interface. |
| **vlan** *vlan-id* | (Optional) Displays QoS policy-map information for a specific VLAN. |

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

Take the following configuration on a non-Supervisor Engine 6-E as an example:

```
interface GigabitEthernet3/1
 vlan-range 20,400
  service-policy input p1
 vlan-range 300-301
  service-policy output p2
```

This example shows how to display policy-map statistics on VLAN 20 on the Gigabit Ethernet 6/1 interface:

```
Switch# show policy-map interface gigabitEthernet 3/1 vlan 20
 GigabitEthernet3/1 vlan 20

  Service-policy input: p1

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes
Switch#
```

Take the following configuration on a non-Supervisor Engine 6-E as an example:

```
interface fastethernet6/1
 vlan-range 100
  service-policy in p1
```

This example shows how to display policy-map statistics on VLAN 100 on the FastEthernet interface:

```
Switch#show policy-map interface fastEthernet 6/1 vlan 100

  FastEthernet6/1 vlan 100

   Service-policy input: p1
```

```
     Class-map: c1 (match-all)
       0 packets
       Match: ip dscp af11 (10)
       police: Per-interface
         Conform: 0 bytes Exceed: 0 bytes

     Class-map: class-default (match-any)
       0 packets
       Match: any
         0 packets
Switch#
```

Take the following configuration on a Supervisor Engine 6-E as an example:

```
interface gigabitethernet3/1
 vlan-range 100
  service-policy in p1
```

This example shows how to display policy-map statistics on VLAN 100 on the FastEthernet interface:

```
Switch#show policy-map interface gigabitethernet 3/1 vlan 100
GigabitEthernet3/1 vlan 100

   Service-policy input: p1

     Class-map: c1 (match-all)
       0 packets
       Match: ip dscp af11 (10)
       police:
          rate 128000 bps, burst 4000 bytes
           conformed 0 packets, 0 bytes; action:
             transmit
           exceeded 0 packets, 0 bytes; action:
             drop
           conformed 0 bps, exceeded 0 bps

     Class-map: class-default (match-any)
       0 packets
       Match: any
         0 packets
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| service-policy (interface configuration) | Attaches a policy map to an interface. |
| show policy-map interface | Displays the statistics and configurations of the input and output policies that are attached to an interface. |

# show port-security

To display the port security settings for an interface or for the switch, use the **show port-security** command.

**show port-security** [**address**] [**interface** *interface-id*]
[**interface** *port-channel port-channel-number*] [**vlan** *vlan-id*]

## Syntax Description

| | |
|---|---|
| **address** | (Optional) Displays all secure MAC addresses for all ports or for a specific port. |
| **interface** *interface-id* | (Optional) Displays port security settings for a specific interface. |
| **interface** *port-channel port channel-number* | (Optional) Displays port security for a specific port-channel interface. |
| **vlan** *vlan-id* | (Optional) Displays port security settings for a specific VLAN. |

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(18)EW | Support was enhanced to display sticky MAC addresses. |
| 12.2(25)EWA | Support was enhanced to display settings on a per-VLAN basis. |
| 12.2(31)SGA | Support was enhanced to display settings on EtherChannel interfaces. |

## Usage Guidelines

If you enter the command without keywords, the output includes the administrative and operational status of all secure ports on the switch.

If you enter the *interface-id* value or *port-channel-interface* value, the **show port-security** command displays port security settings for the interface.

If you enter the **address** keyword, the **show port-security address** command displays the secure MAC addresses for all interfaces and the aging information for each secure address.

If you enter the *interface-id* value and the **address** keyword, the **show port-security address interface** command displays all the MAC addresses for the interface with aging information for each secure address. You can also use this command to display all the MAC addresses for an interface even if you have not enabled port security on it.

Sticky MAC addresses are addresses that persist across switch reboots and link flaps.

## Examples

This example shows how to display port security settings for the entire switch:

```
Switch# show port-security
Secure Port  MaxSecureAddr  CurrentAddr  SecurityViolation  Security Action
               (Count)       (Count)          (Count)
---------------------------------------------------------------------------
      Fa3/1              2            2                  0         Restrict
      Fa3/2              2            2                  0         Restrict
      Fa3/3              2            2                  0         Shutdown
      Fa3/4              2            2                  0         Shutdown
      Fa3/5              2            2                  0         Shutdown
      Fa3/6              2            2                  0         Shutdown
      Fa3/7              2            2                  0         Shutdown
      Fa3/8              2            2                  0         Shutdown
     Fa3/10              1            0                  0         Shutdown
     Fa3/11              1            0                  0         Shutdown
     Fa3/12              1            0                  0         Restrict
     Fa3/13              1            0                  0         Shutdown
     Fa3/14              1            0                  0         Shutdown
     Fa3/15              1            0                  0         Shutdown
     Fa3/16              1            0                  0         Shutdown
     Po2                 3            1                  0         Shutdown
---------------------------------------------------------------------------
Total Addresses in System (excluding one mac per port)     :8
Max Addresses limit in System (excluding one mac per port) :3072
Global SNMP trap control for port-security                 :20 (traps per second)
Switch#
```

This example shows how to display port security settings for interface Fast Ethernet port 1:

```
Switch# show port-security interface fastethernet 5/1
Port Security              : Enabled
Port Status                : Secure-up
Violation Mode             : Shutdown
Aging Time                 : 0 mins
Aging Type                 : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses      : 1
Total MAC Addresses        : 1
Configured MAC Addresses   : 0
Sticky MAC Addresses       : 1
Last Source Address        : 0000.0001.001a
Security Violation Count   : 0
Switch#
```

This example shows how to display all secure MAC addresses configured on all switch interfaces:

```
Switch# show port-security address
          Secure Mac Address Table
------------------------------------------------------------------------
Vlan    Mac Address       Type                Ports   Remaining Age
                                                         (mins)
----    -----------       ----                -----   -------------
   1    0000.0001.0000    SecureConfigured    Fa3/1       15 (I)
   1    0000.0001.0001    SecureConfigured    Fa3/1       14 (I)
   1    0000.0001.0100    SecureConfigured    Fa3/2        -
   1    0000.0001.0101    SecureConfigured    Fa3/2        -
   1    0000.0001.0200    SecureConfigured    Fa3/3        -
   1    0000.0001.0201    SecureConfigured    Fa3/3        -
   1    0000.0001.0300    SecureConfigured    Fa3/4        -
   1    0000.0001.0301    SecureConfigured    Fa3/4        -
   1    0000.0001.1000    SecureDynamic       Fa3/5        -
   1    0000.0001.1001    SecureDynamic       Fa3/5        -
   1    0000.0001.1100    SecureDynamic       Fa3/6        -
   1    0000.0001.1101    SecureDynamic       Fa3/6        -
   1    0000.0001.1200    SecureSticky        Fa3/7        -
   1    0000.0001.1201    SecureSticky        Fa3/7        -
   1    0000.0001.1300    SecureSticky        Fa3/8        -
   1    0000.0001.1301    SecureSticky        Fa3/8        -
   1    0000.0001.2000    SecureSticky        Po2          -
------------------------------------------------------------------------
Total Addresses in System (excluding one mac per port)     :8
Max Addresses limit in System (excluding one mac per port) :3072
```

This example shows how to display the maximum allowed number of secure MAC addresses and the current number of secure MAC addresses on interface Gigabitethernet1/1:

```
Switch# show port-security interface gigabitethernet1/1 vlan
Default maximum: 22
VLAN  Maximum    Current
    2         22          3
    3         22          3
    4         22          3
    5         22          1
    6         22          2
```

This example shows how to display the port security settings on interface Gigabitethernet1/1 for VLANs 2 and 3:

```
Switch# show port-security interface gigabitethernet1/1 vlan 2-3
Default maximum: 22
VLAN  Maximum    Current
    2         22          3
    3         22          3
```

This example shows how to display all secure MAC addresses configured on interface Gigabitethernet1/1 with aging information for each address.

```
Switch# show port-security interface gigabitethernet1/1 address

          Secure Mac Address Table
------------------------------------------------------------------------
Vlan    Mac Address       Type                      Ports   Remaining Age(mins)
----    -----------               ----                      -----   -------------
   2    0001.0001.0001    SecureConfigured          Gi1/1        -
   2    0001.0001.0002    SecureSticky              Gi1/1        -
   3    0001.0001.0001    SecureConfigured          Gi1/1        -
   3    0001.0001.0002    SecureSticky              Gi1/1        -
   3    0001.0001.0003    SecureSticky              Gi1/1        -
   4    0001.0001.0001    SecureConfigured          Gi1/1        -
   4    0001.0001.0003    SecureSticky              Gi1/1        -
   6    0001.0001.0001    SecureConfigured          Gi1/1        -
   6    0001.0001.0002    SecureConfigured          Gi1/1        -
------------------------------------------------------------------------
Total Addresses: 12
```

This example shows how to display all secure MAC addresses configured on VLANs 2 and 3 on interface Gigabitethernet1/1 with aging information for each address:

```
Switch# show port-security interface gigabitethernet1/1 address vlan 2-3

          Secure Mac Address Table
------------------------------------------------------------------------
Vlan    Mac Address       Type                      Ports   Remaining Age(mins)
----    -----------       ----                      -----   -------------
   2    0001.0001.0001    SecureConfigured          Gi1/1        -
   2    0001.0001.0002    SecureSticky              Gi1/1        -
   2    0001.0001.0003    SecureSticky              Gi1/1        -
   3    0001.0001.0001    SecureConfigured          Gi1/1        -
   3    0001.0001.0002    SecureSticky              Gi1/1        -
   3    0001.0001.0003    SecureSticky              Gi1/1        -
------------------------------------------------------------------------
Total Addresses: 12
Switch#
```

This example shows how to display the maximum allowed number of secure MAC addresses and the current number of secure MAC addressees on Fast Ethernet port 1:

```
Switch# show port-security interface fastethernet5/1 vlan
Default maximum: 22
VLAN  Maximum    Current
2         22          3
3         22          3
5         22          1
6         22          2
Switch#
```

This example shows how to display the port security settings on Fast Ethernet port 1 for VLANs 2 and 3:

```
Switch# show port-security interface fastethernet5/1 vlan 2-3
Default maximum: 22
VLAN  Maximum    Current
    2         22          3
    3         22          3
Switch#
```

This example shows how to display all secure MAC addresses configured on Fast Ethernet port 1 with aging information for each address.

```
Switch# show port-security interface fastethernet5/1 address

          Secure Mac Address Table
------------------------------------------------------------------------
Vlan    Mac Address       Type                      Ports   Remaining Age(mins)
----    -----------       ----                      -----   -------------
   2    0001.0001.0001    SecureConfigured          Gi1/1        -
   2    0001.0001.0002    SecureSticky              Gi1/1        -
   2    0001.0001.0003    SecureSticky              Gi1/1        -
   3    0001.0001.0001    SecureConfigured          Gi1/1        -
   3    0001.0001.0002    SecureSticky              Gi1/1        -
   3    0001.0001.0003    SecureSticky              Gi1/1        -
   4    0001.0001.0001    SecureConfigured          Gi1/1        -
   4    0001.0001.0002    SecureSticky              Gi1/1        -
   4    0001.0001.0003    SecureSticky              Gi1/1        -
   5    0001.0001.0001    SecureConfigured          Gi1/1        -
   6    0001.0001.0001    SecureConfigured          Gi1/1        -
   6    0001.0001.0002    SecureConfigured          Gi1/1        -
------------------------------------------------------------------------
Total Addresses: 12
Switch#
```

This example shows how to display all secure MAC addresses configured on VLANs 2 and 3 on Fast Ethernet port 1 with aging information for each address:

```
Switch# show port-security interface fastethernet5/1 address vlan 2-3

          Secure Mac Address Table
------------------------------------------------------------------------
Vlan    Mac Address       Type                      Ports   Remaining Age(mins)
----    -----------       ----                      -----   -------------
   2    0001.0001.0001    SecureConfigured          Gi1/1        -
   2    0001.0001.0002    SecureSticky              Gi1/1        -
   2    0001.0001.0003    SecureSticky              Gi1/1        -
   3    0001.0001.0001    SecureConfigured          Gi1/1        -
   3    0001.0001.0002    SecureSticky              Gi1/1        -
   3    0001.0001.0003    SecureSticky              Gi1/1        -
------------------------------------------------------------------------
Total Addresses: 12
Switch#
```

This example shows how to display all secure MAC addresses configured on all switch interfaces:

```
Switch# show port-security address
          Secure Mac Address Table
------------------------------------------------------------------------
Vlan    Mac Address       Type                Ports   Remaining Age
                                                         (mins)
----    -----------       ----                -----   -------------
   1    0000.0001.0000    SecureConfigured    Fa3/1       15 (I)
   1    0000.0001.0001    SecureConfigured    Fa3/1       14 (I)
   1    0000.0001.0100    SecureConfigured    Fa3/2        -
   1    0000.0001.0101    SecureConfigured    Fa3/2        -
   1    0000.0001.0200    SecureConfigured    Fa3/3        -
   1    0000.0001.0201    SecureConfigured    Fa3/3        -
   1    0000.0001.0300    SecureConfigured    Fa3/4        -
   1    0000.0001.0301    SecureConfigured    Fa3/4        -
   1    0000.0001.1000    SecureDynamic       Fa3/5        -
   1    0000.0001.1001    SecureDynamic       Fa3/5        -
   1    0000.0001.1100    SecureDynamic       Fa3/6        -
   1    0000.0001.1101    SecureDynamic       Fa3/6        -
   1    0000.0001.1200    SecureSticky        Fa3/7        -
   1    0000.0001.1201    SecureSticky        Fa3/7        -
   1    0000.0001.1300    SecureSticky        Fa3/8        -
   1    0000.0001.1301    SecureSticky        Fa3/8        -
------------------------------------------------------------------------
Total Addresses in System (excluding one mac per port)     :8
Max Addresses limit in System (excluding one mac per port) :3072
Switch#
```

This example shows how to display the maximum allowed number of secure MAC addresses and the current number of secure MAC addresses on interface Gigabitethernet1/1:

```
Switch# show port-security interface gigabitethernet1/1 vlan
Default maximum: 22
VLAN  Maximum    Current
    2         22          3
    3         22          3
    4         22          3
    5         22          1
    6         22          2
Switch#
```

This example shows how to display the port security settings on interface Gigabitethernet1/1 for VLANs 2 and 3:

```
Switch# show port-security interface gigabitethernet1/1 vlan 2-3
Default maximum: 22
VLAN  Maximum    Current
    2         22          3
    3         22          3
Switch#
```

This example shows how to display all secure MAC addresses configured on interface Gigabitethernet1/1 with aging information for each address.

```
Switch# show port-security interface gigabitethernet1/1 address

          Secure Mac Address Table
------------------------------------------------------------------------
Vlan    Mac Address       Type                      Ports   Remaining Age(mins)
----    -----------               ----                      -----   -------------
   2    0001.0001.0001    SecureConfigured          Gi1/1        -
   2    0001.0001.0002    SecureSticky              Gi1/1        -
   3    0001.0001.0001    SecureConfigured          Gi1/1        -
   3    0001.0001.0002    SecureSticky              Gi1/1        -
   3    0001.0001.0003    SecureSticky              Gi1/1        -
   4    0001.0001.0001    SecureConfigured          Gi1/1        -
   4    0001.0001.0003    SecureSticky              Gi1/1        -
   6    0001.0001.0001    SecureConfigured          Gi1/1        -
   6    0001.0001.0002    SecureConfigured          Gi1/1        -
------------------------------------------------------------------------
Total Addresses: 12
Switch#
```

This example shows how to display all secure MAC addresses configured on VLANs 2 and 3 on interface Gigabitethernet1/1 with aging information for each address:

```
Switch# show port-security interface gigabitethernet1/1 address vlan 2-3

          Secure Mac Address Table
------------------------------------------------------------------------
Vlan    Mac Address       Type                      Ports   Remaining Age(mins)
----    -----------       ----                      -----   -------------
   2    0001.0001.0001    SecureConfigured          Gi1/1        -
   2    0001.0001.0002    SecureSticky              Gi1/1        -
   2    0001.0001.0003    SecureSticky              Gi1/1        -
   3    0001.0001.0001    SecureConfigured          Gi1/1        -
   3    0001.0001.0002    SecureSticky              Gi1/1        -
   3    0001.0001.0003    SecureSticky              Gi1/1        -
------------------------------------------------------------------------
Total Addresses: 12
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| switchport port-security | Enables port security on an interface. |

# show power

To display information about the power status, use the **show power** command.

**show power** [**available | capabilities | detail | inline** {[*interface*] | **consumption default | module** *mod*} | **module | status | supplies**]

## Syntax Description

| | |
|---|---|
| **available** | (Optional) Displays the available system power. |
| **capabilities** | (Optional) Displays the individual power supply capabilities. |
| **detail** | (Optional) Displays detailed information on power resources. |
| **inline** | (Optional) Displays the PoE status. |
| *interface* | (Optional) Type of interface; the only valid value is **fastethernet.** |
| **consumption default** | (Optional ) Displays the PoE consumption. |
| **module** *mod* | (Optional) Displays the PoE consumption for the specified module. |
| **module** | (Optional) Displays the power consumption for each module. |
| **status** | (Optional) Displays the power supply status. |
| **supplies** | (Optional) Displays the number of power supplies needed by the system. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)SG | Displays inline power handling for the Supervisor Engine II-TS. |

## Usage Guidelines

If a powered device is connected to an interface with external power, the switch does not recognize the powered device. The Device column in the output of the **show power inline** command displays as unknown.

If your port is not capable of supporting Power over Ethernet, you will receive this message:

```
Power over Ethernet not supported on interface Admin
```

The **show power in-line** *interface* **|** *module* command displays the amount of power that is used to operate a Cisco 7960 IP Phone. To view the amount of power requested, use the **show cdp neighbors** command.

Because of the PoE consumed by FPGAs and other hardware components on the module the operating PoE consumption for an 802.3af-compliant module can be nonzero, even when there are no powered devices attached to the module. The operating PoE can vary by as much as 20 W because of fluctuations in the PoE that is consumed by the hardware components.

## Examples

This example shows how to display information about the general power supply:

```
Switch# show power
Power                                                 Fan     Inline
Supply  Model No          Type       Status       Sensor  Status
------  ----------------  ---------  -----------  ------  ------
PS1     PWR-C45-2800AC    AC 2800W   good         good    good
PS2     PWR-C45-1000AC    AC 1000W   err-disable  good    n.a.

*** Power Supplies of different type have been detected***

Power supplies needed by system    :1
Power supplies currently available :1

Power Summary                       Maximum
 (in Watts)              Used     Available
----------------------   ----     ---------
System Power (12V)        328         1360
Inline Power (-50V)         0         1400
Backplane Power (3.3V)     10           40
----------------------   ----
Total Used                338 (not to exceed Total Maximum Available = 750)
Switch#
```

This example shows how to display the amount of available system power:

```
Switch# show power available
Power Summary
 (in Watts)    Available   Used   Remaining
-------------  ---------  ------  ---------
System Power     1360       280     1080
Inline Power     1400         0     1400
Maximum Power    2800       280     2520
Switch#
```

This example shows how to display detailed information for system power.

```
Switch# show power detail
Power                                                 Fan      Inline
Supply  Model No          Type       Status       Sensor   Status
------  ----------------  ---------  -----------  -------  -------
PS1     PWR-C45-1400DC    DCSP1400W  good         good     n.a.
PS1-1                     12.5A       good
PS1-2                     15.0A       off
PS1-3                     15.0A       off
PS2     none              --         --           --       --

Power supplies needed by system    : 1
Power supplies currently available : 1

Power Summary                       Maximum
 (in Watts)              Used     Available
----------------------   ----     ---------
System Power (12V)        360         360
Inline Power (-50V)         0           0
Backplane Power (3.3V)      0          40
----------------------   ----     ---------
Total                     360         400
```

```
Module Inline Power Summary (Watts)
(12V -> -48V on board conversion)
---------------------------------
                    Maximum
Mod      Used      Available
---      ----      ---------
1           5             25
---      ----      ---------

                          Watts Used of System Power (12V)
Mod   Model               currently  out of reset  in reset
----  ------------------  ---------  ------------  --------
 1    WS-X4013+TS            180         180          180
 2    WS-X4506-GB-T           60          60           20
 3    WS-X4424-GB-RJ45        90          90           50
 --   Fan Tray                30          --           --
----------------------   ---------  ------------   -------
       Total                 360         330          250

                        Watts used of Chassis Inline Power (-50V)
                        Inline Power Admin  Inline Power Oper
Mod   Model                PS     Device       PS     Device     Efficiency
----  ------------------  ----------------    ----------------    ----------
 2    WS-X4506-GB-T          0        0          0        0          89
 3    WS-X4424-GB-RJ45       -        -          -        -           -
----------------------  ----------------    ----------------    ----------
       Total                 0        0          0        0

                        Watts used of Module Inline Power (12V -> -50V)
                        Inline Power Admin  Inline Power Oper
Mod   Model                PS     Device       PS     Device     Efficiency
----  ------------------  ----------------    ----------------    ----------
 1    WS-X4013+TS            6        5          3        3          90
----------------------  ----------------    ----------------    ----------
Switch#
```

This example shows how to display power consumption for the module.

```
Switch# show power module
Watts Used of System Power (12V)
Mod   Model               currently  out of reset  in reset
----  ------------------  ---------  ------------  --------
 1    WS-X4013+TS            180         180          180
 2    WS-X4506-GB-T           60          60           20
 3    WS-X4424-GB-RJ45        90          90           50
 --   Fan Tray                30          --           --
----------------------   ---------  ------------   -------
       Total                 360         330          250

                        Watts used of Chassis Inline Power (-50V)
                        Inline Power Admin  Inline Power Oper
Mod   Model                PS     Device       PS     Device     Efficiency
----  ------------------  ----------------    ----------------    ----------
 2    WS-X4506-GB-T          0        0          0        0          89
 3    WS-X4424-GB-RJ45       -        -          -        -           -
----------------------  ----------------    ----------------    ----------
       Total                 0        0          0        0
Watts used of Module Inline Power (12V -> -50V)
                        Inline Power Admin  Inline Power Oper
Mod   Model                PS     Device       PS     Device     Efficiency
----  ------------------  ----------------    ----------------    ----------
 1    WS-X4013+TS            6        5          3        3          90
----------------------  ----------------    ----------------    ----------
Switch#
```

**Note** The "Inline Power Oper" column displays the PoE consumed by the powered devices attached to the module in addition to the PoE consumed by the FPGAs and other hardware components on the module. The "Inline Power Admin" column displays only the PoE allocated by the powered devices attached to the module.

This example shows how to display the power status information:

```
Switch# show power status
Power                                                Fan     Inline
Supply  Model No          Type       Status          Sensor  Status
------  ----------------  ---------  ------------    ------  ------
PS1     PWR-C45-2800AC    AC 2800W   good            good    good
PS2     PWR-C45-2800AC    AC 2800W   good            good    good

Power Supply    Max     Min     Max     Min     Absolute
(Nos in Watts)  Inline  Inline  System  System  Maximum
--------------  ------  ------  ------  ------  --------
PS1             1400    1400    1360    1360    2800
PS2             1400    1400    1360    1360    2800
Switch#
```

This example shows how to verify the PoE consumption for the switch:

```
Switch# show power inline consumption default
Default PD consumption : 5000 mW
Switch#
```

This example shows how to display the status of inline power:

```
Switch# show power inline
Available:677(w)  Used:117(w)  Remaining:560(w)

Interface Admin  Oper            Power(Watts)     Device              Class
                              From PS    To Device
--------- ------ ---------- ---------- ---------- ------------------- -----
Fa3/1     auto   on         17.3       15.4       Ieee PD             0
Fa3/2     auto   on         4.5        4.0        Ieee PD             1
Fa3/3     auto   on         7.1        6.3        Cisco IP Phone 7960 0
Fa3/4     auto   on         7.1        6.3        Cisco IP Phone 7960 n/a
Fa3/5     auto   on         17.3       15.4       Ieee PD             0
Fa3/6     auto   on         17.3       15.4       Ieee PD             0
Fa3/7     auto   on         4.5        4.0        Ieee PD             1
Fa3/8     auto   on         7.9        7.0        Ieee PD             2
Fa3/9     auto   on         17.3       15.4       Ieee PD             3
Fa3/10    auto   on         17.3       15.4       Ieee PD             4
Fa3/11    auto   off        0          0          n/a                 n/a
Fa3/12    auto   off        0          0          n/a                 n/a
Fa3/13    auto   off        0          0          n/a                 n/a
Fa3/14    auto   off        0          0          n/a                 n/a
Fa3/15    auto   off        0          0          n/a                 n/a
Fa3/16    auto   off        0          0          n/a                 n/a
Fa3/17    auto   off        0          0          n/a                 n/a
Fa3/18    auto   off        0          0          n/a                 n/a

--------- ------ ---------- ---------- ---------- ------------------- -----

Totals:          10   on    117.5      104.6

Switch#
```

This example shows how to display the number of power supplies needed by the system:

```
Switch# show power supplies
Power supplies needed by system = 2
Switch#
```

This example shows how to display the PoE status for Fast Ethernet interface 3/1:

```
Switch# show power inline fastethernet3/1
Available:677(w)  Used:11(w)  Remaining:666(w)

Interface Admin  Oper            Power(Watts)     Device              Class
                              From PS    To Device
--------- ------ ---------- ---------- ---------- ------------------- -----

Fa3/1     auto   on         11.2       10.0       Ieee PD             0

Interface  AdminPowerMax   AdminConsumption
             (Watts)           (Watts)
---------- --------------- --------------------

Fa3/1                 15.4                 10.0
Switch#
```

**Note** When the Supervisor Engine II+TS is used with the 1400 W DC power supply (PWR-C45-1400DC), and only one 12.5 A input of the DC power supply is used, the supervisor engine's power consumption may vary depending on whether there is any linecard inserted at slot 2 and 3, as well as on the type of linecards inserted. This amount varies between 155 W and 330 W. This variability also affects the maximum amount of available supervisor engine inline power, which can also vary from 0 W to 175 W. Therefore, it is possible for a supervisor engine to deny inline power to some connected inline power devices when one or more linecards are inserted into the chassis.

The output of the commands **show power detail** and **show power module** display the supervisor engine's variable power consumption and its inline power summary.

```
Switch# show power detail
sh power detail
Power                                                 Fan      Inline
Supply  Model No          Type       Status           Sensor   Status
------  ----------------  ---------  -----------      -------  -------
PS1     PWR-C45-1400DC    DCSP1400W  good             good     n.a.
PS1-1                     12.5A       good
PS1-2                     15.0A       off
PS1-3                     15.0A       off
PS2     none              --         --               --       --

Power supplies needed by system    : 1
Power supplies currently available : 1

Power Summary                        Maximum
 (in Watts)              Used      Available
----------------------   ----      ---------
System Power (12V)        360          360
Inline Power (-50V)         0            0
Backplane Power (3.3V)      0           40
----------------------   ----      ---------
Total                     360          400
```

```
Module Inline Power Summary (Watts)
(12V -> -48V on board conversion)
---------------------------------
                    Maximum
Mod      Used      Available
---      ----      ---------
1           5             25
---      ----      ---------

                          Watts Used of System Power (12V)
Mod   Model               currently  out of reset  in reset
----  ------------------  ---------  ------------  --------
 1    WS-X4013+TS            180         180         180
 2    WS-X4506-GB-T           60          60          20
 3    WS-X4424-GB-RJ45        90          90          50
 --   Fan Tray                30          --          --
----------------------   ---------  ------------   -------
       Total                360         330         250

                        Watts used of Chassis Inline Power (-50V)
                        Inline Power Admin  Inline Power Oper
Mod   Model                PS     Device       PS     Device     Efficiency
----  ------------------  ----------------    ----------------    ----------
 2    WS-X4506-GB-T          0        0          0        0          89
 3    WS-X4424-GB-RJ45       -        -          -        -           -
----------------------  ----------------    ----------------    ----------
       Total                0        0          0        0

                        Watts used of Module Inline Power (12V -> -50V)
                        Inline Power Admin  Inline Power Oper
Mod   Model                PS     Device       PS     Device     Efficiency
----  ------------------  ----------------    ----------------    ----------
 1    WS-X4013+TS            6        5          3        3          90
----------------------  ----------------    ----------------    ----------

Switch#sh power module
sh power module
                          Watts Used of System Power (12V)
Mod   Model               currently  out of reset  in reset
----  ------------------  ---------  ------------  --------
 1    WS-X4013+TS            180         180         180
 2    WS-X4506-GB-T           60          60          20
 3    WS-X4424-GB-RJ45        90          90          50
 --   Fan Tray                30          --          --
----------------------   ---------  ------------   -------
       Total                360         330         250

                        Watts used of Chassis Inline Power (-50V)
                        Inline Power Admin  Inline Power Oper
Mod   Model                PS     Device       PS     Device     Efficiency
----  ------------------  ----------------    ----------------    ----------
 2    WS-X4506-GB-T          0        0          0        0          89
 3    WS-X4424-GB-RJ45       -        -          -        -           -
----------------------  ----------------    ----------------    ----------
       Total                0        0          0        0

                        Watts used of Module Inline Power (12V -> -50V)
                        Inline Power Admin  Inline Power Oper
Mod   Model                PS     Device       PS     Device     Efficiency
----  ------------------  ----------------    ----------------    ----------
 1    WS-X4013+TS            6        5          3        3          90
----------------------  ----------------    ----------------    ----------

Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| **power dc input** | Configures the power DC input parameters on the switch. |
| **power inline** | Sets the inline-power state for the inline-power-capable interfaces. |
| **power inline consumption** | Sets the default power that is allocated to an interface for all the inline-power-capable interfaces on the switch. |
| **power redundancy-mode** | Configures the power settings for the chassis. |

# show qos

To display QoS information, use the **show qos** command.

**show qos**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

## Examples

This example shows the output that might be displayed if you do not enter any keywords:

```
Switch# show qos
  QoS is enabled globally
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| qos (global configuration mode) | Globally enables QoS functionality on the switch. |
| qos (interface configuration mode) | Enables QoS functionality on an interface. |

# show qos aggregate policer

To display QoS aggregate policer information, use the **show qos aggregate policer** command.

**show qos aggregate policer** [*aggregate_name*]

## Syntax Description

| | |
|---|---|
| *aggregate_name* | (Optional) Named aggregate policer. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

The aggregate policer name is case sensitive.

## Examples

This example shows the output if you do not enter any keywords:

```
Switch# show qos aggregate policer
Policer aggr-1
Rate(bps):10000000 Normal-Burst(bytes):1000000
conform-action:transmit exceed-action:policed-dscp-transmit
Policymaps using this policer:
    ipp5-policy
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| qos aggregate-policer | Defines a named aggregate policer. |

# show qos dbl

To display global Dynamic Buffer Limiting (DBL) information, use the **show qos dbl** command.

**show qos dbl**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

## Examples

This example shows how to display global DBL information:

```
Switch# show qos dbl
DBL is enabled globally
DBL flow includes vlan
DBL flow includes l4-ports
DBL does not use ecn to indicate congestion
DBL exceed-action mark probability:15%
DBL max credits:15
DBL aggressive credit limit:10
DBL aggressive buffer limit:2 packets
DBL DSCPs with default drop probability:
     1-10
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| qos (global configuration mode) | Globally enables QoS functionality on the switch. |
| qos dbl | Enables Dynamic Buffer Limiting (DBL) globally on the switch. |

# show qos interface

To display queueing information, use the **show qos interface** command.

**show qos interface** {**fastethernet** *interface-number* | **gigabitethernet** *interface-number*} | [**vlan** *vlan_id* | **port-channel** *number*]

## Syntax Description

| | |
|---|---|
| **fastethernet** *interface-number* | Specifies the Fast Ethernet 802.3 interface. |
| **gigabitethernet** *interface-number* | Specifies the Gigabit Ethernet 802.3z interface. |
| **vlan** *vlan_id* | (Optional) Specifies the VLAN ID; valid values are from 1 to 4094. |
| **port-channel** *number* | (Optional) Specifies the port channel; valid ranges are from 1 to 64. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(13)EW | Added support for extended VLAN addresses. |
| 12.1(19)EW | Display changed to include the Port Trust Device. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

## Examples

This example shows how to display queueing information:

```
Switch# show qos interface fastethernet 6/1
    QoS is enabled globally
    Port QoS is enabled
    Administrative Port Trust State: 'dscp'
    Operational Port Trust State: 'untrusted'
    Port Trust Device:'cisco-phone'
    Default DSCP:0 Default CoS:0

    Tx-Queue   Bandwidth   ShapeRate   Priority   QueueSize
                 (bps)       (bps)                (packets)
      1        31250000    disabled    N/A        240
      2        31250000    disabled    N/A        240
      3        31250000    disabled    normal     240
      4        31250000    disabled    N/A        240
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| qos map cos | Defines the ingress CoS-to-DSCP mapping for the trusted interfaces. |
| show qos | Displays QoS information. |
| tx-queue | Configures the transmit queue parameters for an interface. |

# show qos maps

To display QoS map information, use the **show qos maps** command.

**show qos maps** [**cos** | **dscp** [**policed** | **tx-queue**]]

**Syntax Description**

| | |
|---|---|
| **cos** | (Optional) Displays CoS map information. |
| **dscp** | (Optional) Displays DSCP map information. |
| **policed** | (Optional) Displays policed map information. |
| **tx-queue** | (Optional) Displays tx-queue map information. |

**Defaults**

This command has no default settings.

**Command Modes**

Privileged EXEC mode

**Command History**

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

**Usage Guidelines**

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

**Examples**

This example shows how to display QoS map settings:

```
Switch# show qos maps
DSCP-TxQueue Mapping Table (dscp = d1d2)
d1 :d2  0  1  2  3  4  5  6  7  8  9
-----------------------------------
 0 :   01 01 01 01 01 01 01 01 01 01
 1 :   01 01 01 01 01 01 02 02 02 02
 2 :   02 02 02 02 02 02 02 02 02 02
 3 :   02 02 03 03 03 03 03 03 03 03
 4 :   03 03 03 03 03 03 03 03 04 04
 5 :   04 04 04 04 04 04 04 04 04 04
 6 :   04 04 04 04

Policed DSCP Mapping Table (dscp = d1d2)
d1 :d2  0  1  2  3  4  5  6  7  8  9
-----------------------------------
 0 :   00 01 02 03 04 05 06 07 08 09
 1 :   10 11 12 13 14 15 16 17 18 19
 2 :   20 21 22 23 24 25 26 27 28 29
 3 :   30 31 32 33 34 35 36 37 38 39
 4 :   40 41 42 43 44 45 46 47 48 49
 5 :   50 51 52 53 54 55 56 57 58 59
 6 :   60 61 62 63
```

```
DSCP-CoS Mapping Table (dscp = d1d2)
d1 :d2  0  1  2  3  4  5  6  7  8  9
---------------------------------------
 0 :   00 00 00 00 00 00 00 00 01 01
 1 :   01 01 01 01 01 01 02 02 02 02
 2 :   02 02 02 02 03 03 03 03 03 03
 3 :   03 03 04 04 04 04 04 04 04 04
 4 :   05 05 05 05 05 05 05 05 06 06
 5 :   06 06 06 06 06 06 07 07 07 07
 6 :   07 07 07 07

CoS-DSCP Mapping Table
   CoS:  0  1  2  3  4  5  6  7
--------------------------------
  DSCP:  0  8 16 24 32 40 48 56

Switch#
```

## Related Commands

| Command | Description |
|---|---|
| qos (global configuration mode) | Globally enables QoS functionality on the switch. |
| qos (interface configuration mode) | Enables QoS functionality on an interface. |

# show redundancy

To display redundancy facility information, use the **show redundancy** command.

**show redundancy** {**clients** | **counters** | **history** | **states**}

## Syntax Description

| | |
|---|---|
| **clients** | (Optional) Displays information about the redundancy facility client. |
| **counters** | (Optional) Displays information about the redundancy facility counter. |
| **history** | (Optional) Displays a log of past status and related information for the redundancy facility. |
| **states** | (Optional) Displays information about the redundancy facility state, such as disabled, initialization, standby, active. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1.(13)EW | Support for this command was introduced on the Catalyst 4500 series switch (Catalyst 4507R only). |
| 12.2(31)SGA | Support for ISSU was introduced. |

## Examples

This example shows how to display information about the redundancy facility:

```
Switch# show redundancy
Switch# show redundancy
4507r-demo#show redundancy
Redundant System Information :
------------------------------
       Available system uptime = 2 days, 2 hours, 39 minutes
Switchovers system experienced = 0
              Standby failures = 0
        Last switchover reason = none

                 Hardware Mode = Duplex
    Configured Redundancy Mode = Stateful Switchover
     Operating Redundancy Mode = Stateful Switchover
              Maintenance Mode = Disabled
                Communications = Up

Current Processor Information :
-------------------------------
               Active Location = slot 1
        Current Software state = ACTIVE
       Uptime in current state = 2 days, 2 hours, 39 minutes
                 Image Version = Cisco Internetwork Operating System Software
IOS (tm) Catalyst 4000 L3 Switch Software (cat4000-I5S-M), Version 12.2(20)EWA(3
.92), CISCO INTERNAL USE ONLY ENHANCED PRODUCTION VERSION
```

```
Copyright (c) 1986-2004 by cisco Systems, Inc.
Compiled Wed 14-Jul-04 04:42 by esi
                          BOOT = bootflash:cat4000-i5s-mz.122_20_EWA_392,1
        Configuration register = 0x2002

Peer Processor Information :
----------------------------
              Standby Location = slot 2
        Current Software state = STANDBY HOT
       Uptime in current state = 2 days, 2 hours, 39 minutes
                 Image Version = Cisco Internetwork Operating System Software
IOS (tm) Catalyst 4000 L3 Switch Software (cat4000-I5S-M), Version 12.2(20)EWA(3
.92), CISCO INTERNAL USE ONLY ENHANCED PRODUCTION VERSION
Copyright (c) 1986-2004 by cisco Systems, Inc.
Compiled Wed 14-Jul-04 0
                          BOOT = bootflash:cat4000-i5s-mz.122_20_EWA_392,1
        Configuration register = 0x2002

Switch#
```

This example shows how to display redundancy facility client information:

```
Switch# show redundancy clients
clientID = 0       clientSeq = 0        RF_INTERNAL_MSG
clientID = 30      clientSeq = 135      Redundancy Mode RF
clientID = 28      clientSeq = 330      GALIOS_CONFIG_SYNC
clientID = 65000   clientSeq = 65000    RF_LAST_CLIENT Switch
```

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.

This example shows how to display the redundancy facility counter information:

```
Switch# show redundancy counters
Redundancy Facility OMs
               comm link up = 1
        comm link down 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 = 1535
     tx buffers unavailable = 0
                buffers rx = 1530
      buffer release errors = 0

 duplicate client registers = 0
  failed to register client = 0
       Invalid client syncs = 0
Switch#
```

This example shows how to display redundancy facility history information:

```
Switch# show redundancy history
00:00:01 client added: RF_INTERNAL_MSG(0) seq=0
00:00:01 client added: RF_LAST_CLIENT(65000) seq=65000
00:00:01 client added: GALIOS_CONFIG_SYNC(28) seq=330
00:00:03 client added: Redundancy Mode RF(30) seq=135
00:00:03 *my state = INITIALIZATION(2) *peer state = DISABLED(1)
00:00:03 RF_PROG_INITIALIZATION(100) RF_INTERNAL_MSG(0) op=0 rc=11
00:00:03 RF_PROG_INITIALIZATION(100) Redundancy Mode RF(30) op=0 rc=11
00:00:03 RF_PROG_INITIALIZATION(100) GALIOS_CONFIG_SYNC(28) op=0 rc=11
00:00:03 RF_PROG_INITIALIZATION(100) RF_LAST_CLIENT(65000) op=0 rc=11
00:00:03 *my state = NEGOTIATION(3) peer state = DISABLED(1)
00:00:25 RF_EVENT_GO_ACTIVE(511) op=0
00:00:25 *my state = ACTIVE-FAST(9) peer state = DISABLED(1)
00:00:25 RF_STATUS_MAINTENANCE_ENABLE(403) Redundancy Mode RF(30) op=0
00:00:25 RF_STATUS_MAINTENANCE_ENABLE(403) GALIOS_CONFIG_SYNC(28) op=0
00:00:25 RF_PROG_ACTIVE_FAST(200) RF_INTERNAL_MSG(0) op=0 rc=11
00:00:25 RF_PROG_ACTIVE_FAST(200) Redundancy Mode RF(30) op=0 rc=11
00:00:25 RF_PROG_ACTIVE_FAST(200) GALIOS_CONFIG_SYNC(28) op=0 rc=11
00:00:25 RF_PROG_ACTIVE_FAST(200) RF_LAST_CLIENT(65000) op=0 rc=11
00:00:25 *my state = ACTIVE-DRAIN(10) peer state = DISABLED(1)
00:00:25 RF_PROG_ACTIVE_DRAIN(201) RF_INTERNAL_MSG(0) op=0 rc=11
00:00:25 RF_PROG_ACTIVE_DRAIN(201) Redundancy Mode RF(30) op=0 rc=11
00:00:25 RF_PROG_ACTIVE_DRAIN(201) GALIOS_CONFIG_SYNC(28) op=0 rc=11
00:00:25 RF_PROG_ACTIVE_DRAIN(201) RF_LAST_CLIENT(65000) op=0 rc=11
00:01:34 RF_PROG_PLATFORM_SYNC(300) RF_INTERNAL_MSG(0) op=0 rc=11
00:01:34 RF_PROG_PLATFORM_SYNC(300) Redundancy Mode RF(30) op=0 rc=11
00:01:34 RF_PROG_PLATFORM_SYNC(300) GALIOS_CONFIG_SYNC(28) op=0 rc=0
00:01:34 RF_EVENT_CLIENT_PROGRESSION(503) GALIOS_CONFIG_SYNC(28) op=1 rc=0
00:01:36 RF_EVENT_PEER_PROG_DONE(506) GALIOS_CONFIG_SYNC(28) op=300
00:01:36 RF_PROG_PLATFORM_SYNC(300) RF_LAST_CLIENT(65000) op=0 rc=0
00:01:36 RF_EVENT_CLIENT_PROGRESSION(503) RF_LAST_CLIENT(65000) op=1 rc=0
00:01:36 RF_EVENT_PEER_PROG_DONE(506) RF_LAST_CLIENT(65000) op=300
00:01:38 *my state = ACTIVE(13) *peer state = STANDBY COLD(4)
Switch#
```

This example shows how to display information about the redundancy facility state:

```
Switch# show redundancy states
my state = 13 -ACTIVE
     peer state = 8  -STANDBY HOT
           Mode = Duplex
           Unit = Primary
        Unit ID = 2

Redundancy Mode (Operational) = Stateful Switchover
Redundancy Mode (Configured)  = Stateful Switchover
     Split Mode = Disabled
   Manual Swact = Enabled
 Communications = Up

   client count = 21
 client_notification_TMR = 240000 milliseconds
          keep_alive TMR = 9000 milliseconds
        keep_alive count = 0
    keep_alive threshold = 18
           RF debug mask = 0x0
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| redundancy | Enters the redundancy configuration mode. |
| redundancy force-switchover | Forces a switchover from the active to the standby supervisor engine. |

# show redundancy config-sync

To display an ISSU config-sync failure or the ignored mismatched command list (MCL), if any, use the **show redundancy config-sync** command.

**show redundancy config-sync** {**failures** | **ignored**} {**bem** | **mcl**| **prc**}

**show redundancy config-sync ignored failures mcl**

## Syntax Description

| | |
|---|---|
| **failures** | Displays MCL entries or BEM/PRC failures. |
| **ignored** | Displays the ignored MCL entries. |
| **bem** | (Deprecated) |
| **mcl** | Displays commands that exist in the active supervisor engine's running configuration, but are not supported by the image on the standby supervisor engine. |
| **prc** | Displays a Parser Return Code (PRC) failure and forces the system to operate in RPR mode provided there is a mismatch in the return code for a command execution at the active and standby supervisor engine. |

## Defaults

This command has no default settings.

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SGA | This command was introduced on the Catalyst 4500 series switch. |
| 12.2(44)SG | Updated command syntax from issu config-sync to redundancy config-sync. |

## Usage Guidelines

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 supervisor engine, the standby supervisor engine might not recognize those commands. This causes a config mismatch condition. If the syntax check for the command fails on standby supervisor engine during a bulk sync, the command is moved into the MCL and the standby supervisor engine is reset. To display all the mismatched commands, use the **show redundancy config-sync failures mcl** command.

To *clean* the MCL, follow these steps:

**Step 1** Remove all mismatched commands from the active supervisor engines' running configuration.

**Step 2** Revalidate the MCL with a modified running configuration using the **redundancy config-sync validate mismatched-commands** command.

**Step 3** Reload the standby supervisor engine.

Alternatively, you could ignore the MCL by following these steps:

**Step 1** Enter the **redundancy config-sync ignore mismatched-commands** command.

**Step 2** Reload the standby supervisor engine; the system transitions to SSO mode.

**Note** If you ignore the mismatched commands, the *out-of-sync* configuration at the active supervisor engine and the standby supervisor engine still exists.

**Step 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 supervisor engine maintains the PRC after executing a command. The standby supervisor engine executes the command and sends PRC back to the active supervisor engine. PRC failure occurs if these two PRCs do not match. If a PRC error occurs at the standby supervisor engine either during bulk sync or LBL sync, the standby supervisor engine 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.

## Examples

The following example shows how to display the ISSU BEM failures:

```
Switch# show redundancy config-sync failures bem
BEM Failed Command List
-----------------------

The list is Empty
Switch#
```

The following example shows how to display the ISSU MCL failures:

```
Switch#show redundancy config-sync failures mcl
Mismatched Command List
-----------------------

The list is Empty
Switch#
```

The following example shows how to display the ISSU PRC failures:

```
Switch#show redundancy config-sync failures prc
PRC Failed Command List
------------------------------
interface FastEthernet3/2
 ! <submode> "interface"
- channel-protocol pagp
 ! </submode> "interface"
```

## Related Commands

| Command | Description |
|---|---|
| redundancy config-sync mismatched-commands | Moves the active supervisor engine into the Mismatched Command List (MCL) and resets the standby supervisor engine. |

# show running-config

To display the module status and configuration, use the **show running-config** command.

**show running-config** [**module** *slot*]

## Syntax Description

| | |
|---|---|
| **module** *slot* | (Optional) Specifies the module slot number; valid values are from 1 to 6. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

In some cases, you might see a difference in the duplex mode displayed when you enter the **show interfaces** command and the **show running-config** command. If you do see a difference, the duplex mode displayed in the **show interfaces** command is the actual duplex mode that the interface is running. The **show interfaces** command shows the operating mode for an interface, while the **show running-config** command shows the configured mode for an interface.

The **show running-config** command output for an interface may display a duplex mode configuration but no configuration for the speed. When no speed is displayed in the output, it indicates that the interface speed is configured to be auto and that the duplex mode shown becomes the operational setting once the speed is configured to something other than auto. With this configuration, it is possible that the operating duplex mode for that interface does not match the duplex mode shown with the **show running-config** command.

## Examples

This example shows how to display the module and status configuration for all modules:

```
Switch# show running-config
03:23:36:%SYS-5-CONFIG_I:Configured from console by consolesh runn
Building configuration...

Current configuration:3268 bytes
!
version 12.1
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Switch
!
!
power supplies required 1
ip subnet-zero
```

```
!
!
!
interface FastEthernet1
 no ip address
 shutdown
 duplex auto
 speed auto
Switch#
```

This example shows the output for the **show running-config** command when you have enabled the **switchport voice vlan** command:

```
Switch# show running-config int fastethernet 6/1
Building configuration...

Current configuration:133 bytes
!
interface FastEthernet6/1
 switchport voice vlan 2
 no snmp trap link-status
 spanning-tree portfast
 channel-group 1 mode on
end

Switch#
```

# show slavebootflash:

To display information about the standby bootflash file system, use the **show slavebootflash:** command.

**show slavebootflash:** [**all** | **chips** | **filesys**]

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Displays all possible Flash information. |
| **chips** | (Optional) Displays Flash chip information. |
| **filesys** | (Optional) Displays file system information. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display file system status information:

```
Switch# show slavebootflash: filesys

-------- F I L E   S Y S T E M   S T A T U S --------
  Device Number = 0
DEVICE INFO BLOCK: bootflash
  Magic Number          = 6887635   File System Vers = 10000    (1.0)
  Length                = 1000000   Sector Size      = 40000
  Programming Algorithm = 39        Erased State     = FFFFFFFF
  File System Offset    = 40000     Length = F40000
  MONLIB Offset         = 100       Length = C628
  Bad Sector Map Offset = 3FFF8     Length = 8
  Squeeze Log Offset    = F80000    Length = 40000
  Squeeze Buffer Offset = FC0000    Length = 40000
  Num Spare Sectors     = 0
    Spares:
STATUS INFO:
  Writable
  NO File Open for Write
  Complete Stats
  No Unrecovered Errors
  No Squeeze in progress
USAGE INFO:
  Bytes Used     = 917CE8  Bytes Available = 628318
  Bad Sectors    = 0       Spared Sectors  = 0
  OK Files       = 2       Bytes = 917BE8
  Deleted Files  = 0       Bytes = 0
  Files w/Errors = 0       Bytes = 0
Switch>
```

This example shows how to display system image information:

```
Switch# show slavebootflash:
-# - ED --type-- --crc--- -seek-- nlen -length- -----date/time------ name
1   .. image    8C5A393A  237E3C   14  2063804 Aug 23 1999 16:18:45 c4-boot-mz
2   .. image    D86EE0AD  957CE8    9  7470636 Sep 20 1999 13:48:49 rp.halley
Switch>
```

This example shows how to display all bootflash information:

```
Switch# show slavebootflash: all
-# - ED --type-- --crc--- -seek-- nlen -length- -----date/time------ name
1   .. image    8C5A393A  237E3C   14  2063804 Aug 23 1999 16:18:45 c4-boot-
mz
2   .. image    D86EE0AD  957CE8    9  7470636 Sep 20 1999 13:48:49 rp.halley

6456088 bytes available (9534696 bytes used)

-------- F I L E   S Y S T E M   S T A T U S --------
  Device Number = 0
DEVICE INFO BLOCK: bootflash
  Magic Number          = 6887635   File System Vers = 10000    (1.0)
  Length                = 1000000   Sector Size      = 40000
  Programming Algorithm = 39        Erased State     = FFFFFFFF
  File System Offset    = 40000     Length = F40000
  MONLIB Offset         = 100       Length = C628
  Bad Sector Map Offset = 3FFF8     Length = 8
  Squeeze Log Offset    = F80000    Length = 40000
  Squeeze Buffer Offset = FC0000    Length = 40000
  Num Spare Sectors     = 0
    Spares:
STATUS INFO:
  Writable
  NO File Open for Write
  Complete Stats
  No Unrecovered Errors
  No Squeeze in progress
USAGE INFO:
  Bytes Used     = 917CE8  Bytes Available = 628318
  Bad Sectors    = 0       Spared Sectors  = 0
  OK Files       = 2       Bytes = 917BE8
  Deleted Files  = 0       Bytes = 0
  Files w/Errors = 0       Bytes = 0
Switch>
```

# show slaveslot0:

To display information about the file system on the standby supervisor engine, use the **show slaveslot0:** command.

**show slot0:** [**all** | **chips** | **filesys**]

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Displays all Flash information including the output from the **show slot0: chips** and **show slot0: filesys** commands. |
| **chips** | (Optional) Displays Flash chip register information. |
| **filesys** | (Optional) Displays file system status information. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display a summary of the file system:

```
Switch# show slaveslot0:
-# - ED --type-- --crc--- -seek-- nlen -length- -----date/time------ name
1   .. image    6375DBB7  A4F144    6 10678468 Nov 09 1999 10:50:42 halley

5705404 bytes available (10678596 bytes used)
Switch>
```

This example shows how to display Flash chip information:

```
Switch# show slaveslot0: chips
******** Intel Series 2+ Status/Register Dump ********
ATTRIBUTE MEMORY REGISTERS:
  Config Option Reg (4000): 2
  Config Status Reg (4002): 0
  Card Status   Reg (4100): 1
  Write Protect Reg (4104): 4
  Voltage Cntrl Reg (410C): 0
  Rdy/Busy Mode Reg (4140): 2

COMMON MEMORY REGISTERS: Bank 0
  Intelligent ID Code  : 8989A0A0
  Compatible Status Reg: 8080
  Global     Status Reg: B0B0
  Block Status Regs:
    0  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    8  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    16 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    24 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
```

```
COMMON MEMORY REGISTERS: Bank 1
  Intelligent ID Code  : 8989A0A0
  Compatible Status Reg: 8080
  Global     Status Reg: B0B0
  Block Status Regs:
    0  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    8  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    16 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    24 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0

COMMON MEMORY REGISTERS: Bank 2
  Intelligent ID Code  : 8989A0A0
  Compatible Status Reg: 8080
  Global     Status Reg: B0B0
  Block Status Regs:
    0  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    8  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    16 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    24 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0

COMMON MEMORY REGISTERS: Bank 3
  Intelligent ID Code  : 8989A0A0
  Compatible Status Reg: 8080
  Global     Status Reg: B0B0
  Block Status Regs:
    0  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    8  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    16 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    24 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0

COMMON MEMORY REGISTERS: Bank 4
  Intelligent ID Code  : FFFFFFFF
    IID Not Intel -- assuming bank not populated
```

This example shows how to display file system information:

```
Switch# show slaveslot0: filesys
-------- F I L E   S Y S T E M   S T A T U S --------
  Device Number = 0
DEVICE INFO BLOCK: slot0
  Magic Number          = 6887635   File System Vers = 10000    (1.0)
  Length                = 1000000   Sector Size      = 20000
  Programming Algorithm = 4         Erased State     = FFFFFFFF
  File System Offset    = 20000     Length = FA0000
  MONLIB Offset         = 100       Length = F568
  Bad Sector Map Offset = 1FFF0     Length = 10
  Squeeze Log Offset    = FC0000    Length = 20000
  Squeeze Buffer Offset = FE0000    Length = 20000
  Num Spare Sectors     = 0
    Spares:
STATUS INFO:
  Writable
  NO File Open for Write
  Complete Stats
  No Unrecovered Errors
  No Squeeze in progress
USAGE INFO:
  Bytes Used     = 9F365C  Bytes Available = 5AC9A4
  Bad Sectors    = 0       Spared Sectors  = 0
  OK Files       = 1       Bytes = 9F35DC
  Deleted Files  = 0       Bytes = 0
  Files w/Errors = 0       Bytes =
Switch>
```

# show slot0:

To display information about the slot0: file system, use the **show slot0:** command.

**show slot0:** [**all** | **chips** | **filesys**]

## Syntax Description

| | |
|---|---|
| **all** | (Optional) Displays all Flash information including the output from the **show slot0: chips** and **show slot0: filesys** commands. |
| **chips** | (Optional) Displays Flash chip register information. |
| **filesys** | (Optional) Displays file system status information. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display a summary of the file system:

```
Switch# show slot0:
-# - ED --type-- --crc--- -seek-- nlen -length- -----date/time------ name
1   .. image    6375DBB7  A4F144    6 10678468 Nov 09 1999 10:50:42 halley

5705404 bytes available (10678596 bytes used)
Switch>
```

This example shows how to display Flash chip information:

```
Switch# show slot0: chips
******** Intel Series 2+ Status/Register Dump ********
ATTRIBUTE MEMORY REGISTERS:
  Config Option Reg (4000): 2
  Config Status Reg (4002): 0
  Card Status   Reg (4100): 1
  Write Protect Reg (4104): 4
  Voltage Cntrl Reg (410C): 0
  Rdy/Busy Mode Reg (4140): 2

COMMON MEMORY REGISTERS: Bank 0
  Intelligent ID Code  : 8989A0A0
  Compatible Status Reg: 8080
  Global     Status Reg: B0B0
  Block Status Regs:
    0  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    8  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    16 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    24 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
```

```
COMMON MEMORY REGISTERS: Bank 1
  Intelligent ID Code  : 8989A0A0
  Compatible Status Reg: 8080
  Global     Status Reg: B0B0
  Block Status Regs:
    0  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    8  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    16 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    24 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0

COMMON MEMORY REGISTERS: Bank 2
  Intelligent ID Code  : 8989A0A0
  Compatible Status Reg: 8080
  Global     Status Reg: B0B0
  Block Status Regs:
    0  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    8  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    16 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    24 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0

COMMON MEMORY REGISTERS: Bank 3
  Intelligent ID Code  : 8989A0A0
  Compatible Status Reg: 8080
  Global     Status Reg: B0B0
  Block Status Regs:
    0  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    8  :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    16 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0
    24 :  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0  B0B0

COMMON MEMORY REGISTERS: Bank 4
  Intelligent ID Code  : FFFFFFFF
    IID Not Intel -- assuming bank not populated
Switch>
```

This example shows how to display file system information:

```
Switch# show slot0: filesys
-------- F I L E   S Y S T E M   S T A T U S --------
  Device Number = 0
DEVICE INFO BLOCK: slot0
  Magic Number          = 6887635   File System Vers = 10000    (1.0)
  Length                = 1000000   Sector Size      = 20000
  Programming Algorithm = 4         Erased State     = FFFFFFFF
  File System Offset    = 20000     Length = FA0000
  MONLIB Offset         = 100       Length = F568
  Bad Sector Map Offset = 1FFF0     Length = 10
  Squeeze Log Offset    = FC0000    Length = 20000
  Squeeze Buffer Offset = FE0000    Length = 20000
  Num Spare Sectors     = 0
    Spares:
STATUS INFO:
  Writable
  NO File Open for Write
  Complete Stats
  No Unrecovered Errors
  No Squeeze in progress
USAGE INFO:
  Bytes Used     = 9F365C  Bytes Available = 5AC9A4
  Bad Sectors    = 0       Spared Sectors  = 0
  OK Files       = 1       Bytes = 9F35DC
  Deleted Files  = 0       Bytes = 0
  Files w/Errors = 0       Bytes = 0
Switch>
```

# show spanning-tree

To display spanning-tree state information, use the **show spanning-tree** command.

**show spanning-tree** [*bridge_group* | **active** | **backbonefast** | **bridge** [*id*] | **inconsistentports** | **interface** *type* | **root** | **summary** [**total**] | **uplinkfast** | **vlan** *vlan_id* | **pathcost method** | **detail**]

## Syntax Description

| | |
|---|---|
| *bridge_group* | (Optional) Specifies the bridge group number; valid values are from 1 to 255. |
| **active** | (Optional) Displays the spanning-tree information on active interfaces only. |
| **backbonefast** | (Optional) Displays the spanning-tree BackboneFast status. |
| **bridge** | (Optional) Displays the bridge status and configuration information. |
| *id* | (Optional) Name of the bridge. |
| **inconsistentports** | (Optional) Displays the root inconsistency state. |
| **interface** *type* | (Optional) Specifies the interface type and number; valid values are **fastethernet**, **gigabitethernet**, **tengigabitethernet**, **port-channel** (1 to 64), and **vlan** (1 to 4094). |
| **root** | (Optional) Displays the root bridge status and configuration. |
| **summary** | (Optional) Specifies a summary of port states. |
| **total** | (Optional) Displays the total lines of the spanning-tree state section. |
| **uplinkfast** | (Optional) Displays the spanning-tree UplinkFast status. |
| **vlan** *vlan_id* | (Optional) Specifies the VLAN ID; valid values are from 1 to 4094. |
| **pathcost method** | (Optional) Displays the default path cost calculation method used. |
| **detail** | (Optional) Displays a summary of interface information. |

## Defaults

Interface information summary is displayed.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Support for extended addressing was added. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Examples

This example shows how to display spanning-tree information on the active interfaces only:

```
Switch# show spanning-tree active
UplinkFast is disabled
BackboneFast is disabled

 VLAN1 is executing the ieee compatible Spanning Tree protocol
  Bridge Identifier has priority 32768, address 0050.3e8d.6401
  Configured hello time 2, max age 20, forward delay 15
  Current root has priority 16384, address 0060.704c.7000
  Root port is 265 (FastEthernet5/9), cost of root path is 38
  Topology change flag not set, detected flag not set
  Number of topology changes 0 last change occurred 18:13:54 ago
  Times:  hold 1, topology change 24, notification 2
          hello 2, max age 14, forward delay 10
  Timers: hello 0, topology change 0, notification 0

 Port 265 (FastEthernet5/9) of VLAN1 is forwarding
   Port path cost 19, Port priority 128, Port Identifier 129.9.
   Designated root has priority 16384, address 0060.704c.7000
   Designated bridge has priority 32768, address 00e0.4fac.b000
   Designated port id is 128.2, designated path cost 19
   Timers: message age 3, forward delay 0, hold 0
   Number of transitions to forwarding state: 1
   BPDU: sent 3, received 32852
Switch#
```

This example shows how to display the spanning-tree BackboneFast status:

```
Switch# show spanning-tree backbonefast
BackboneFast is enabled

BackboneFast statistics
-----------------------
Number of transition via backboneFast (all VLANs) : 0
Number of inferior BPDUs received (all VLANs)     : 0
Number of RLQ request PDUs received (all VLANs)   : 0
Number of RLQ response PDUs received (all VLANs)  : 0
Number of RLQ request PDUs sent (all VLANs)       : 0
Number of RLQ response PDUs sent (all VLANs)      : 0
Switch#
```

This example shows how to display spanning-tree information for the bridge:

```
Switch# show spanning-tree bridge
VLAN1
  Bridge ID  Priority    32768
             Address     0050.3e8d.6401
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
VLAN2
  Bridge ID  Priority    32768
             Address     0050.3e8d.6402
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
VLAN3
  Bridge ID  Priority    32768
             Address     0050.3e8d.6403
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
Switch#
```

This example shows how to display a summary of interface information:

```
Switch# show spanning-tree

VLAN1
```

```
  Spanning tree enabled protocol ieee
  Root ID    Priority    32768
             Address     0030.94fc.0a00
             This bridge is the root
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32768
             Address     0030.94fc.0a00
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time 300

Interface                                    Designated
Name                 Port ID Prio  Cost Sts   Cost Bridge ID            Port ID
-------------------  ------- --- ------ ---   ---- -------------------- -------
FastEthernet6/15     129.79  128     19 FWD      0 32768 0030.94fc.0a00 129.79


VLAN2
  Spanning tree enabled protocol ieee
  Root ID    Priority    32768
             Address     0030.94fc.0a01
             This bridge is the root
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32768
             Address     0030.94fc.0a01
             Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time 300

Interface                                    Designated
Name                 Port ID Prio  Cost Sts   Cost Bridge ID            Port ID
-------------------  ------- --- ------ ---   ---- -------------------- -------
FastEthernet6/16     129.80  128     19 FWD      0 32768 0030.94fc.0a01 129.80
Switch#
```

This example shows how to display spanning-tree information for Fast Ethernet interface 5/9:

```
Switch# show spanning-tree interface fastethernet5/9
Interface Fa0/10 (port 23) in Spanning tree 1 is ROOT-INCONSISTENT
Port path cost 100, Port priority 128
Designated root has priority 8192, address 0090.0c71.a400
Designated bridge has priority 32768, address 00e0.1e9f.8940
Designated port is 23, path cost 115
Timers: message age 0, forward delay 0, hold 0
BPDU: sent 0, received 0
The port is in the portfast mode
Switch#
```

This example shows how to display spanning-tree information for a specific VLAN:

```
Switch# show spanning-tree vlan 1
VLAN1 is executing the ieee compatible Spanning Tree protocol
  Bridge Identifier has priority 32768, address 0030.94fc.0a00
  Configured hello time 2, max age 20, forward delay 15
  We are the root of the spanning tree
  Topology change flag not set, detected flag not set
  Number of topology changes 5 last change occurred 01:50:47 ago
          from FastEthernet6/16
  Times: hold 1, topology change 35, notification 2
          hello 2, max age 20, forward delay 15

  Timers:hello 0, topology change 0, notification 0, aging 300

 Port 335 (FastEthernet6/15) of VLAN1 is forwarding
```

```
   Port path cost 19, Port priority 128, Port Identifier 129.79.
   Designated root has priority 32768, address 0030.94fc.0a00
   Designated bridge has priority 32768, address 0030.94fc.0a00
   Designated port id is 129.79, designated path cost 0
   Timers:message age 0, forward delay 0, hold 0
   Number of transitions to forwarding state:1
   BPDU:sent 6127, received 0
Switch#
```

This example shows how to display spanning-tree information for a specific bridge group:

```
Switch# show spanning-tree vlan 1
 UplinkFast is disabled
 BackboneFast is disabled
Switch#
```

This example shows how to display a summary of port states:

```
Switch# show spanning-tree summary
Root bridge for:VLAN1, VLAN2.
PortFast BPDU Guard is disabled
EtherChannel misconfiguration guard is enabled
UplinkFast is disabled
BackboneFast is disabled
Default pathcost method used is short

Name                   Blocking Listening Learning Forwarding STP Active
---------------------- -------- --------- -------- ---------- ----------
VLAN1                  0        0         0        1          1
VLAN2                  0        0         0        1          1
---------------------- -------- --------- -------- ---------- ----------
              2 VLANs 0        0         0        2          2
Switch#
```

This example shows how to display the total lines of the spanning-tree state section:

```
Switch#  show spanning-tree summary totals
Root bridge for:VLAN1, VLAN2.
PortFast BPDU Guard is disabled
EtherChannel misconfiguration guard is enabled
UplinkFast is disabled
BackboneFast is disabled
Default pathcost method used is short

Name                   Blocking Listening Learning Forwarding STP Active
---------------------- -------- --------- -------- ---------- ----------
              2 VLANs 0        0         0        2          2
Switch#
```

This example shows how to determine whether any ports are in root inconsistent state:

```
Switch#  show spanning-tree inconsistentports

Name                 Interface            Inconsistency
-------------------- -------------------- ------------------
VLAN1               FastEthernet3/1      Root Inconsistent

Number of inconsistent ports (segments) in the system:1
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| spanning-tree backbonefast | Enables BackboneFast on a spanning-tree VLAN. |
| spanning-tree cost | Calculates the path cost of STP on an interface. |
| spanning-tree guard | Enables root guard. |
| spanning-tree pathcost method | Sets the path cost calculation method. |
| spanning-tree portfast default | Enables PortFast by default on all access ports. |
| spanning-tree portfast (interface configuration mode) | Enables PortFast mode. |
| spanning-tree port-priority | Prioritizes an interface when two bridges compete for position as the root bridge. |
| spanning-tree uplinkfast | Enables the UplinkFast feature. |
| spanning-tree vlan | Configures STP on a per-VLAN basis. |

# show spanning-tree mst

To display MST protocol information, use the **show spanning-tree mst** command.

**show spanning-tree mst** [**configuration**]

**show spanning-tree mst** [*instance-id*] [**detail**]

**show spanning-tree mst** [*instance-id*] **interface** *interface* [**detail**]

## Syntax Description

| | |
|---|---|
| **configuration** | (Optional) Displays region configuration information. |
| *instance-id* | (Optional) Instance identification number; valid values are from 0 to 15. |
| **detail** | (Optional) Displays detailed MST protocol information. |
| **interface** *interface* | (Optional) Interface type and number; valid values for type are **fastethernet**, **gigabitethernet**, **tengigabitethernet**, **port-channel**, and **vlan**. See the "Usage Guidelines" section for more information. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Usage Guidelines

This command is not supported on systems that are configured with a Supervisor Engine I.

In the output display of the **show spanning-tree mst configuration** command, a warning message might display. This message appears if you do not map secondary VLANs to the same instance as the associated primary VLAN. The display includes a list of the secondary VLANs that are not mapped to the same instance as the associated primary VLAN. The warning message is as follows:

```
These secondary vlans are not mapped to the same instance as their primary:
-> 3
```

See the **show spanning-tree** command for output definitions.

## Examples

This example shows how to display region configuration information:

```
Switch# show spanning-tree mst configuration
Name      [leo]
Revision  2702
Instance  Vlans mapped
--------  ---------------------------------------------------------------------
0         1-9,11-19,21-29,31-39,41-4094
1         10,20,30,40
-------------------------------------------------------------------------------
Switch#
```

This example shows how to display additional MST protocol values:

```
Switch# show spanning-tree mst 3 detail
# # # # # # MST03 vlans mapped: 3,3000-3999
Bridge address 0002.172c.f400 priority 32771 (32768 sysid 3)
Root this switch for MST03

GigabitEthernet1/1 of MST03 is boundary forwarding
Port info port id 128.1 priority 128
cost 20000
Designated root address 0002.172c.f400 priority 32771
cost 0
Designated bridge address 0002.172c.f400 priority 32771 port
id 128.1
Timers: message expires in 0 sec, forward delay 0, forward transitions 1
Bpdus (MRecords) sent 4, received 0

FastEthernet4/2 of MST03 is backup blocking
Port info port id 128.194 priority 128 cost
200000
Designated root address 0002.172c.f400 priority 32771
cost 0
Designated bridge address 0002.172c.f400 priority 32771 port id
128.193
Timers: message expires in 2 sec, forward delay 0, forward transitions 1
Bpdus (MRecords) sent 3, received 252
Switch#
```

This example shows how to display MST information for a specific interface:

```
Switch# show spanning-tree mst 0 interface fastethernet4/1 detail
Edge port: no (trunk) port guard : none
(default)
Link type: point-to-point (point-to-point) bpdu filter: disable
(default)
Boundary : internal bpdu guard : disable
(default)
FastEthernet4/1 of MST00 is designated forwarding
Vlans mapped to MST00 1-2,4-2999,4000-4094
Port info port id 128.193 priority 128 cost
200000
Designated root address 0050.3e66.d000 priority 8193
cost 20004
Designated ist master address 0002.172c.f400 priority 49152
cost 0
Designated bridge address 0002.172c.f400 priority 49152 port id
128.193
Timers: message expires in 0 sec, forward delay 0, forward transitions 1
Bpdus sent 492, received 3
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| spanning-tree mst | Sets the path cost and port-priority parameters for any MST instance. |
| spanning-tree mst forward-time | Sets the forward delay timer for all the instances. |
| spanning-tree mst hello-time | Sets the hello-time delay timer for all the instances. |
| spanning-tree mst max-hops | Specifies the number of possible hops in the region before a BPDU is discarded. |
| spanning-tree mst root | Designates the primary root. |

# show storm-control

To display the broadcast storm control settings on the switch or on the specified interface, use the **show storm-control** command.

**show storm-control** [*interface-id* | **broadcast**]

**Supervisor Engine 6-E and Catalyst 4900M chassis**

**show storm-control** [*interface-id* | **broadcast** | **multicast**]

## Syntax Description

| | |
|---|---|
| *interface-id* | (Optional) Specifies the interface ID for the physical port. |
| **broadcast** | (Optional) Displays the broadcast storm threshold setting. |
| **multicast** | (Optional) Displays the multicast storm threshold setting. |

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |
| 12.2(40)SG | Added support for the Supervisor Engine 6-E and Catalyst 4900M chassis. |

## Usage Guidelines

When you enter an interface ID, the storm control thresholds are displayed for the specified interface.

If you do not enter an interface ID, the settings are displayed for the broadcast traffic type for all ports on the switch.

## Examples

This is an example of output from the **show storm-control** command when no keywords are entered. Because no traffic type keyword was entered, the broadcast storm control settings are displayed.

```
Switch# show storm-control
Interface  Filter State   Upper    Lower    Current
---------  -------------  -------  -------  -------
Gi2/1      Forwarding      30.00%   30.00%      N/A
Gi4/1      Forwarding      30.00%   30.00%      N/A
Gi4/3      Forwarding      30.00%   30.00%      N/A
Switch#
```

This is an example of output from the **show storm-control multicast** command on a Supervisor Engine 6-E.

```
Switch# show storm-control multicast //Supervisor Engine 6-E
Interface Filter State  Broadcast Multicast Level
--------- ------------- --------- --------- -----
Fa6/2     Blocking      Enabled   Enabled   61%
Switch#
```

This is an example of output from the **show storm-control** command on a Supervisor Engine 6-E when no keywords are entered.

```
Switch# show storm-control
Interface Filter State  Broadcast Multicast Level
--------- ------------- --------- --------- -----
Fa6/1     Blocking      Enabled   Disabled  81%
Fa6/2     Blocking      Enabled   Enabled   61%
Switch#
```

This is an example of output from the **show storm-control** command for a specified interface.

```
Switch# show storm-control fastethernet2/17
Interface  Filter State   Level    Current
---------  -------------  -------  -------
Fa2/17     Forwarding      50.00%    0.00%
Switch#
```

This is an example of output from the **show storm-control** command for a specified interface on a Supervisor Engine 6-E.

```
Switch# show storm-control interface fastethernet6/1
Interface  Filter State   Broadcast Multicast   Level
---------  -------------  -------   -------     -----
Fa6/1      Blocking       Enabled   Disabled    81%
Switch#
```

Table 2-24 describes the fields in the **show storm-control** display.

***Table 2-24 show storm-control Field Descriptions***

| Field | Description |
|---|---|
| Interface | Displays the ID of the interface. |
| Filter State | Displays the status of the filter:<br>• Blocking—Storm control is enabled, and a storm has occurred.<br>• Forwarding—Storm control is enabled, and no storms have occurred.<br>• Inactive—Storm control is disabled. |
| Level | Displays the threshold level set on the interface for broadcast traffic. |
| Current | Displays the bandwidth utilization of broadcast traffic as a percentage of total available bandwidth. This field is valid only when storm control is enabled.<br>**Note** N/A is displayed for interfaces that do storm control in the hardware. |

## Related Commands

| Command | Description |
|---|---|
| **storm-control** | Enables broadcast storm control on a port and specifies what to do when a storm occurs on a port. |
| **show interfaces counters** | Displays the traffic on the physical interface. |
| **show running-config** | Displays the running configuration of a switch. |

# show system mtu

To display the global MTU setting, use the **show system mtu** command.

**show system mtu**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the global MTU setting:

```
Switch# show system mtu
Global Ethernet MTU is 1550 bytes.
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| system mtu | Sets the maximum Layer 2 or Layer 3 payload size. |

# show tech-support

To display troubleshooting information for TAC, use the **show tech-support** command.

**show tech-support** [**bridging** | **cef** | **ipmulticast** | **isis** | **password** [**page**] | **page**]

## Syntax Description

| | |
|---|---|
| **bridging** | (Optional) Specifies bridging-related information. |
| **cef** | (Optional) Specifies CEF-related information. |
| **ipmulticast** | (Optional) Specifies IP multicast-related information. |
| **isis** | (Optional) Specifies CLNS and ISIS-related information. |
| **password** | (Optional) Includes passwords and other security information in the output. |
| **page** | (Optional) Displays one page of information at a time in the output. |

## Defaults

The defaults are as follows:

- Outputs are displayed without page breaks.
- Passwords and other security information are removed from the output.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Output from the **show tech-support** command may be terminated in midstream with the key combination Ctrl+Alt+6. The command output is buffered so that the command terminates when output of the current sub-command running under this command completes.

Press the **Return** key to display the next line of output, or press the **Space** bar to display the next page of information. If you do not enter the **page** keyword, the output scrolls. It does not stop for page breaks.

If you enter the **password** keyword, password encryption is enabled, but only the encrypted form appears in the output.

If you do not enter the **password** keyword, the passwords and other security-sensitive information in the output are replaced in the output with the word “removed.”

The **show tech-support** commands are a compilation of several **show** commands and the output can be quite lengthy. For a sample display of the output of the **show tech-support** command, see the individual **show** command listed.

If you enter the **show tech-support** command without arguments, the output displays the equivalent of these **show** commands:

- **show version**
- **show running-config**
- **show stacks**

- **show interfaces**
- **show controllers**
- **show process memory**
- **show process cpu**
- **show buffers**
- **show logging**
- **show module**
- **show power**
- **show environment**
- **show interfaces switchport**
- **show interfaces trunk**
- **show vlan**

If you enter the **ipmulticast** keyword, the output displays the equivalent of these **show** commands:

- **show ip pim interface**
- **show ip pim interface count**
- **show ip pim neighbor**
- **show ip pim rp**
- **show ip igmp groups**
- **show ip igmp interface**
- **show ip mroute count**
- **show ip mroute**
- **show ip mcache**
- **show ip dvmrp route**

## Examples

For a sample display of the **show tech-support** command output, see the commands listed in the "Usage Guidelines" section for more information.

## Related Commands

See the "Usage Guidelines " section.

# show udld

To display the administrative and operational UDLD status, use the **show udld** command.

**show udld** *interface-id*

## Syntax Description

| | |
|---|---|
| *interface-id* | Name of the interface. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(25)EW | Added support for the 10-Gigabit Ethernet interface. |

## Usage Guidelines

If you do not enter an interface ID value, the administrative and operational UDLD status for all interfaces is displayed.

## Examples

This example shows how to display the UDLD state for Gigabit Ethernet interface 2/2:

```
Switch# show udld gigabitethernet2/2
Interface Gi2/2
---
Port enable administrative configuration setting: Follows device default
Port enable operational state: Enabled
Current bidirectional state: Bidirectional
Current operational state: Advertisement
Message interval: 60
Time out interval: 5
No multiple neighbors detected
    Entry 1
    ---
    Expiration time: 146
    Device ID: 1
    Current neighbor state: Bidirectional
    Device name: 0050e2826000
    Port ID: 2/1
    Neighbor echo 1 device: SAD03160954
    Neighbor echo 1 port: Gi1/1
    Message interval: 5
    CDP Device name: 066527791
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| udld (global configuration mode) | Enables aggressive or normal mode in the UDLD protocol and sets the configurable message timer time. |
| udld (interface configuration mode) | Enables UDLD on an individual interface or prevents a fiber interface from being enabled by the udld (global configuration mode) command. |

# show vlan

To display VLAN information, use the **show vlan** command.

**show vlan** [**brief** | **id** *vlan_id* | **name** *name*]

**show vlan private-vlan** [*type*]

## Syntax Description

| | |
|---|---|
| **brief** | (Optional) Displays only a single line for each VLAN, naming the VLAN, status, and ports. |
| **id** *vlan_id* | (Optional) Displays information about a single VLAN identified by VLAN ID number; valid values are from 1 to 4094. |
| **name** *name* | (Optional) Displays information about a single VLAN identified by VLAN name; valid values are an ASCII string from 1 to 32 characters. |
| **private-vlan** | Displays private VLAN information. |
| *type* | (Optional) Private VLAN type. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.1(12c)EW | Added support for extended VLAN addresses. |

## Examples

This example shows how to display the VLAN parameters for all VLANs within the administrative domain:

```
Switch# show vlan
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa5/9
2    VLAN0002                         active    Fa5/9
3    VLAN0003                         active    Fa5/9
4    VLAN0004                         active    Fa5/9
5    VLAN0005                         active    Fa5/9
6    VLAN0006                         active    Fa5/9
10   VLAN0010                         active    Fa5/9
20   VLAN0020                         active    Fa5/9

<...Output truncated...>
```

```
850  VLAN0850                         active    Fa5/9
917  VLAN0917                         active    Fa5/9
999  VLAN0999                         active    Fa5/9
1002 fddi-default                     active    Fa5/9
1003 trcrf-default                    active    Fa5/9
1004 fddinet-default                  active    Fa5/9
1005 trbrf-default                    active    Fa5/9

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
1    enet  100001     1500  -      -      -        -    -        0      0
2    enet  100002     1500  -      -      -        -    -        0      0
3    enet  100003     1500  -      -      -        -    -        303    0
4    enet  100004     1500  -      -      -        -    -        304    0
5    enet  100005     1500  -      -      -        -    -        305    0
6    enet  100006     1500  -      -      -        -    -        0      0
10   enet  100010     1500  -      -      -        -    -        0      0
20   enet  100020     1500  -      -      -        -    -        0      0
50   enet  100050     1500  -      -      -        -    -        0      0

<...Output truncated...>

850  enet  100850     1500  -      -      -        -    -        0      0
917  enet  100917     1500  -      -      -        -    -        0      0
999  enet  100999     1500  -      -      -        -    -        0      0
1002 fddi  101002     1500  -      0      -        -    -        0      0
1003 trcrf 101003     4472  1005   3276   -        -    srb      0      0
1004 fdnet 101004     1500  -      -      -        ieee -        0      0
1005 trbrf 101005     4472  -      -      15       ibm  -        0      0

VLAN AREHops STEHops Backup CRF
---- ------- ------- ----------
802  0       0       off
1003 7       7       off
Switch#
```

This example shows how to display the VLAN name, status, and associated ports only:

```
Switch# show vlan brief
VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa5/9
2    VLAN0002                         active    Fa5/9
3    VLAN0003                         active    Fa5/9
4    VLAN0004                         active    Fa5/9
5    VLAN0005                         active    Fa5/9
10   VLAN0010                         active    Fa5/9
.
.
.
999  VLAN0999                         active    Fa5/9
1002 fddi-default                     active    Fa5/9
1003 trcrf-default                    active    Fa5/9
1004 fddinet-default                  active    Fa5/9
1005 trbrf-default                    active    Fa5/9
Switch#
```

This example shows how to display the VLAN parameters for VLAN 3 only:

```
Switch# show vlan id 3

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
3    VLAN0003                         active    Fa5/9

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
3    enet  100003     1500  -      -      -        -    -        303    0
Switch#
```

Table 2-25 describes the fields in the **show vlan** command output.

***Table 2-25 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 Identifier 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. |

The following example shows how to verify that the primary vlan and secondary vlans are correctly associated with each other and the same association also exists on the PVLAN port:

```
Switch# show vlan private-vlan

Primary Secondary Type              Ports
-------      ---------       -----------------
-----------------------------------------
10         100           community     Fa3/1, Fa3/2
```

Now, let's say that you remove the VLAN association, as follows:

```
Switch(config)# vlan 10
Switch(config-vlan)# private-vlan association remove 100
Switch(config-vlan)# end
Switch# show vlan private
Primary Secondary Type              Ports
------- --------- ----------------- ----------------------------------------
10                primary
        100       community
```

You can use the following command to verify PVLAN configuration on the interface:

```
Switch# show interface f3/2 status
Port      Name               Status       Vlan       Duplex  Speed Type
Fa3/2                        connected    pvlan seco a-full  a-100 10/100BaseTX

Switch# show interface f3/1 status
Port      Name               Status       Vlan       Duplex  Speed Type
Fa3/1                        connected    pvlan prom a-full  a-100 10/100BaseTX
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| vlan (VLAN Database mode) | Configures a specific VLAN. |
| vlan database | Enters VLAN configuration mode. |
| vtp (global configuration mode) | Modifies the name of a VTP configuration storage file. |

# show vlan access-map

To display the contents of a VLAN access map, use the **show vlan access-map** command.

**show vlan access-map** [*map-name*]

## Syntax Description

| | |
|---|---|
| *map-name* | (Optional) Name of the VLAN access map. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This command shows how to display the contents of a VLAN access map:

```
Switch# show vlan access-map mordred
Vlan access-map "mordred"  1
        match: ip address 13
        action: forward capture
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| vlan access-map | Enters VLAN access-map command mode to create a VLAN access map. |

# show vlan counters

To display the software-cached counter values, use the **show vlan counters** command.

**show vlan** [**id** *vlanid*] **counters**

## Syntax Description

| | |
|---|---|
| **id** *vlanid* | (Optional) Displays the software-cached counter values for a specific VLAN. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

If you enter the **show vlan counters** command without specifying the VLAN ID, the software-cached counter values for all VLANs are displayed.

## Examples

This example shows how to display the software-cached counter values for a specific VLAN:

```
Switch# show vlan counters
* Multicast counters include broadcast packets

Vlan Id                                          : 1
L2 Unicast Packets                               : 0
L2 Unicast Octets                                : 0
L3 Input Unicast Packets                         : 0
L3 Input Unicast Octets                          : 0
L3 Output Unicast Packets                        : 0
L3 Output Unicast Octets                         : 0
L3 Output Multicast Packets                      : 0
L3 Output Multicast Octets                       : 0
L3 Input Multicast Packets                       : 0
L3 Input Multicast Octets                        : 0
L2 Multicast Packets                             : 1
L2 Multicast Octets                              : 94
Switch>
```

## Related Commands

| Command | Description |
|---|---|
| **clear vlan counters** | Clears the software-cached counter values to start from zero again for a specified VLAN or all existing VLANs. |

# show vlan dot1q tag native

To display all the ports on the switch that are eligible for native VLAN tagging as well as their current native VLAN tagging status, use the **show vlan dot1q tag native** command.

**show vlan dot1q tag native**

## Syntax Description

This command has no arguments or keywords.

## Command Modes

User EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(18)EW | This command was introduced on the Catalyst 4500 series switch. |

## Examples

This is an example of output from the **show vlan dot1q tag native** command:

```
Switch# show vlan dot1q tag native
dot1q native vlan tagging is disabled globally

Per Port Native Vlan Tagging State
----------------------------------


Port    Operational    Native VLAN
            Mode       Tagging State
------------------------------------

f3/2    trunk          enabled
f3/16   PVLAN trunk    disabled
f3/16   trunk          enabled
```

## Related Commands

| Command | Description |
|---|---|
| **switchport mode** | Sets the interface type. |
| **vlan (global configuration)** (refer to Cisco IOS documentation) | Enters global VLAN configuration mode. |
| **vlan (VLAN configuration)** (refer to Cisco IOS documentation) | Enters VLAN configuration mode. |

# show vlan internal usage

To display information about the internal VLAN allocation, use the **show vlan internal usage** command.

**show vlan** [**id** *vlan-id*] **internal usage**

## Syntax Description

| | |
|---|---|
| **id** *vlan-id* | (Optional) Displays internal VLAN allocation information for the specified VLAN; valid values are from 1 to 4094. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display information about the current internal VLAN allocation:

```
Switch# show vlan internal usage

VLAN Usage
---- --------------------
1025 -
1026 -
1027 -
1028 -
1029 Port-channel6
1030 GigabitEthernet1/2
1032 FastEthernet3/20
1033 FastEthernet3/21
1129 -
```

This example shows how to display information about the internal VLAN allocation for a specific VLAN:

```
Switch# show vlan id 1030 internal usage

VLAN Usage
---- --------------------
1030 GigabitEthernet1/2
```

## Related Commands

| Command | Description |
|---|---|
| vlan internal allocation policy | Configures the internal VLAN allocation scheme. |

# show vlan mtu

To display the minimum and maximum transmission unit (MTU) sizes of each VLAN, use the **show vlan mtu** command.

**show vlan mtu**

## Syntax Description

This command has no arguments or keywords

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The MTU_Mismatch column in the command output indicates whether all the ports in the VLAN have the same MTU. When "yes" is displayed in the MTU_Mismatch column, it means that the VLAN has a port with different MTUs, and packets might be dropped that are switched from a port with a larger MTU to a port with a smaller MTU. If the VLAN does not have an SVI, the hyphen (-) symbol is displayed in the SVI_MTU column.

For a VLAN, if the MTU-Mismatch column displays yes, the names of the port with the MinMTU and the port with the MaxMTU are displayed. For a VLAN, if the SVI_MTU is bigger than the MinMTU, "TooBig" is displayed after the SVI_MTU.

## Examples

This is an example of output from the **show vlan mtu** command:

```
Switch# show vlan mtu

VLAN    SVI_MTU    MinMTU(port)   MaxMTU(port)  MTU_Mismatch
---- ------------- -------------  ------------  ------------
1    1500          1500           1500           No
Switch>
```

## Related Commands

| Command | Description |
|---|---|
| mtu | Enables jumbo frames on an interface by adjusting the maximum size of a packet or maximum transmission unit (MTU). |

# show vlan private-vlan

To display private VLAN information, use the **show vlan private-vlan** command.

**show vlan private-vlan** [**type**]

## Syntax Description

| | |
|---|---|
| **type** | (Optional) Displays the private VLAN type; valid types are isolated, primary, community, nonoperational, and normal. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |
| 12.2(20)EW | Support for community VLAN was added. |

## Usage Guidelines

When the **show vlan private-vlan type** command displays a VLAN type as normal, it indicates that a regular VLAN has been used in the private VLAN configuration. When normal is displayed, this indicates that two VLANs have been associated before the type was set, and the private VLAN is not operational. This information is useful for debugging purposes.

## Examples

This example shows how to display information about all currently configured private VLANs:

```
Switch# show vlan private-vlan

Primary Secondary Type              Ports
------- --------- ----------------- ------------------------------------------
2       301       community         Fa5/3, Fa5/25
2       302       community
        10        community
100     101       isolated
150     151       non-operational
        202       community
        303       community
401     402       non-operational
Switch#
```

**Note** A blank Primary value indicates that no association exists.

This example shows how to display information about all currently configured private VLAN types:

```
Switch# show vlan private-vlan type

Vlan Type
---- -----------------
202  primary
303  community
304  community
305  community
306  community
307  community
308  normal
309  community
440  isolated
Switch#
```

Table 2-26 describes the fields in the **show vlan private-vlan** command output.

*Table 2-26 show vlan private-vlan Command Output Fields*

| Field | Description |
|---|---|
| Primary | Number of the primary VLAN. |
| Secondary | Number of the secondary VLAN. |
| Secondary-Type | Secondary VLAN type is **isolated or community.** |
| Ports | Indicates the ports within a VLAN. |
| Type | Type of VLAN; possible values are **primary, isolated**, community, nonoperational, or **normal**. |

## Related Commands

| Command | Description |
|---|---|
| **private-vlan** | Configures private VLANs and the association between a private VLAN and a secondary VLAN. |
| **private-vlan mapping** | Creates a mapping between the primary and the secondary VLANs so that both share the same primary VLAN SVI. |

# show vlan remote-span

To display a list of Remote SPAN (RSPAN) VLANs, use the **show vlan remote-span** command.

**show vlan remote-span**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12)EW | This command was introduced on the Catalyst 4500 series switches. |

## Examples

This example shows how to display a list of RSPAN VLANs:

```
Router# show vlan remote-span
Remote SPAN VLANs
------------------------------------------------------------------------------
2,20
```

## Related Commands

| Command | Description |
|---|---|
| remote-span | Converts a VLAN into an RSPAN VLAN. |
| vlan (VLAN Database mode) | Configures a specific VLAN. |

# show vmps

To display the VLAN Query Protocol (VQP) version, reconfirmation interval, retry count, VLAN Membership Policy Server (VMPS) IP addresses, current servers, and primary servers, use the **show vmps** command.

**show vmps** [**statistics**]

## Syntax Description

| | |
|---|---|
| **statistics** | (Optional) Displays the client-side statistics. |

## Defaults

This command has no default settings.

## Command Modes

EXEC

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

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

```
Switch# show vmps
VQP Client Status:
--------------------
VMPS VQP Version:   1
Reconfirm Interval: 60 min
Server Retry Count: 3
VMPS domain server: 172.20.50.120 (primary, current)

Reconfirmation status
---------------------
VMPS Action:         No Dynamic Port
Switch#
```

This is an example of output from the **show vmps statistics** command:

```
Switch# show vmps statistics
VMPS Client Statistics
----------------------
VQP  Queries:               0
VQP  Responses:             0
VMPS Changes:               0
VQP  Shutdowns:             0
VQP  Denied:                0
VQP  Wrong Domain:          0
VQP  Wrong Version:         0
VQP  Insufficient Resource: 0
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| vmps reconfirm (privileged EXEC) | Sends VLAN Query Protocol (VQP) queries to reconfirm all the dynamic VLAN assignments with the VLAN Membership Policy Server (VMPS). |

# show vtp

To display VTP statistics and domain information, use the **show vtp** command.

**show vtp** {**counters** | **status**}

## Syntax Description

| | |
|---|---|
| **counters** | Specifies the VTP statistics. |
| **status** | Specifies the VTP domain status. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to display the VTP statistics:

```
Switch# show vtp counters
VTP statistics:
Summary advertisements received    : 1
Subset advertisements received     : 1
Request advertisements received    : 0
Summary advertisements transmitted : 31
Subset advertisements transmitted  : 1
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
---------------- ---------------- ---------------- ---------------------------
Fa5/9               1555             1564             0
Switch#
```

This example shows how to display the VTP domain status:

```
Switch# show vtp status
VTP Version                     : 2
Configuration Revision          : 250
Maximum VLANs supported locally : 1005
Number of existing VLANs        : 33
VTP Operating Mode              : Server
VTP Domain Name                 : Lab_Network
VTP Pruning Mode                : Enabled
VTP V2 Mode                     : Enabled
VTP Traps Generation            : Disabled
```

```
MD5 digest                        : 0xE6 0xF8 0x3E 0xDD 0xA4 0xF5 0xC2 0x0E
Configuration last modified by 172.20.52.18 at 9-22-99 11:18:20
Local updater ID is 172.20.52.18 on interface Vl1 (lowest numbered VLAN interfac
e found)
Switch#
```

This example shows how to display only those lines in the **show vtp** output that contain the word Summary:

```
Switch# show vtp counters | include Summary
Summary advertisements received    : 1
Summary advertisements transmitted : 32
Trunk            Join Transmitted Join Received    Summary advts received from
Switch#
```

Table 2-27 describes the fields in the **show vtp** command output.

***Table 2-27 show vtp Command Output Fields***

| Field | Description |
|---|---|
| Summary advertisements received | Total number of summary advertisements received. |
| Subset advertisements received | Total number of subset advertisements received. |
| Request advertisements received | Total number of request advertisements received. |
| Summary advertisements transmitted | Total number of summary advertisements transmitted. |
| Subset advertisements transmitted | Total number of subset advertisements transmitted. |
| Request advertisements transmitted | Total number of request advertisements transmitted. |
| Number of config revision errors | Number of config revision errors. |
| Number of config digest errors | Number of config revision digest errors. |
| Number of V1 summary errors | Number of V1 summary errors. |
| Trunk | Trunk port participating in VTP pruning. |
| Join Transmitted | Number of VTP-Pruning Joins transmitted. |
| Join Received | Number of VTP-Pruning Joins received. |
| Summary advts received from non-pruning-capable device | Number of Summary advertisements received from nonpruning-capable devices. |
| Number of existing VLANs | Total number of VLANs in the domain. |
| Configuration Revision | VTP revision number used to exchange VLAN information. |
| Maximum VLANs supported locally | Maximum number of VLANs allowed on the device. |
| Number of existing VLANs | Number of existing VLANs. |
| VTP Operating Mode | Indicates whether VTP is enabled or disabled. |
| VTP Domain Name | Name of the VTP domain. |
| VTP Pruning Mode | Indicates whether VTP pruning is enabled or disabled. |
| VTP V2 Mode | Indicates the VTP V2 mode as server, client, or transparent. |
| VTP Traps Generation | Indicates whether VTP trap generation mode is enabled or disabled. |
| MD5 digest | Checksum values. |

**Related Commands**

| Command | Description |
|---|---|
| **vtp (global configuration mode)** | Modifies the name of a VTP configuration storage file. |
| **vtp client** | Places a device in VTP client mode. |
| **vtp domain** | Configures the administrative domain name for a device. |
| **vtp password** | Creates a VTP domain password. |
| **vtp pruning** | Enables pruning in the VLAN database. |
| **vtp server** | Places the device in VTP server mode. |
| **vtp transparent** | Places device in VTP transparent mode. |
| **vtp v2-mode** | Enables version 2 mode. |

# snmp ifindex clear

To clear any previously configured **snmp ifindex** commands that were entered for a specific interface, use the **snmp ifindex clear** command.

**snmp ifindex clear**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

Interface index persistence occurs when ifIndex values in the interface MIB (IF-MIB) persist across reboots and allow for consistent identification of specific interfaces using SNMP.

Use the **snmp ifindex clear** command on a specific interface when you want that interface to use the global configuration setting for ifIndex persistence. This command clears any ifIndex configuration commands previously entered for that specific interface.

## Examples

This example shows how to enable ifIndex persistence for all interfaces:

```
Router(config)# snmp-server ifindex persist
```

This example shows how to disable IfIndex persistence for FastEthernet 1/1 only:

```
Router(config)# interface fastethernet 1/1
Router(config-if)# no snmp ifindex persist
Router(config-if)# exit
```

This example shows how to clear the ifIndex configuration from the FastEthernet 1/1 configuration:

```
Router(config)# interface fastethernet 1/1
Router(config-if)# snmp ifindex clear
Router(config-if)# exit
```

As a result of this sequence of commands, ifIndex persistence is enabled for all interfaces that are specified by the **snmp-server ifindex persist** global configuration command.

## Related Commands

| Command | Description |
|---|---|
| snmp ifindex persist | Enables ifIndex values in the Interfaces MIB (IF-MIB) that persist across reboots (ifIndex persistence) on a specific interface. |
| snmp-server ifindex persist | Enables ifIndex values that will remain constant across reboots for use by SNMP. |

# snmp ifindex persist

To enable ifIndex values in the Interfaces MIB (IF-MIB) that persist across reboots (ifIndex persistence) on a specific interface, use the **snmp ifindex persist** command. To disable ifIndex persistence only on a specific interface, use the **no** form of this command.

**snmp ifindex persist**

**no snmp ifindex persist**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

Interface index persistence occurs when ifIndex values in the IF-MIB persist across reboots and allow for consistent identification of specific interfaces using SNMP.

The **snmp ifindex persist** interface configuration command enables and disables ifIndex persistence for individual entries (that correspond to individual interfaces) in the ifIndex table of the IF-MIB.

The **snmp-server ifindex persist** global configuration command enables and disables ifIndex persistence for all interfaces on the routing device. This action applies only to interfaces that have ifDescr and ifIndex entries in the ifIndex table of the IF-MIB.

## Examples

This example shows how to enable ifIndex persistence for interface FastEthernet 1/1 only:

```
Router(config)# interface fastethernet 1/1
Router(config-if)# snmp ifindex persist
Router(config-if)# exit
```

This example shows how to enable ifIndex persistence for all interfaces, and then disable ifIndex persistence for interface FastEthernet 1/1 only:

```
Router(config)# snmp-server ifindex persist
Router(config)# interface fastethernet 1/1
Router(config-if)# no snmp ifindex persist
Router(config-if)# exit
```

## Related Commands

| Command | Description |
|---|---|
| snmp ifindex clear | Clears any previously configured **snmp ifindex** commands that were entered for a specific interface. |
| snmp ifindex persist | Enables ifIndex values in the Interfaces MIB (IF-MIB) that persist across reboots (ifIndex persistence) on a specific interface. |

# snmp-server enable traps

To enable SNMP notifications (traps or informs), use the **snmp-server enable traps** command. To disable all SNMP notifications, use the **no** form of this command.

**snmp-server enable traps** [**flash** [**insertion** | **removal**] | **fru-ctrl** | **port-security** [**trap-rate** *trap-rate*] | **removal** | **stpx** | **vlancreate** | **vlandelete** | **vtp**] [**mac-notification** [**change** | **move** | **threshold**]

**no snmp-server enable traps** [**flash** [**insertion** | **removal**] | **fru-ctrl** | **port-security** [**trap-rate** *trap-rate*] | **removal** | **stpx** | **vlancreate** | **vlandelete** | **vtp**] [**mac-notification**]

## Syntax Description

| | |
|---|---|
| **flash** | (Optional) Controls the SNMP FLASH trap notifications. |
| **insertion** | (Optional) Controls the SNMP Flash insertion trap notifications. |
| **removal** | (Optional) Controls the SNMP Flash removal trap notifications. |
| **fru-ctrl** | (Optional) Controls the SNMP entity FRU control trap notifications. |
| **port-security** | (Optional) Controls the SNMP trap generation. |
| **trap-rate** *trap-rate* | (Optional) Sets the number of traps per second. |
| **stpx** | (Optional) Controls all the traps defined in CISCO-STP-EXTENSIONS-MIB notifications. |
| **vlancreate** | (Optional) Controls the SNMP VLAN created trap notifications. |
| **vlandelete** | (Optional) Controls the SNMP VLAN deleted trap notifications. |
| **vtp** | (Optional) Controls the SNMP VTP trap notifications. |
| **mac-notification** | (Optional) Controls the SNMP MAC trap notifications. |
| **change** | (Optional) Controls the SNMP MAC change trap notifications |
| **move** | (Optional) Controls the SNMP MAC move trap notifications |
| **threshold** | (Optional) Controls the SNMP MAC threshold trap notifications |

## Defaults

SNMP notifications are disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.2(31)SG | Support for MAC notification was added. |

## Usage Guidelines

If you enter this command without an option, all notification types controlled by this command are enabled.

SNMP notifications can be sent as traps or inform requests. This command enables both traps and inform requests for the specified notification types. To specify whether the notifications should be sent as traps or informs, use the **snmp-server host** [**traps** | **informs**] command.

The **snmp-server enable traps** command is used in conjunction with the **snmp-server host** command. Use the **snmp-server host** command to specify which host or hosts receive SNMP notifications. To send notifications, you must configure at least one **snmp-server host** command.

This list of the MIBs is used for the traps:

- **flash—**Controls SNMP FLASH traps from the CISCO-FLASH-MIB.
  - **insertion**—Controls the SNMP Flash insertion trap notifications.
  - **removal**—Controls the SNMP Flash removal trap notifications.
- **fru-ctrl—**Controls the FRU control traps from the CISCO-ENTITY-FRU-CONTROL-MIB.
- **port-security—**Controls the port-security traps from the CISCO-PORT-SECURITY-MIB.
- **stpx—**Controls all the traps from the CISCO-STP-EXTENSIONS-MIB.
- **vlancreate—**Controls SNMP VLAN created trap notifications.
- **vlandelete—**Controls SNMP VLAN deleted trap notifications.
- **vtp—**Controls the VTP traps from the CISCO-VTP-MIB.

## Examples

This example shows how to send all traps to the host is specified by the name myhost.cisco.com using the community string defined as public:

```
Switch(config)# snmp-server enable traps
Switch(config)# snmp-server host myhost.cisco.com public
Switch(config)#
```

This example shows how to enable the MAC address change MIB notification:

```
Switch(config)# snmp-server enable traps mac-notification change
Switch(config)#
```

SNMP traps can be enabled with a rate-limit to detect port-security violations due to restrict mode. The following example shows how to enable traps for port-security with a rate of 5 traps per second:

```
Switch(config)# snmp-server enable traps port-security trap-rate 5
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| clear mac-address-table dynamic | Clears the dynamic address entries from the Layer 2 MAC address table. |
| mac-address-table notification | Enables MAC address notification on a switch. |
| show mac-address-table notification | Displays the MAC address table notification status and history. |
| snmp-server enable traps | Enables SNMP notifications. |
| snmp trap mac-notification change | Enables SNMP MAC address notifications. |

# snmp-server ifindex persist

To globally enable ifIndex values that will remain constant across reboots for use by SNMP, use the **snmp-server ifindex persist** command. To globally disable inIndex persistence, use the **no** form of this command.

**snmp-server ifindex persist**

**no snmp-server ifindex persist**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

Interface index persistence occurs when ifIndex values in the IF-MIB persist across reboots and allow for consistent identification of specific interfaces using SNMP.

The **snmp-server ifindex persist** global configuration command does not override the interface-specific configuration. To override the interface-specific configuration of ifIndex persistence, enter the **no snmp ifindex persist** and **snmp ifindex clear** interface configuration commands.

Entering the **no snmp-server ifindex persist** global configuration command enables and disables ifIndex persistence for all interfaces on the routing device using ifDescr and ifIndex entries in the ifIndex table of the IF-MIB.

## Examples

This example shows how to enable ifIndex persistence for all interfaces:

```
Router(config)# snmp-server ifindex persist
```

## Related Commands

| Command | Description |
|---|---|
| **snmp ifindex clear** | Clears any previously configured **snmp ifindex** commands that were entered for a specific interface. |
| **snmp ifindex persist** | Enables ifIndex values in the Interfaces MIB (IF-MIB) that persist across reboots (ifIndex persistence) on a specific interface. |

# snmp-server ifindex persist compress

To configure the format of the ifIndex table in a compressed format, use the **snmp-server ifindex persist compress** command. To place the table in a decompressed format, use the **no** form of this command.

**snmp-server ifindex persist compress**

**no snmp-server ifindex persist compress**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

Global configuration mode.

## Command History

| Release | Modification |
|---|---|
| 12.2(46)SG | Support for this command was introduced on the Catalyst 4500 series switches. |

## Usage Guidelines

This command is hidden on Supervisor Engine V and later supervisor engines because the ifIndex table is always in a compressed format on those supervisor engines.

At bootup, if the nvram:ifIndex-table.gz file (the ifIndex table ina compressed format) is present on a Supervisor Engine II+, Supervisor Engine III, or Supervisor Engine IV, the **snmp-server ifindex persist compress** command is automatically run even if the startup-config file does not have this configuration.

## Examples

This example shows how to enable compression of the ifIndex table:

```
Router(config)# snmp-server ifindex persist compress
```

This example shows how to disable compression of the ifIndex table:

```
Router(config)# no snmp-server ifindex persist compress
```

## Related Commands

| Command | Description |
|---|---|
| snmp ifindex clear | Clears any previously configured **snmp ifindex** commands that were entered for a specific interface. |
| snmp ifindex persist | Enables ifIndex values in the Interfaces MIB (IF-MIB) that persist across reboots (ifIndex persistence) on a specific interface. |
| snmp-server ifindex persist | Enables ifIndex values that will remain constant across reboots for use by SNMP. |

# snmp trap mac-notification change

To enable SNMP MAC address notifications, use the **snmp trap mac-notification** command. To return to the default setting, use the **no** form of this command.

**snmp trap mac-notification change** {**added** | **removed**}

**no snmp trap mac-notification change** {**added** | **removed**}

## Syntax Description

| | |
|---|---|
| **added** | Specifies enabling the MAC address notification trap whenever a MAC address is added to an interface. |
| **removed** | Specifies enabling the MAC address notification trap whenever a MAC address is removed from an interface. |

## Defaults

MAC address addition and removal are disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(31)SG | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Even though you enable the change notification trap for a specific interface by using the **snmp trap mac-notification change** command, the trap is generated only when you enable the **snmp-server enable traps mac-notification change** and the **mac address-table notification change** global configuration commands.

## Examples

This example shows how to enable the MAC notification trap when a MAC address is added to a port:

```
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# snmp trap mac-notification change added
```

You can verify your settings by entering the show mac address-table notification change interface privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **clear mac-address-table** | Clears the address entries from the Layer 2 MAC address table. |
| **mac-address-table notification** | Enables MAC address notification on a switch. |
| **show mac-address-table notification** | Displays the MAC address table notification status and history. |
| **snmp-server enable traps** | Enables SNMP notifications. |

# spanning-tree backbonefast

To enable BackboneFast on a spanning-tree VLAN, use the **spanning-tree backbonefast** command. To disable BackboneFast, use the **no** form of this command.

**spanning-tree backbonefast**

**no spanning-tree backbonefast**

## Syntax Description

This command has no arguments or keywords.

## Defaults

BackboneFast is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

BackboneFast should be enabled on all Catalyst 4506 series switches to allow the detection of indirect link failures. Enabling BackboneFast starts the spanning-tree reconfiguration more quickly.

## Examples

This example shows how to enable BackboneFast on all VLANs:

```
Switch(config)# spanning-tree backbonefast
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **spanning-tree cost** | Calculates the path cost of STP on an interface. |
| **spanning-tree portfast default** | Enables PortFast by default on all access ports. |
| **spanning-tree portfast (interface configuration mode)** | Enables PortFast mode. |
| **spanning-tree port-priority** | Prioritizes an interface when two bridges compete for position as the root bridge. |
| **spanning-tree uplinkfast** | Enables the UplinkFast feature. |
| **spanning-tree vlan** | Configures STP on a per-VLAN basis. |
| **show spanning-tree** | Displays spanning-tree information. |

# spanning-tree bpdufilter

To enable BPDU filtering on an interface, use the **spanning-tree bpdufilter** command. To return to the default settings, use the **no** form of this command.

**spanning-tree bpdufilter** {**enable** | **disable**}

**no spanning-tree bpdufilter**

## Syntax Description

| | |
|---|---|
| **enable** | Enables BPDU filtering on this interface. |
| **disable** | Disables BPDU filtering on this interface. |

## Defaults

Disabled

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

**Caution** Use care when entering the **spanning-tree bpdufilter enable** command. Enabling BPDU filtering on an interface is approximately equivalent to disabling the spanning tree for this interface. It is possible to create bridging loops if this command is not correctly used.

When configuring Layer 2 protocol tunneling on all the service provider edge switches, you must enable spanning-tree BPDU filtering on the 802.1Q tunnel ports by entering the **spanning-tree bpdufilter enable** command.

BPDU filtering allows you to prevent a port from sending and receiving BPDUs. The configuration is applicable to the whole interface, whether it is trunking or not. This command has three states:

- **spanning-tree bpdufilter enable**—This state unconditionally enables the BPDU filter feature on the interface.
- **spanning-tree bpdufilter disable**—This state unconditionally disables the BPDU filter feature on the interface.
- **no spanning-tree bpdufilter**—This state enables the BPDU filter feature on the interface if the interface is in operational PortFast state and if the **spanning-tree portfast bpdufilter default** command is configured.

## Examples

This example shows how to enable the BPDU filter feature on this interface:

```
Switch(config-if)# spanning-tree bpdufilter enable
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show spanning-tree | Displays spanning-tree information. |
| spanning-tree portfast bpdufilter default | Enables the BPDU filtering by default on all PortFast ports. |

# spanning-tree bpduguard

To enable BPDU guard on an interface, use the **spanning-tree bpduguard** command. To return to the default settings, use the **no** form of this command.

**spanning-tree bpduguard** {**enable** | **disable**}

**no spanning-tree bpduguard**

## Syntax Description

| | |
|---|---|
| **enable** | Enables BPDU guard on this interface. |
| **disable** | Disables BPDU guard on this interface. |

## Defaults

BPDU guard is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

BPDU guard is a feature that prevents a port from receiving BPDUs. This feature is typically used in a service provider environment where the administrator wants to prevent an access port from participating in the spanning tree. If the port still receives a BPDU, it is put in the ErrDisable state as a protective measure. This command has three states:

- **spanning-tree bpduguard enable**—This state unconditionally enables BPDU guard on the interface.
- **spanning-tree bpduguard disable**—This state unconditionally disables BPDU guard on the interface.
- **no spanning-tree bpduguard**—This state enables BPDU guard on the interface if it is in the operational PortFast state and if the **spanning-tree portfast bpduguard default** command is configured.

## Examples

This example shows how to enable BPDU guard on this interface:

```
Switch(config-if)# spanning-tree bpduguard enable
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **show spanning-tree** | Displays spanning-tree information. |
| **spanning-tree portfast bpdufilter default** | Enables the BPDU filtering by default on all PortFast ports. |

# spanning-tree cost

To calculate the path cost of STP on an interface, use the **spanning-tree cost** command. To revert to the default, use the **no** form of this command.

**spanning-tree cost** *cost*

**no spanning-tree cost** *cost*

## Syntax Description

| | |
|---|---|
| *cost* | Path cost; valid values are from 1 to 200,000,000. |

## Defaults

The default settings are as follows:

- FastEthernet—19
- GigabitEthernet—1

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

When you configure the cost, the higher values indicate higher costs. The range applies regardless of the protocol type that is specified. The path cost is calculated, based on the interface bandwidth.

## Examples

This example shows how to access an interface and set a path cost value of 250 for the spanning-tree VLAN that is associated with that interface:

```
Switch(config)# interface fastethernet 2/1
Switch(config-if)# spanning-tree cost 250
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| spanning-tree portfast default | Enables PortFast by default on all access ports. |
| spanning-tree portfast (interface configuration mode) | Enables PortFast mode. |
| spanning-tree port-priority | Prioritizes an interface when two bridges compete for position as the root bridge. |
| spanning-tree uplinkfast | Enables the UplinkFast feature. |
| spanning-tree vlan | Configures STP on a per-VLAN basis. |
| show spanning-tree | Displays spanning-tree information. |

# spanning-tree etherchannel guard misconfig

To display an error message when a loop due to a channel misconfiguration is detected, use the **spanning-tree etherchannel guard misconfig** command. To disable the feature, use the **no** form of this command.

**spanning-tree etherchannel guard misconfig**

**no spanning-tree etherchannel guard misconfig**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Spanning-tree EtherChannel guard is enabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

When an EtherChannel guard misconfiguration is detected, this message is displayed:

```
%SPANTREE-2-CHNL_MISCFG:Detected loop due to etherchannel misconfig of interface
Port-Channel1
```

To determine which local ports are involved in the misconfiguration, enter the **show interfaces status err-disabled** command. To verify the EtherChannel configuration on the remote device, enter the **show etherchannel summary** command on the remote device.

After you correct the configuration, enter the **shutdown** and the **no shutdown** commands on the associated port-channel interface.

## Examples

This example shows how to enable the EtherChannel guard misconfiguration feature:

```
Switch(config)# spanning-tree etherchannel guard misconfig
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show etherchannel** | Displays EtherChannel information for a channel. |
| **show interfaces status** | Displays the interface status or a list of interfaces in error-disabled state. |
| **shutdown** (refer to Cisco IOS documentation) | Disables a port. |

# spanning-tree extend system-id

To enable the extended system ID feature on a chassis that supports 1024 MAC addresses, use the **spanning-tree extend system-id** command. To disable the feature, use the **no** form of this command.

**spanning-tree extend system-id**

**no spanning-tree extend system-id**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Enabled on systems that do not provide 1024 MAC addresses.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

Releases 12.1(13)E and later support chassis with 64 or 1024 MAC addresses. For chassis with 64 MAC addresses, STP uses the extended system ID plus a MAC address to make the bridge ID unique for each VLAN.

You cannot disable the extended system ID on chassis that support 64 MAC addresses.

Enabling or disabling the extended system ID updates the bridge IDs of all active STP instances, which might change the spanning-tree topology.

## Examples

This example shows how to enable the extended system ID:

```
Switch(config)# spanning-tree extend system-id
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| show spanning-tree | Displays spanning-tree information. |

# spanning-tree guard

To enable root guard, use the **spanning-tree guard** command. To disable root guard, use the **no** form of this command.

**spanning-tree guard** {**loop** | **root** | **none**}

**no spanning-tree guard**

## Syntax Description

| | |
|---|---|
| **loop** | Enables the loop guard mode on the interface. |
| **root** | Enables root guard mode on the interface. |
| **none** | Sets the guard mode to none. |

## Defaults

Root guard is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.1(12c)EW | Loop guard support was added. |

## Examples

This example shows how to enable root guard:

```
Switch(config-if)# spanning-tree guard root
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show spanning-tree | Displays spanning-tree information. |

# spanning-tree link-type

To configure a link type for a port, use the **spanning-tree link-type** command. To return to the default settings, use the **no** form of this command.

**spanning-tree link-type** {**point-to-point** | **shared**}

**no spanning-tree link-type**

## Syntax Description

| | |
|---|---|
| **point-to-point** | Specifies that the interface is a point-to-point link. |
| **shared** | Specifies that the interface is a shared medium. |

## Defaults

Link type is derived from the duplex mode.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

RSTP+ fast transition works only on point-to-point links between two bridges.

By default, the switch derives the link type of a port from the duplex mode. A full-duplex port is considered as a point-to-point link while a half-duplex configuration is assumed to be on a shared link.

If you designate a port as a shared link, RSTP+ fast transition is forbidden, regardless of the duplex setting.

## Examples

This example shows how to configure the port as a shared link:

```
Switch(config-if)# spanning-tree link-type shared
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show spanning-tree | Displays spanning-tree information. |

# spanning-tree loopguard default

To enable loop guard as the default on all ports of a specific bridge, use the **spanning-tree loopguard default** command. To disable loop guard, use the **no** form of this command.

**spanning-tree loopguard default**

**no spanning-tree loopguard default**

## Syntax Description

This command has no keywords or arguments.

## Defaults

Loop guard is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

Loop guard provides an additional security in the bridge network. Loop guard prevents alternate or root ports from becoming the designated port because of a failure leading to a unidirectional link.

Loop guard operates only on ports that are considered point-to-point by the spanning tree.

Individual loop-guard port configuration overrides this global default.

## Examples

This example shows how to enable loop guard:

```
Switch(config)# spanning-tree loopguard default
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| spanning-tree guard | Enables root guard. |
| show spanning-tree | Displays spanning-tree information. |

# spanning-tree mode

To switch between PVST+ and MST modes, use the **spanning-tree mode** command. To return to the default settings, use the **no** form of this command.

**spanning-tree mode** {**pvst** | **mst** | **rapid-pvst**}

**no spanning-tree mode** {**pvst** | **mst** | **rapid-pvst**}

## Syntax Description

| | |
|---|---|
| **pvst** | Specifies PVST+ mode. |
| **mst** | Specifies MST mode. |
| **rapid-pvst** | Specifies Rapid PVST mode. |

## Defaults

PVST+ mode

## Command Modes

Configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.1(19)EW | Support for the **rapid-pvst** keyword. |

## Usage Guidelines

**Caution** Be careful when using the **spanning-tree mode** command to switch between PVST+ and MST modes. When you enter the command, all spanning-tree instances are stopped for the previous mode and restarted in the new mode. Using this command may cause disruption of user traffic.

## Examples

This example shows how to switch to MST mode:

```
Switch(config)# spanning-tree mode mst
Switch(config)#
```

This example shows how to return to the default mode (PVST):

```
Switch(config)# no spanning-tree mode
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| show spanning-tree mst | Displays MST protocol information. |

# spanning-tree mst

To set the path cost and port-priority parameters for any MST instance (including the CIST with instance ID 0), use the **spanning-tree mst** command. To return to the default settings, use the **no** form of this command.

**spanning-tree mst** *instance-id* [**cost** *cost*] | [**port-priority** *prio*]

**no spanning-tree mst** *instance-id* {**cost** | **port-priority**}

## Syntax Description

| | |
|---|---|
| *instance-id* | Instance ID number; valid values are from 0 to 15. |
| **cost** *cost* | (Optional) Specifies the path cost for an instance; valid values are from 1 to 200000000. |
| **port-priority** *prio* | (Optional) Specifies the port priority for an instance; valid values are from 0 to 240 in increments of 16. |

## Defaults

Port priority is **128**.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

The higher **cost** *cost* values indicate higher costs. When entering the *cost* value, do not include a comma in the entry; for example, enter **1000**, not **1,000**.

The higher **port-priority** *prio* values indicate smaller priorities.

By default, the cost depends on the port speed; faster interface speeds indicate smaller costs. MST always uses long path costs.

## Examples

This example shows how to set the interface path cost:

```
Switch(config-if)# spanning-tree mst 0 cost 17031970
Switch(config-if)#
```

This example shows how to set the interface priority:

```
Switch(config-if)# spanning-tree mst 0 port-priority 64
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show spanning-tree mst | Displays MST protocol information. |
| spanning-tree port-priority | Enables an interface when two bridges compete for position as the root bridge. |

# spanning-tree mst configuration

To enter the MST configuration submode, use the **spanning-tree mst configuration** command. To return to the default MST configuration, use the **no** form of this command.

**spanning-tree mst configuration**

**no spanning-tree mst configuration**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The default settings are as follows:

- No VLANs are mapped to any MST instance.
- All VLANs are mapped to the CIST instance.
- The region name is an empty string.
- The revision number is 0.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The MST configuration consists of three main parameters:

- Instance VLAN mapping (see the **instance** command)
- Region name (see the **name** command)
- Configuration revision number (see the **revision** command)

By default, the value for the MST configuration is the default value for all its parameters.

The **abort** and **exit** commands allow you to exit the MST configuration submode. The difference between the two commands depends on whether you want to save your changes or not.

The **exit** command commits all the changes before leaving MST configuration submode. If you do not map the secondary VLANs to the same instance as the associated primary VLAN, when you exit the MST configuration submode, a message displays and lists the secondary VLANs that are not mapped to the same instance as the associated primary VLAN. The message is as follows:

```
These secondary vlans are not mapped to the same instance as their primary:
->3
```

The **abort** command leaves the MST configuration submode without committing any changes.

Whenever you change an MST configuration submode parameter, it can cause a loss of connectivity. To reduce the number of service disruptions, when you enter the MST configuration submode, you are changing a copy of the current MST configuration. When you are done editing the configuration, you can apply all the changes at once by using the **exit** keyword, or you can exit the submode without committing any change to the configuration by using the **abort** keyword.

In the unlikely event that two users enter a new configuration at exactly at the same time, this message is displayed:

```
Switch(config-mst)# exit
% MST CFG:Configuration change lost because of concurrent access
Switch(config-mst)#
```

## Examples

This example shows how to enter the MST configuration submode:

```
Switch(config)# spanning-tree mst configuration
Switch(config-mst)#
```

This example shows how to reset the MST configuration to the default settings:

```
Switch(config)# no spanning-tree mst configuration
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| instance | Maps a VLAN or a set of VLANs to an MST instance. |
| name | Sets the MST region name. |
| revision | Sets the MST configuration revision number. |
| show spanning-tree mst | Displays MST protocol information. |

# spanning-tree mst forward-time

To set the forward delay timer for all the instances, use the **spanning-tree mst forward-time** command. To return to the default settings, use the **no** form of this command.

**spanning-tree mst forward-time** *seconds*

**no spanning-tree mst forward-time**

## Syntax Description

| | |
|---|---|
| *seconds* | Number of seconds to set the forward delay timer for all the instances on the Catalyst 4500 series switch; valid values are from 4 to 30 seconds. |

## Defaults

The forward delay timer is set for 15 seconds.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Examples

This example shows how to set the forward-delay timer:

```
Switch(config)# spanning-tree mst forward-time 20
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show spanning-tree mst** | Displays MST protocol information. |

# spanning-tree mst hello-time

To set the hello-time delay timer for all the instances, use the **spanning-tree mst hello-time** command. To return to the default settings, use the **no** form of this command.

**spanning-tree mst hello-time** *seconds*

**no spanning-tree mst hello-time**

## Syntax Description

| | |
|---|---|
| *seconds* | Number of seconds to set the hello-time delay timer for all the instances on the Catalyst 4500 series switch; valid values are from 1 to 10 seconds. |

## Defaults

The hello-time delay timer is set for 2 seconds.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

If you do not specify the *hello-time* value, the value is calculated from the network diameter.

## Examples

This example shows how to set the hello-time delay timer:

```
Switch(config)# spanning-tree mst hello-time 3
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show spanning-tree mst** | Displays MST protocol information. |

# spanning-tree mst max-age

To set the max-age timer for all the instances, use the **spanning-tree mst max-age** command. To return to the default settings, use the **no** form of this command.

**spanning-tree mst max-age** *seconds*

**no spanning-tree mst max-age**

## Syntax Description

| | |
|---|---|
| *seconds* | Number of seconds to set the max-age timer for all the instances on the Catalyst 4500 series switch; valid values are from 6 to 40 seconds. |

## Defaults

The max-age timer is set for 20 seconds.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Examples

This example shows how to set the max-age timer:

```
Switch(config)# spanning-tree mst max-age 40
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show spanning-tree mst** | Displays MST protocol information. |

# spanning-tree mst max-hops

To specify the number of possible hops in the region before a BPDU is discarded, use the **spanning-tree mst max-hops** command. To return to the default settings, use the **no** form of this command.

**spanning-tree mst max-hops** *hopnumber*

**no spanning-tree mst max-hops**

## Syntax Description

| | |
|---|---|
| *hopnumber* | Number of possible hops in the region before a BPDU is discarded; valid values are from 1 to 40 hops. |

## Defaults

Number of hops is 20.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Examples

This example shows how to set the number of possible hops in the region before a BPDU is discarded to 25:

```
Switch(config)# spanning-tree mst max-hops 25
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show spanning-tree mst** | Displays MST protocol information. |

# spanning-tree mst root

To designate the primary root, secondary root, bridge priority, and timer value for an instance, use the **spanning-tree mst root** command. To return to the default settings, use the **no** form of this command.

**spanning-tree mst** *instance-id* **root** {**primary** | **secondary**} | {**priority** *prio*} [**diameter** *dia* [**hello-time** *hello*]]

**no spanning-tree mst root**

## Syntax Description

| | |
|---|---|
| *instance-id* | Instance identification number; valid values are from 1 to 15. |
| **root** | Configures switch as the root switch. |
| **primary** | Sets a high enough priority (low value) to make the bridge root of the spanning-tree instance. |
| **secondary** | Designates this switch as a secondary root if the primary root fails. |
| **priority** *prio* | Sets the bridge priority; see the "Usage Guidelines" section for valid values and additional information. |
| **diameter** *dia* | (Optional) Sets the timer values for the bridge based on the network diameter; valid values are from 2 to 7. |
| **hello-time** *hello* | (Optional) Specifies the duration between the generation of configuration messages by the root switch. |

## Defaults

Bridge priority is 32768.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

The bridge priority can be set in increments of 4096 only. When you set the priority, valid values are 0, 4096, 8192, 12288, 16384, 20480, 24576, 28672, 32768, 36864, 40960, 45056, 49152, 53248, 57344, and 61440.

You can set the priority to 0 to make the switch root.

The **spanning-tree root secondary** bridge priority value is 16384.

The **diameter** *dia* and **hello-time** *hello* options are available for instance 0 only.

If you do not specify the *hello_time* value, the value is calculated from the network diameter.

## Examples

This example shows how to set the priority and timer values for the bridge:

```
Switch(config)# spanning-tree mst 0 root primary diameter 7 hello-time 2
Switch(config)# spanning-tree mst 5 root primary
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| show spanning-tree mst | Displays MST protocol information. |

# spanning-tree pathcost method

To set the path cost calculation method, use the **spanning-tree pathcost method** command. To revert to the default setting, use the **no** form of this command.

**spanning-tree pathcost method** {**long** | **short**}

**no spanning-tree pathcost method**

## Syntax Description

| | |
|---|---|
| **long** | Specifies 32-bit-based values for port path costs. |
| **short** | Specifies 16-bit-based values for port path costs. |

## Defaults

Port path cost has 32-bit-based values.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

This command applies to all the spanning-tree instances on the switch.

The **long** path cost calculation method uses all the 32 bits for path cost calculation and yields values in the range of 1 through 200,000,000.

The **short** path cost calculation method (16 bits) yields values in the range of 1 through 65,535.

## Examples

This example shows how to set the path cost calculation method to long:

```
Switch(config) spanning-tree pathcost method long
Switch(config)
```

This example shows how to set the path cost calculation method to short:

```
Switch(config) spanning-tree pathcost method short
Switch(config)
```

## Related Commands

| Command | Description |
|---|---|
| **show spanning-tree** | Displays spanning-tree state information. |

# spanning-tree portfast (interface configuration mode)

To enable PortFast mode, where the interface is immediately put into the forwarding state upon linkup without waiting for the timer to expire, use the **spanning-tree portfast** command. To return to the default setting, use the **no** form of this command.

**spanning-tree portfast** {**disable** | **trunk**}

**no spanning-tree portfast**

## Syntax Description

| | |
|---|---|
| **disable** | Disables PortFast on the interface. |
| **trunk** | Enables PortFast on the interface even while in the trunk mode. |

## Defaults

PortFast mode is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.1(12c)EW | The **disable** and **trunk** options were added. |

## Usage Guidelines

You should use this feature only with interfaces that connect to end stations; otherwise, an accidental topology loop could cause a data packet loop and disrupt the Catalyst 4500 series switch and network operation.

An interface with PortFast mode enabled is moved directly to the spanning-tree forwarding state when linkup occurs without waiting for the standard forward-time delay.

Be careful when using the **no spanning-tree portfast** command. This command does not disable PortFast if the **spanning-tree portfast default** command is enabled.

This command has four states:

- **spanning-tree portfast**—This command enables PortFast unconditionally on the given port.
- **spanning-tree portfast disable**—This command explicitly disables PortFast for the given port. The configuration line shows up in the running-configuration as it is not the default.
- **spanning-tree portfast trunk**—This command allows you to configure PortFast on trunk ports.

**Note** If you enter the **spanning-tree portfast trunk** command, the port is configured for PortFast even when in the access mode.

- **no spanning-tree portfast**—This command implicitly enables PortFast if the **spanning-tree portfast default** command is defined in global configuration and if the port is not a trunk port. If you do not configure PortFast globally, the **no spanning-tree portfast** command is equivalent to the **spanning-tree portfast disable** command.

## Examples

This example shows how to enable PortFast mode:

```
Switch(config-if)# spanning-tree portfast
Switch(config-if)
```

## Related Commands

| Command | Description |
|---|---|
| **spanning-tree cost** | Calculates the path cost of STP on an interface. |
| **spanning-tree portfast default** | Enables PortFast by default on all access ports. |
| **spanning-tree port-priority** | Prioritizes an interface when two bridges compete for position as the root bridge. |
| **spanning-tree uplinkfast** | Enables the UplinkFast feature. |
| **spanning-tree vlan** | Configures STP on a per-VLAN basis. |
| **show spanning-tree** | Displays spanning-tree state information. |

# spanning-tree portfast bpdufilter default

To enable the BPDU filtering by default on all PortFast ports, use the **spanning-tree portfast bpdufilter default** command. To return to the default settings, use the **no** form of this command.

**spanning-tree portfast bpdufilter default**

**no spanning-tree portfast bpdufilter default**

## Syntax Description

This command has no keywords or arguments.

## Defaults

BPDU filtering is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

The **spanning-tree portfast bpdufilter default** command enables BPDU filtering globally on the Catalyst 4500 series switch. BPDU filtering prevents a port from sending or receiving any BPDUs.

You can override the effects of the **spanning-tree portfast bpdufilter default** command by configuring BPDU filtering at the interface level.

**Note** Be careful when enabling BPDU filtering. Functionality is different when enabling on a per-port basis or globally. When enabled globally, BPDU filtering is applied only on ports that are in an operational PortFast state. Ports still send a few BPDUs at linkup before they effectively filter outbound BPDUs. If a BPDU is received on an edge port, it immediately loses its operational PortFast status and BPDU filtering is disabled.

When enabled locally on a port, BPDU filtering prevents the Catalyst 4500 series switch from receiving or sending BPDUs on this port.

**Caution** Be careful when using this command. This command can cause bridging loops if not used correctly.

## Examples

This example shows how to enable BPDU filtering by default:

```
Switch(config)# spanning-tree portfast bpdufilter default
Switch(config)#
```

**Related Commands**

| Command | Description |
|---|---|
| **show spanning-tree mst** | Displays MST protocol information. |
| **spanning-tree bpdufilter** | Enables BPDU filtering on an interface. |

# spanning-tree portfast bpduguard default

To enable BPDU guard by default on all the PortFast ports, use the **spanning-tree portfast bpduguard default** command. To return to the default settings, use the **no** form of this command.

**spanning-tree portfast bpduguard default**

**no spanning-tree portfast bpduguard default**

## Syntax Description

This command has no keywords or arguments.

## Defaults

BPDU guard is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

**Caution** Be careful when using this command. You should use this command only with the interfaces that connect to the end stations; otherwise, an accidental topology loop could cause a data packet loop and disrupt the Catalyst 4500 series switch and network operation.

BPDU guard disables a port if it receives a BPDU. BPDU guard is applied only on ports that are PortFast enabled and are in an operational PortFast state.

## Examples

This example shows how to enable BPDU guard by default:

```
Switch(config)# spanning-tree portfast bpduguard default
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| show spanning-tree mst | Displays MST protocol information. |
| spanning-tree bpduguard | Enables BPDU guard on an interface. |

# spanning-tree portfast default

To globally enable PortFast by default on all access ports, use the **spanning-tree portfast default** command. To disable PortFast as default on all access ports, use the **no** form of this command.

**spanning-tree portfast default**

**no spanning-tree portfast default**

## Syntax Description

This command has no arguments or keywords.

## Defaults

PortFast is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

**Caution** Be careful when using this command. You should use this command only with the interfaces that connect to end stations; otherwise, an accidental topology loop could cause a data packet loop and disrupt the Catalyst 4500 series switch and network operation.

An interface with PortFast mode enabled is moved directly to the spanning-tree forwarding state when linkup occurs without waiting for the standard forward-time delay.

You can enable PortFast mode on individual interfaces using the **spanning-tree portfast (interface configuration mode)** command.

## Examples

This example shows how to globally enable PortFast by default on all access ports:

```
Switch(config)# spanning-tree portfast default
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show spanning-tree** | Displays spanning-tree state information. |
| **spanning-tree portfast (interface configuration mode)** | Enables PortFast mode. |

# spanning-tree port-priority

To prioritize an interface when two bridges compete for position as the root bridge, use the **spanning-tree port-priority** command. The priority you set breaks the tie. To revert to the default setting, use the **no** form of this command.

**spanning-tree port-priority** *port_priority*

**no spanning-tree port-priority**

## Syntax Description

| | |
|---|---|
| *port_priority* | Port priority; valid values are from 0 to 240 in increments of 16. |

## Defaults

Port priority value is set to 128.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Examples

This example shows how to increase the possibility that the spanning-tree instance 20 will be chosen as the root-bridge on interface FastEthernet 2/1:

```
Switch(config-if)# spanning-tree port-priority 0
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **spanning-tree cost** | Calculates the path cost of STP on an interface. |
| **spanning-tree portfast default** | Enables PortFast by default on all access ports. |
| **spanning-tree portfast (interface configuration mode)** | Enables PortFast mode. |
| **spanning-tree uplinkfast** | Enables the UplinkFast feature. |
| **spanning-tree vlan** | Configures STP on a per-VLAN basis. |
| **show spanning-tree** | Displays spanning-tree state information. |

# spanning-tree uplinkfast

To enable the UplinkFast feature, use the **spanning-tree uplinkfast** command. To disable UplinkFast, use the **no** form of this command.

**spanning-tree uplinkfast** [**max-update-rate** *packets-per-second*]

**no spanning-tree uplinkfast** [**max-update-rate**]

## Syntax Description

| | |
|---|---|
| **max-update-rate** *packets_per_second* | (Optional) Specifies the maximum rate (in packets per second) at which update packets are sent; valid values are from 0 to 65535. |

## Defaults

The default settings are as follows:

- Disabled.
- Maximum update rate is 150.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

This command should be used only on access switches.

When UplinkFast is configured, the bridge priority is changed to 49,152 so that this switch will not be selected as root. All interface path costs of all spanning-tree interfaces belonging to the specified spanning-tree instances are also increased by 3000.

When spanning tree detects that the root interface has failed, the UplinkFast feature causes an immediate switchover to an alternate root interface, transitioning the new root interface directly to the forwarding state. During this time, a topology change notification is sent. To minimize the disruption caused by the topology change, a multicast packet is sent to 01-00-0C-CD-CD-CD for each station address in the forwarding bridge except for those associated with the old root interface.

Use the **spanning-tree uplinkfast max-update-rate** command to enable UplinkFast (if not already enabled) and change the rate at which the update packets are sent. Use the **no** form of this command to return the default rate of 150 packets per second.

## Examples

This example shows how to enable UplinkFast and set the maximum rate to 200 packets per second:

```
Switch(config)# spanning-tree uplinkfast
Switch(config)# spanning-tree uplinkfast max-update-rate 200
```

## Related Commands

| Command | Description |
|---|---|
| spanning-tree cost | Calculates the path cost of STP on an interface. |
| spanning-tree port-priority | Prioritizes an interface when two bridges compete for position as the root bridge. |
| spanning-tree portfast default | Enables PortFast by default on all access ports. |
| spanning-tree portfast (interface configuration mode) | Enables PortFast mode. |
| spanning-tree vlan | Configures STP on a per-VLAN basis. |

# spanning-tree vlan

To configure STP on a per-VLAN basis, use the **spanning-tree vlan** command. To return to the default value, use the **no** form of this command.

**spanning-tree vlan** *vlan_id* [**forward-time** *seconds* | **hello-time** *seconds* | **max-age** *seconds* | **priority** *priority* | **protocol** *protocol* | **root** {**primary** | **secondary**} [**diameter** *net-diameter* [**hello-time** *seconds*]]]

**no spanning-tree vlan** *vlan_id* [**forward-time** | **hello-time** | **max-age** | **priority** | **root**]

## Syntax Description

| | |
|---|---|
| *vlan_id* | VLAN identification number; valid values are from 1 to 4094. |
| **forward-time** *seconds* | (Optional) Sets the STP forward delay time; valid values are from 4 to 30 seconds. |
| **hello-time** *seconds* | (Optional) Specifies, in seconds, the time between configuration messages generated by the root switch; valid values are from 1 to 10 seconds. |
| **max-age** *seconds* | (Optional) Sets the maximum time, in seconds, that the information in a BPDU is valid; valid values are from 6 to 40 seconds. |
| **priority** *priority* | (Optional) Sets the STP bridge priority; valid values are from 0 to 65535. |
| **protocol** *protocol* | (Optional) Specifies the protocol. |
| **root primary** | (Optional) Forces this switch to be the root bridge. |
| **root secondary** | (Optional) Specifies this switch act as the root switch should the primary root fail. |
| **diameter** *net-diameter* | (Optional) Specifies the maximum number of bridges between two end stations; valid values are from 2 to 7. |

## Defaults

The default settings are as follows:

- Forward-time—15 seconds
- Hello-time—2 seconds
- Max-age—20 seconds
- Priority—32768 with STP enabled; 128 with MST enabled
- Root—No STP root

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.1(12c)EW | Support for extended addressing was added. |

## Usage Guidelines

When you are setting the **max-age** *seconds* value, if a bridge does not hear BPDUs from the root bridge within the specified interval, it assumes that the network has changed and recomputes the spanning-tree topology.

The **spanning-tree root primary** command alters the switch bridge priority to 8192. If you enter the **spanning-tree root primary** command and the switch does not become root, then the bridge priority is changed to 100 less than the bridge priority of the current bridge. If the switch does not become root, an error will result.

The **spanning-tree root secondary** command alters the switch bridge priority to 16384. If the root switch fails, this switch becomes the next root switch.

Use the **spanning-tree root** commands on backbone switches only.

## Examples

This example shows how to enable spanning tree on VLAN 200:

```
Switch(config)# spanning-tree vlan 200
Switch(config)#
```

This example shows how to configure the switch as the root switch for VLAN 10 with a network diameter of 4:

```
Switch(config)# spanning-tree vlan 10 root primary diameter 4
Switch(config)#
```

This example shows how to configure the switch as the secondary root switch for VLAN 10 with a network diameter of 4:

```
Switch(config)# spanning-tree vlan 10 root secondary diameter 4
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **spanning-tree cost** | Calculates the path cost of STP on an interface. |
| **spanning-tree port-priority** | Prioritizes an interface when two bridges compete for position as the root bridge. |
| **spanning-tree portfast default** | Enables PortFast by default on all access ports. |
| **spanning-tree portfast (interface configuration mode)** | Enables PortFast mode. |
| **spanning-tree vlan** | Configures STP on a per-VLAN basis. |
| **show spanning-tree** | Displays spanning-tree state information. |

# speed

To configure the interface speed, use the **speed** command. To disable a speed setting, use the **no** form of this command.

**speed** {**10** | **100** | **1000** | **auto** [**10** | **100** | **1000**] | **nonegotiate**}

**no speed**

## Syntax Description

| | |
|---|---|
| **10** | (Optional) Configures the interface to transmit at 10 Mbps. |
| **100** | (Optional) Configures the interface to transmit at 100 Mbps. |
| **1000** | (Optional) Configures the interface to transmit at 1000 Mbps. |
| **auto** [**10** \| **100** \| **1000**] | (Optional) Enables the interface to autonegotiate the speed and specify the exact values to advertise when autonegotiating. |
| **nonegotiate** | (Optional) Enables the interface to not negotiate the speed. |

## Defaults

The default values are shown in the following table:

| Interface Type | Supported Syntax | Default Setting |
|---|---|---|
| 10/100-Mbps module | **speed** [**10** \| **100** \| **auto** [**10** \| **100**]] | Auto |
| 100-Mbps fiber modules | Not applicable | Not applicable |
| Gigabit Ethernet Interface | **speed nonegotiate** | Nonegotiate |
| 10/100/1000 | **speed** [**10** \| **100** \| **1000** \| **auto** [**10** \| **100** \| **1000**]] | Auto |
| 1000 | Not applicable | Not applicable |

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.2(20)EWA | Support for auto negotiating specific speeds added. |

## Usage Guidelines

Table 2-28 lists the supported command options by interface.

*Table 2-28 Supported speed Command Options*

| Interface Type | Supported Syntax | Default Setting | Guidelines |
|---|---|---|---|
| 10/100-Mbps module | **speed** [**10** \| **100** \| **auto**] | **auto** | If the speed is set to 10 or 100 and you do not configure the duplex setting, the duplex is set to half. |
| 100-Mbps fiber modules | Not applicable. | Not applicable. | Not applicable. |
| Gigabit Ethernet Interface | **speed nonegotiate** | **nonegotiate** is enabled. | This is only applicable to Gigabit Ethernet ports. |
| 10/100/1000 | **speed** [**10** \| **100** \| **1000** \| **auto**] | **auto** | If the speed is set to 10 or 100 and you do not configure the duplex setting, the duplex is set to half.<br>If the speed is set to 1000 or auto with any subset containing 1000 (e.g. **speed auto 10 1000** or **speed auto** on a 10/100/1000 port), you will not able to set half duplex. |
| 1000 | Not applicable. | Not applicable. | The speed is always 1000.<br>The duplex is half. |

If you configure the interface speed and duplex commands manually and enter a value other than **speed auto** (for example, 10 or 100 Mbps), make sure that you configure the connecting interface speed command to a matching speed but do not use the auto parameter.

When manually configuring the interface speed to either 10 or 100 Mbps, the switch prompts you to also configure duplex mode on the interface.

**Note** Catalyst 45006 switches cannot automatically negotiate the interface speed and the duplex mode if either connecting interface is configured to a value other than **auto**.

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

Table 2-29 describes the system's performance for different combinations of the duplex and speed modes. The specified **duplex** command that is configured with the specified **speed** command produces the resulting system action.

*Table 2-29 System Action Using duplex and speed Commands*

| duplex Command | speed Command | Resulting System Action |
|---|---|---|
| **duplex auto** | **speed auto** | Autonegotiates both speed and duplex modes |
| **duplex half** | **speed 10** | Forces 10 Mbps and half duplex |
| **duplex full** | **speed 10** | Forces 10 Mbps and full duplex |
| **duplex half** | **speed 100** | Forces 100 Mbps and half duplex |
| **duplex full** | **speed 100** | Forces 100 Mbps and full duplex |
| **duplex full** | **speed 1000** | Forces 1000 Mbps and full duplex |

## Examples

This example shows how to set the interface speed to 100 Mbps on the Fast Ethernet interface 5/4:

```
Switch(config)# interface fastethernet 5/4
Switch(config-if)# speed 100
```

This example shows how to allow Fast Ethernet interface 5/4 to autonegotiate the speed and duplex mode:

```
Switch(config)# interface fastethernet 5/4
Switch(config-if)# speed auto
```

**Note** The **speed auto 10 100** command is similar to the **speed auto** command on a Fast Ethernet interface.

This example shows how to limit the interface speed to 10 and 100 Mbps on the Gigabit Ethernet interface 1/1 in auto-negotiation mode:

```
Switch(config)# interface gigabitethernet 1/1
Switch(config-if)# speed auto 10 100
```

This example shows how to limit the speed negotiation to 100 Mbps on the Gigabit Ethernet interface 1/1:

```
Switch(config)# interface gigabitethernet 1/1
Switch(config-if)# speed auto 100
```

## Related Commands

| Command | Description |
|---|---|
| **duplex** | Configures the duplex operation on an interface. |
| **interface** (refer to Cisco IOS documentation) | Configures an interface type and enter interface configuration mode. |
| **show controllers** (refer to Cisco IOS documentation) | Displays controller information. |
| **show interfaces** | Displays traffice on a specific interface. |

# storm-control

To enable broadcast storm control on a port and to specify what to do when a storm occurs on a port, use the **storm-control** interface configuration command. To disable storm control for the broadcast traffic and to disable a specified storm-control action, use the **no** form of this command.

**storm-control** {**broadcast level** *high level* [*lower level*]} | **action** {**shutdown** | **trap**}}

**no storm-control** {**broadcast level** *level* [*lower level*]} | **action** {**shutdown** | **trap**}}

## Syntax Description

| | |
|---|---|
| **broadcast** | Enables the broadcast storm control on the port. |
| **level** *high-level lower-level* | Defines the rising and falling suppression levels:<br>• *high-level*—Rising suppression level as a percent of total bandwidth, up to two decimal places; valid values are from 0 to 100 percent. Blocks the flooding of storm packets when the value specified for *level* is reached.<br>• *lower-level*—(Optional) Falling suppression level as a percent of total bandwidth, up to two decimal places; valid values are from 0 to 100. This value must be less than the rising suppression value. |
| **action** | Directs the switch to take action when a storm occurs on a port. |
| **shutdown** | Disables the port during a storm. |
| **trap** | Sends an SNMP trap when a storm occurs. This keyword is available but not supported in 12.1(19)EW. |

## Defaults

Broadcast storm control is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.2(40)SG | Support for the Supervisor Engine 6-E and Catalyst 4900M chassis is introduced. |

## Usage Guidelines

Enter the **storm-control broadcast level** command to enable traffic storm control on the interface, configure the traffic storm control level, and apply the traffic storm control level to the broadcast traffic on the interface.

The Catalyst 4500 series switch supports broadcast traffic storm control on all LAN ports.

The period is required when you enter the fractional suppression level.

The suppression level is entered as a percentage of the total bandwidth. A threshold value of 100 percent indicates that no limit is placed on traffic. A value of 0.0 means that all specified traffic on that port is blocked.

Enter the **show interfaces counters storm-control** command to display the discard count.

Enter the **show running-config** command to display the enabled suppression mode and level setting.

To turn off suppression for the specified traffic type, you can do one of the following:

- Set the *high-level* value to 100 percent for the specified traffic type.
- Use the **no** form of this command.

The lower level is ignored for the interfaces that perform storm control in the hardware.

**Note** The **lower level** keyword does not apply to the Supervisor Engine 6-E and Catalyst 4900M chassis implementations.

## Examples

This example shows how to enable broadcast storm control on a port with a 75.67 percent rising suppression level:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 3/1
Switch(config-if)# storm-control broadcast level 75.67
Switch(config-if)# end
```

This example shows how to disable the port during a storm:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 3/1
Switch(config-if)# storm-control action shutdown
Switch(config-if)# end
```

This example shows how to disable storm control on a port:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 3/1
Switch(config-if)# no storm-control broadcast level
Switch(config-if)# end
```

This example shows how to disable storm control by setting the high level to 100 percent:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 3/1
Switch(config-if)# storm-control broadcast level 100
Switch(config-if)# end
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces counters | Displays the traffic on the physical interface. |
| show running-config | Displays the running configuration of a switch. |

# storm-control broadcast include multicast

To enable multicast storm control on a port, use the **storm-control broadcast include multicast** command. To disable multicast storm control, use the **no** form of this command.

**storm-control broadcast include multicast**

**no storm-control broadcast include multicast**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Multicast storm control is disabled.

## Command Modes

Global configuration mode
Interface configuration mode on a Supervisor Engine 6-E or Catalyst 4900M chassis

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.2(40)SG | Support for the Supervisor Engine 6-E and Catalyst 4900M chassis is introduced. |

## Usage Guidelines

This command prompts the hardware to filter multicast packets if it is already filtering broadcast packets.

The Supervisor Engine 6-E and Catalyst 4900M chassis supports per-interface multicast suppression. When you enable multicast suppression on an interface you subject incoming multicast and broadcast traffic on that interface to suppression.

## Examples

This example shows how to enable multicast storm control globally:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# storm-control broadcast include multicast
Switch(config)# end
```

This example shows how to enable per-port Multicast storm control on a Supervisor Engine 6-E:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet2/4
Switch(config-if)# storm-control broadcast include multicast
Switch(config)# end
```

## Related Commands

| Command | Description |
|---|---|
| storm-control | Enables broadcast storm control on a port and and specifies what to do when a storm occurs on a port. |

# switchport

To modify the switching characteristics of a Layer 2 switch interface, use the **switchport** command. To return the interface to the routed-interface status and cause all further Layer 2 configuration to be erased, use the **no** form of this command without parameters.

**switchport** [**access vlan** *vlan_num*] | [**nonegotiate**] | [**voice vlan** {*vlan_id* | **dot1p** | **none** | **untagged**}]

**no switchport** [**access** | **nonegotiate** | **voice vlan**]

## Syntax Description

| | |
|---|---|
| **access vlan** *vlan_num* | (Optional) Sets the VLAN when the interface is in access mode; valid values are from 1 to 1005. |
| **nonegotiate** | (Optional) Specifies that the DISL/DTP negotiation packets will not be sent on the interface. |
| **voice vlan** *vlan_id* | (Optional) Specifies the number of the VLAN; valid values are from 1 to 1005. |
| **dot1p** | (Optional) Specifies that the PVID packets are tagged as priority. |
| **none** | (Optional) Specifies that the telephone and voice VLAN do not communicate. |
| **untagged** | (Optional) Specifies the untagged PVID packets. |

## Defaults

The default settings are as follows:

- Switchport trunking mode is enabled.
- Dynamic negotiation parameter is set to auto.
- Access VLANs and trunk interface native VLANs are a default VLAN corresponding to the platform or interface hardware.
- All VLAN lists include all VLANs.
- No voice VLAN is enabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.1(11)EW | Support for voice VLAN was added. |

## Usage Guidelines

The **no switchport** command shuts the port down and then reenables it, which may generate messages on the device to which the port is connected.

The **no** form of the **switchport access** command resets the access mode VLAN to the appropriate default VLAN for the device. The **no** form of the **switchport nonegotiate** command removes the **nonegotiate** status.

When you are using the **nonegotiate** keyword, DISL/DTP negotiation packets will not be sent on the interface. The device will trunk or not trunk according to the **mode** parameter given: **access** or **trunk**. This command will return an error if you attempt to execute it in **dynamic** (**auto** or **desirable**) mode.

The voice VLAN is automatically set to VLAN 1 unless you use one of the optional keywords.

If you use the **switch port voice vlan** command for an interface, the interface cannot join a port channel.

When you use the **switchport voice vlan** command, the output for the **show running-config** command changes to show the voice VLAN set.

## Examples

This example shows how to cause the port interface to stop operating as a Cisco-routed port and convert to a Layer 2-switched interface:

```
Switch(config-if)# switchport
Switch(config-if)#
```

This example shows how to cause a port interface in access mode, which is configured as a switched interface, to operate in VLAN 2:

```
Switch(config-if)# switchport access vlan 2
Switch(config-if)#
```

This example shows how to cause a port interface, which is configured as a switched interface, to refrain from negotiating in trunking mode and act as a trunk or access port (depending on the **mode** set):

```
Switch(config-if)# switchport nonegotiate
Switch(config-if)#
```

This example shows how to set the voice VLAN for the interface to VLAN 2:

```
Switch(config-if)# switchport voice vlan 2
switchport voice vlan 2
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces switchport | Displays the administrative and operational status of a switching (nonrouting) port. |

# switchport access vlan

To set the VLAN when an interface is in access mode, use the **switchport access vlan** command. To reset the access mode VLAN to the appropriate default VLAN for the device, use the **no** form of this command.

**switchport access** [**vlan** {*vlan-id* | **dynamic**}]

**no switchport access vlan**

## Syntax Description

| | |
|---|---|
| *vlan-id* | (Optional) Number of the VLAN on the interface in access mode; valid values are from 1 to 4094. |
| **dynamic** | (Optional) Enables VMPS control of the VLAN. |

## Defaults

The default settings are as follows:

- The access VLAN and trunk interface native VLAN are default VLANs that correspond to the platform or the interface hardware.
- All VLAN lists include all VLANs.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.1(13)EW | Support for VPMS was added. |

## Usage Guidelines

You must enter the **switchport** command without any keywords to configure the LAN interface as a Layer 2 interface before you can enter the **switchport access vlan** command. This action is required only if you have not already entered the **switchport** command for the interface.

Entering the **no switchport** command shuts the port down and then reenables it, which could generate messages on the device to which the port is connected.

The **no** form of the **switchport access vlan** command resets the access mode VLAN to the appropriate default VLAN for the device.

If your system is configured with a Supervisor Engine I, valid values for *vlan-id* are from 1 to 1005. If your system is configured with a Supervisor Engine II, valid values for *vlan-id* are from 1 to 4094. Extended-range VLANs are not supported on systems configured with a Supervisor Engine I.

## Examples

This example shows how to cause the port interface to stop operating as a Cisco-routed port and convert to a Layer 2-switched interface:

```
Switch(config-if)# switchport
Switch(config-if)#
```

**Note** This 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.

This example shows how to cause a port interface that has already been configured as a switched interface to operate in VLAN 2 instead of the platform's default VLAN when in access mode:

```
Switch(config-if)# switchport access vlan 2
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces switchport | Displays the administrative and operational status of a switching (nonrouting) port. |

# switchport autostate exclude

To exclude a port from the VLAN interface link-up calculation, use the **switchport autostate exclude** command. To return to the default settings, use the **no** form of this command.

**switchport autostate exclude**

**no switchport autostate exclude**

## Syntax Description

This command has no keywords or arguments.

## Defaults

All ports are included in the VLAN interface link-up calculation.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(37)SG | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

You must enter the **switchport** command without any keywords to configure the LAN interface as a Layer 2 interface before you can enter the **switchport autostate exclude** command. This action is required only if you have not entered the **switchport** command for the interface.

**Note** 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.

The **switchport autostate exclude** command marks the port to be excluded from the interface VLAN up calculation when there are multiple ports in the VLAN.

The **show interface** *interface* **switchport** command displays the autostate mode if the mode has been set. If the mode has not been set, the autostate mode is not displayed.

## Examples

This example shows how to exclude a port from the VLAN interface link-up calculation:

```
Switch(config-if)# switchport autostate exclude
Switch(config-if)#
```

This example shows how to include a port in the VLAN interface link-up calculation:

```
Switch(config-if)# no switchport autostate exclude
Switch(config-if)#
```

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

**Related Commands**

| Command | Description |
|---|---|
| **show interfaces switchport** | Displays the administrative and operational status of a switching (nonrouting) port. |

# switchport block

To prevent the unknown multicast or unicast packets from being forwarded, use the **switchport block** interface configuration command. To allow the unknown multicast or unicast packets to be forwarded, use the **no** form of this command.

**switchport block** {**multicast** | **unicast**}

**no switchport block** {**multicast** | **unicast**}

## Syntax Description

| | |
|---|---|
| **multicast** | Specifies that the unknown multicast traffic should be blocked. |
| **unicast** | Specifies that the unknown unicast traffic should be blocked. |

## Defaults

Unknown multicast and unicast traffic are not blocked.

All traffic with unknown MAC addresses is sent to all ports.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

You can block the unknown multicast or unicast traffic on the switch ports.

Blocking the unknown multicast or unicast traffic is not automatically enabled on the switch ports; you must explicitly configure it.

**Note** For more information about blocking the packets, refer to the software configuration guide for this release.

## Examples

This example shows how to block the unknown multicast traffic on an interface:

```
Switch(config-if)# switchport block multicast
```

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

## Related Commands

| Command | Description |
|---|---|
| **show interfaces switchport** | Displays the administrative and operational status of a switching (nonrouting) port. |

# switchport mode

To set the interface type, use the **switchport mode** command. To reset the mode to the appropriate default mode for the device, use the **no** form of this command.

**switchport mode** {**access** | **dot1q-tunnel** | **trunk** | **dynamic** {**auto** | **desirable**}}

**switchport mode private-vlan** {**host** | **promiscuous** | **trunk promiscuous** | **trunk** [**secondary**]}

**no switchport mode dot1q-tunnel**

**no switchport mode private-vlan**

## Syntax Description

| | |
|---|---|
| **access** | Specifies a nontrunking, nontagged single VLAN Layer 2 interface. |
| **dot1q-tunnel** | Specifies an 802.1Q tunnel port. |
| **trunk** | Specifies a trunking VLAN Layer 2 interface. |
| **dynamic auto** | Specifies that the interface convert the link to a trunk link. |
| **dynamic desirable** | Specifies that the interface actively attempt to convert the link to a trunk link. |
| **private-vlan host** | Specifies that the ports with a valid PVLAN trunk association become active host private VLAN trunk ports. |
| **private-vlan promiscuous** | Specifies that the ports with a valid PVLAN mapping become active promiscuous ports. |
| **private-vlan trunk promiscuous** | Specifies that the ports with valid PVLAN trunk mapping become active promiscuous trunk ports. |
| **private-vlan trunk secondary** | Specifies that the ports with a valid PVLAN trunk association become active host private VLAN trunk ports. |

## Defaults

Link converts to a trunk link.

dot1q tunnel ports are disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.2(18)EW | Support was added for configuring dot1q tunnel ports. |
| 12.2(31)SG | Support was added for trunk promiscuous ports. |

## Usage Guidelines

If you enter **access** mode, the interface goes into permanent nontrunking mode and negotiates to convert the link into a nontrunk link even if the neighboring interface does not approve the change.

If you enter **trunk** mode, the interface goes into permanent trunking mode and negotiates to convert the link into a trunk link even if the neighboring interface does not approve the change.

If you enter **dynamic auto** mode, the interface converts the link to a trunk link if the neighboring interface is set to **trunk** or **desirable** mode.

If you enter **dynamic desirable** mode, the interface becomes a trunk interface if the neighboring interface is set to **trunk**, **desirable**, or **auto** mode.

If you specify the **dot1q-tunnel keyword**, the port is set unconditionally as an 802.1Q tunnel port.

The port becomes inactive if you configure it as a private VLAN trunk port and one of the following applies:

- The port does not have a valid PVLAN association.
- The port does not have valid allowed normal VLANs.

If a private port PVLAN association or mapping is deleted, or if a private port is configured as a SPAN destination, it becomes inactive.

## Examples

This example shows how to set the interface to dynamic desirable mode:

```
Switch(config-if)# switchport mode dynamic desirable
Switch(config-if)#
```

This example shows how to set a port to PVLAN host mode:

```
Switch(config-if)# switchport mode private-vlan host
Switch(config-if)#
```

This example shows how to set a port to private VLAN trunk:

```
Switch(config-if)# switchport mode private-vlan trunk
Switch(config-if)#
```

This example shows how to configure a port for an 802.1Q tunnel port:

```
Switch(config-if)# switchport mode dot1q-tunnel
Switch(config-if)#
```

This example shows how to configure a promiscuous trunk port:

```
Switch(config-if)# switchport mode private-vlan trunk promiscuous
Switch(config-if)#
```

This example shows how to configure an isolated trunk port:

```
Switch(config-if)# switchport mode private-vlan trunk
OR
Switch(config-if)# switchport mode private-vlan trunk secondary
Switch(config-if)#
```

You can verify your settings by entering the **show interfaces switchport** command and examining information in the Administrative Mode and Operational Mode rows.

This example shows how to configure interface FastEthernet 5/2 as a PVLAN promiscuous port, map it to a PVLAN, and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/2
Switch(config-if)# switchport mode private-vlan promiscuous
Switch(config-if)# switchport private-vlan mapping 200 2
Switch(config-if)# end
Switch# show interfaces fastethernet 5/2 switchport
Name:Fa5/2
Switchport:Enabled
Administrative Mode:private-vlan promiscuous
Operational Mode:private-vlan promiscuous
Administrative Trunking Encapsulation:negotiate
Operational Trunking Encapsulation:native
Negotiation of Trunking:Off
Access Mode VLAN:1 (default)
Trunking Native Mode VLAN:1 (default)
Voice VLAN:none
Administrative Private VLAN Host Association:none
Administrative Private VLAN Promiscuous Mapping:200 (VLAN0200) 2 (VLAN0002)
Private VLAN Trunk Native VLAN:none
Administrative Private VLAN Trunk Encapsulation:dot1q
Administrative Private VLAN Trunk Normal VLANs:none
Administrative Private VLAN Trunk Private VLANs:none
Operational Private VLANs:
  200 (VLAN0200) 2 (VLAN0002)
Trunking VLANs Enabled:ALL
Pruning VLANs Enabled:2-1001
Capture Mode Disabled
Capture VLANs Allowed:ALL
```

This example shows how to configure interface FastEthernet 5/1 as a PVLAN host port and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/1
Switch(config-if)# switchport mode private-vlan host
Switch(config-if)# switchport private-vlan host-association 202 440
Switch(config-if)# end

Switch# show interfaces fastethernet 5/1 switchport
Name: Fa5/1
Switchport: Enabled
Administrative Mode: private-vlan host
Operational Mode: private-vlan host
Administrative Trunking Encapsulation: negotiate
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Appliance trust: none
Administrative Private Vlan
  Host Association: 202 (VLAN0202) 440 (VLAN0440)
  Promiscuous Mapping: none
  Trunk encapsulation : dot1q
  Trunk vlans:
Operational private-vlan(s):
  202 (VLAN0202) 440 (VLAN0440)
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
```

This example shows how to configure interface FastEthernet 5/2 as a secondary trunk port, and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/2
Switch(config-if)# switchport mode private-vlan trunk secondary
Switch(config-if)# switchport private-vlan trunk native vlan 10
Switch(config-if)# switchport private-vlan trunk allowed vlan 10. 3-4
Switch(config-if)# switchport private-vlan association trunk 3 301
Switch(config-if)# end
Switch# show interfaces fastethernet 5/2 switchport
Name: Fa5/2
    Switchport: Enabled
    Administrative Mode: private-vlan trunk secondary
    Operational Mode: private-vlan trunk secondary
    Administrative Trunking Encapsulation: negotiate
    Operational Trunking Encapsulation: dot1q
    Negotiation of Trunking: On
    Access Mode VLAN: 1 (default)
    Trunking Native Mode VLAN: 1 (default)
    Administrative Native VLAN tagging: enabled
    Voice VLAN: none
    Administrative private-vlan host-association: none A
    dministrative private-vlan mapping: none
    Administrative private-vlan trunk native VLAN: 10
    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:
        3 (VLAN0003) 301 (VLAN0301)
    Administrative private-vlan trunk mappings: none
    Operational private-vlan: none
    Operational Normal VLANs: 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
Switch(config-if)#
```

This example shows how to configure interface FastEthernet 5/2 as a promiscuous trunk port and to verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/2
Switch(config-if)# switchport mode private-vlan trunk promiscuous
Switch(config-if)# switchport private-vlan trunk native vlan 10
Switch(config-if)# switchport private-vlan trunk allowed vlan 10, 3-4
Switch(config-if)# switchport private-vlan mapping trunk 3 301, 302
Switch(config-if)# end
Switch# show interfaces fastethernet 5/2 switchport
Name: Fa5/2
Switchport: Enabled
Administrative Mode: private-vlan trunk promiscuous
Operational Mode: private-vlan trunk promiscuous
Administrative Trunking Encapsulation: negotiate
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
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: 10
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: 3-4,10
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings:
    3 (VLAN0003) 301 (VLAN0301)  302 (VLAN0302)
Operational private-vlan:
  3 (VLAN0003) 301 (VLAN0301) 302 (VLAN0302)
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
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **show interfaces switchport** | Displays the administrative and operational status of a switching (nonrouting) port. |
| **switchport** | Enables port security on an interface. |
| **switchport private-vlan host-association** | Defines a PVLAN association for an isolated or community port. |
| **switchport private-vlan mapping** | Defines private VLAN mapping for a promiscuous port. |

# switchport port-security

To enable port security on an interface, use the **switchport port-security** command. To disable port security and set parameters to their default states, use the **no** form of this command.

**switchport port-security** [**aging** {**static** | **time** *time* | **type** {**absolute** | **inactivity**}} | **limit rate invalid-source-mac** [**N** | **none**] | **mac-address** *mac-address* [**vlan** {**access** | **voice**} | **mac-address sticky** [*mac-address*] [**vlan access** | **voice**] | **maximum** *value* [**vlan** {**access** | **voice**} | **violation** {**restrict** | **shutdown**}]

**no switchport port-security** [**aging** {**static** | **time** *time* | **type** {**absolute** | **inactivity**}} | **limit rate invalid-source-mac** [**N** | **none**] | **mac-address** *mac-address* [**vlan** {**access** | **voice**} | **mac-address sticky** [*mac-address*] [**vlan access** | **voice**] | **maximum** *value* [**vlan** {**access** | **voice**} | **violation** {**restrict** | **shutdown**}]

## Syntax Description

| | |
|---|---|
| **aging** | (Optional) Specifies aging for port security. |
| **static** | (Optional) Enables aging for statically configured secure addresses on this port. |
| **time** *time* | (Optional) Specifies the aging time for this port. The valid values are from 0 to 1440 minutes. If the time is 0, aging is disabled for this port. |
| **type absolute** | (Optional) Sets the aging type as absolute aging. All the secure addresses on this port age out exactly after the time (minutes) specified and are removed from the secure address list. |
| **type inactivity** | (Optional) Sets the aging type as inactivity aging. 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. |
| **limit rate invalid-source-mac** | (Optional) Sets the rate limit for bad packets. This rate limit also applies to the port where DHCP snooping security mode is enabled as filtering the IP and MAC address. |
| **N none** | (Optional) Supplies a rate limit (**N**) or indicates none (**none**). |
| **mac-address** *mac-address* | (Optional) Specifies a secure MAC address for the interface; a 48-bit MAC address. You can add additional secure MAC addresses up to the maximum value that is configured. |
| **sticky** | (Optional) Configures the dynamic addresses as sticky on the interface. |
| **vlan access** | (Optional) Deletes the secure MAC addresses from access VLANs. |
| **vlan voice** | (Optional) Deletes the secure MAC addresses from voice VLANs. |
| **maximum** *value* | (Optional) Sets the maximum number of secure MAC addresses for the interface. Valid values are from 1 to 3072. The default setting is 1. |
| **violation** | (Optional) Sets the security violation mode and action to be taken if port security is violated. |
| **restrict** | (Optional) Sets the security violation restrict mode. In this mode, a port security violation restricts data and causes the security violation counter to increment. |
| **shutdown** | (Optional) Sets the security violation shutdown mode. In this mode, a port security violation causes the interface to immediately become error disabled. |

## Defaults

The default settings are as follows:

- Port security is disabled.
- When port security is enabled and no keywords are entered, the default maximum number of secure MAC addresses is 1.
- Aging is disabled.
- Aging time is 0 minutes.
- All secure addresses on this port age out immediately after they are removed from the secure address list.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.1(19)EW | Extended to include DHCP snooping security enhancement. |
| 12.2(18)EW | Add support for sticky interfaces. |
| 12.2(31)SG | Add support for sticky port security. |

## Usage Guidelines

After you set the maximum number of secure MAC addresses that are allowed on a port, you can add secure addresses to the address table by manually configuring them, by allowing the port to dynamically configure them, or by configuring some MAC addresses and allowing the rest to be dynamically configured.

The packets are dropped into the hardware when the maximum number of secure MAC addresses are in the address table and a station that does not have a MAC address in the address table attempts to access the interface.

If you enable port security on a voice VLAN port and if there is a PC connected to the IP phone, you set the maximum allowed secure addresses on the port to more than 1.

You cannot configure static secure MAC addresses in the voice VLAN.

A secure port has the following limitations:

- A secure port cannot be a dynamic 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 Fast EtherChannel or Gigabit EtherChannel port group.
- A secure port cannot be an 802.1X port.
- If you try to enable 802.1X on a secure port, an error message appears, and 802.1X is not enabled. If you try to change an 802.1X-enabled port to a secure port, an error message appears, and the security settings are not changed.

When a secure port is in the error-disabled state, you can remove it from this state by entering the **errdisable recovery cause** *psecure-violation* global configuration command, or you can manually reenable it by entering the **shutdown** and **no shut down** interface configuration commands.

To enable secure address aging for a particular port, set the aging time to a value other than 0 for that port.

To allow limited time access to particular secure addresses, set the aging type as **absolute**. When the aging time lapses, the secure addresses are deleted.

To allow continuous access to a limited number of secure addresses, set the aging type as **inactivity**. This action removes the secure address when it becomes inactive, and other addresses can become secure.

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 **no switchport port-security aging static** interface configuration command.

If the sticky command is executed without a MAC address specified, all MAC addresses that are learned on that port will be made sticky. You can also specify a specific MAC address to be a sticky address by entering the **sticky** keyword next to it.

You can configure the sticky feature even when port security is not enabled on the interface. The feature becomes operational when you enable port security on the interface.

You can use the **no** form of the **sticky** command only if the sticky feature is already enabled on the interface.

## Examples

This example shows how to set the aging time to 2 hours (120 minutes) for the secure addresses on the Fast Ethernet port 12:

```
Switch(config)# interface fastethernet 0/12
Switch(config-if)# switchport port-security aging time 120
Switch(config-if)#
```

This example shows how to set the aging timer type to Inactivity for the secure addresses on the Fast Ethernet port 12:

```
Switch(config)# interface fastethernet 0/12
Switch(config-if)# switch port-security aging type inactivity
Switch(config-if)#
```

The following example shows how to configure rate limit for invalid source packets on Fast Ethernet port 12:

```
Switch(config)# interface fastethernet 0/12
Switch(config-if)# switchport port-security limit rate invalid-source-mac 100
Switch(config-if)#
```

The following example shows how to configure rate limit for invalid source packets on Fast Ethernet port 12:

```
Switch(config)# interface fastethernet 0/12
Switch(config-if)# switchport port-security limit rate invalid-source-mac none
Switch(config-if)#
```

You can verify the settings for all secure ports or the specified port by using the **show port-security** privileged EXEC command.

This example shows how to remove all sticky and static addresses that are configured on the interface:

```
Switch(config)# interface fastethernet 2/12
Switch(config-if)# no switchport port-security mac-address
```

```
Switch(config-if)
```

This example shows how to configure a secure MAC address on Fast Ethernet port 12:

```
Switch(config)# interface fastethernet 0/12
Switch(config-if)# switchport mode access
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security mac-address 1000.2000.3000
Switch(config-if)
```

This example shows how to make all MAC addresses learned on Fast Ethernet port 12 sticky:

```
Switch(config)# interface fastethernet 2/12
SSwitch(config-if)# switchport port-security mac-address sticky
Switch(config-if)
```

This example shows how to make MAC address 1000.2000.3000 sticky on Fast Ethernet port 12:

```
Switch(config)# interface fastethernet 2/12
Switch(config-if)# switchport port-security mac-address sticky 1000.2000.3000
Switch(config-if)
```

This example shows how to disable the sticky feature on Fast Ethernet port 12:

```
Switch(config)# interface fastethernet 2/12
Switch(config-if)# no switchport port-security mac-address sticky
Switch(config-if)
```

**Note** This command makes all sticky addresses on this interface normal learned entries. It does not delete the entries from the secure MAC address table.

**Note** The following examples show how to configure sticky secure MAC addresses in access and voice VLANs on interfaces with voice VLAN configured. If you do not have voice VLAN configured the **vlan** [**access** | **voice**] keywords are not supported.

This example shows how to configure sticky MAC addresses for voice and data VLANs on Fast Ethernet interface 5/1 and to verify the configuration:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fa5/1
Switch(config-if)# switchport mode access
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security mac-address sticky 0000.0000.obob vlan voice
Switch(config-if)# switchport port-security mac-address sticky 0000.0000.0005 vlan access
Switch(config-if)# end
```

This example shows how to designate a maximum of one MAC address for a voice VLAN (for a Cisco IP Phone, let's say) and one MAC address for the data VLAN (for a PC, let's say) on Fast Ethernet interface 5/1 and to verify the configuration:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fa5/1
Switch(config-if)# switchport mode access
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security mac-address sticky
Switch(config-if)# switchport port-security maximum 1 vlan voice
Switch(config-if)# switchport port-security maximum 1 vlan access
Switch(config-if)# end
```

**Note** Sending traffic to the ports causes the system to configure the port with sticky secure addresses.

You can verify your settings by using the **show port-security address** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **show interfaces switchport** | Displays the administrative and operational status of a switching (nonrouting) port. |
| **show port-security** | Displays the port security settings for an interface or for the switch. |
| **switchport block** | Prevents the unknown multicast or unicast packets from being forwarded. |

# switchport private-vlan association trunk

To configure the association between a secondary VLAN and a VLAN on a private VLAN trunk port, use the **switchport private-vlan association trunk** command. To remove the private VLAN mapping from the port, use the **no** form of this command.

**switchport private-vlan association trunk** {*primary-vlan-id*} {*secondary-vlan-id*}

**no switchport private-vlan association trunk** {*primary-vlan-id*}

## Syntax Description

| | |
|---|---|
| *primary-vlan-id* | Number of the primary VLAN of the private VLAN relationship. |
| *secondary-vlan-id* | Number of the secondary VLAN of the private VLAN relationship. |

## Defaults

Private VLAN mapping is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.2(20)EW | Support for community VLAN was added. |

## Usage Guidelines

Multiple private VLAN pairs can be specified so that a private VLAN trunk port can carry multiple secondary VLANs. If an association is specified for the existing primary VLAN, the existing association is replaced.

Only isolated secondary VLANs can be carried over a private VLAN trunk.

**Note** Community secondary VLANs on a private VLAN trunk are not supported in this release.

If there is no trunk association, any packets received on the secondary VLANs are dropped.

## Examples

This example shows how to configure a port with a primary VLAN (VLAN 18) and secondary VLAN (VLAN 20):

```
Switch(config-if)# switchport private-vlan association trunk 18 20
Switch(config-if)#
```

This example shows how to remove the private VLAN association from the port:

```
Switch(config-if)# no switchport private-vlan association trunk 18
Switch(config-if)#
```

This example shows how to configure interface FastEthernet 5/2 as a secondary trunk port, and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/2
Switch(config-if)# switchport mode private-vlan trunk secondary
Switch(config-if)# switchport private-vlan trunk native vlan 10
Switch(config-if)# switchport private-vlan trunk allowed vlan 10. 3-4
Switch(config-if)# switchport private-vlan association trunk 3 301
Switch(config-if)# end
Switch# show interfaces fastethernet 5/2 switchport
Name: Fa5/2
    Switchport: Enabled
    Administrative Mode: private-vlan trunk secondary
    Operational Mode: private-vlan trunk secondary
    Administrative Trunking Encapsulation: negotiate
    Operational Trunking Encapsulation: dot1q
    Negotiation of Trunking: On
    Access Mode VLAN: 1 (default)
    Trunking Native Mode VLAN: 1 (default)
    Administrative Native VLAN tagging: enabled
    Voice VLAN: none
    Administrative private-vlan host-association: none A
    dministrative private-vlan mapping: none
    Administrative private-vlan trunk native VLAN: 10
    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:
        3 (VLAN0003) 301 (VLAN0301)
    Administrative private-vlan trunk mappings: none
    Operational private-vlan: none
    Operational Normal VLANs: 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
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces switchport | Displays the administrative and operational status of a switching (nonrouting) port. |
| switchport mode | Enables the interface type. |

# switchport private-vlan host-association

To define a PVLAN association for an isolated or community port, use the **switchport private-vlan host-association** command. To remove the PVLAN mapping from the port, use the **no** form of this command.

**switchport private-vlan host-association** {*primary-vlan-id*} {*secondary-vlan-id*}

**no switchport private-vlan host-association**

## Syntax Description

| | |
|---|---|
| *primary-vlan-id* | Number of the primary VLAN of the PVLAN relationship; valid values are from 1 to 4094. |
| *secondary-vlan-list* | Number of the secondary VLAN of the private VLAN relationship; valid values are from 1 to 4094. |

## Defaults

Private VLAN mapping is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.1(12c)EW | Support for extended addressing was added. |

## Usage Guidelines

There is no runtime effect on the port unless it is in PVLAN host mode. If the port is in PVLAN host mode but all VLANs do not exist, the command is allowed, but the port is made inactive.

The secondary VLAN may be an isolated or community VLAN.

## Examples

This example shows how to configure a port with a primary VLAN (VLAN 18) and secondary VLAN (VLAN 20):

```
Switch(config-if)# switchport private-vlan host-association 18 20
Switch(config-if)#
```

This example shows how to remove the PVLAN association from the port:

```
Switch(config-if)# no switchport private-vlan host-association
Switch(config-if)#
```

This example shows how to configure interface FastEthernet 5/1 as a PVLAN host port and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/1
Switch(config-if)# switchport mode private-vlan host
Switch(config-if)# switchport private-vlan host-association 202 440
Switch(config-if)# end
Switch# show interfaces fastethernet 5/1 switchport
Name: Fa5/1
Switchport: Enabled
Administrative Mode: private-vlan host
Operational Mode: private-vlan host
Administrative Trunking Encapsulation: negotiate
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Appliance trust: none
Administrative Private Vlan
  Host Association: 202 (VLAN0202) 440 (VLAN0440)
  Promiscuous Mapping: none
  Trunk encapsulation : dot1q
  Trunk vlans:
Operational private-vlan(s):
  202 (VLAN0202) 440 (VLAN0440)
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces switchport | Displays the administrative and operational status of a switching (nonrouting) port. |
| switchport mode | Enables the interface type. |

# switchport private-vlan mapping

To define private VLAN mapping for a promiscuous port, use the **switchport private-vlan mapping** command. To clear all mapping from the primary VLAN, use the **no** form of this command.

**switchport private-vlan mapping** {*primary-vlan-id*} {*secondary-vlan-list*} | {**add** *secondary-vlan-list*} | {**remove** *secondary-vlan-list*}

**switchport private-vlan mapping trunk** {*primary-vlan-id*} [**add** | **remove**] *secondary-vlan-list*

**no switchport private-vlan mapping** [**trunk**]

## Syntax Description

| | |
|---|---|
| *primary-vlan-id* | Number of the primary VLAN of the private VLAN relationship; valid values are from 2 to 4094 (excluding 1002 to 1005). |
| *secondary-vlan-list* | Number of the secondary VLANs to map to the primary VLAN; valid values are from 2 to 4094. |
| **add** | Maps the secondary VLANs to the primary VLAN. |
| **remove** | Clears mapping between the secondary VLANs and the primary VLAN. |
| **trunk** | Maps the trunks secondary VLANs to the primary VLAN. |

## Defaults

Private VLAN mapping is disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.1(12c)EW | Support for extended addressing was added. |
| 12.2(20)EW | Support for community VLAN was added. |
| 12.2(31)SG | Support for trunk VLAN was added. |

## Usage Guidelines

There is no run-time effect on the port unless it is in private VLAN promiscuous mode. If the port is in private VLAN promiscuous mode but the VLANs do not exist, the command is allowed, but the port is made inactive.

The secondary VLAN may be an isolated or community VLAN.

**Note** The maximum number of unique private VLAN pairs supported by the **switchport private-vlan mapping trunk** command above is 500. For example, one thousand secondary VLANs could map to one primary VLAN, or one thousand secondary VLANs could map one to one to one thousand primary VLANs.

## Examples

This example shows how to configure the mapping of primary VLAN 18 to the secondary isolated VLAN 20 on a port:

```
Switch(config-if)# switchport private-vlan mapping 18 20
Switch(config-if)#
```

This example shows how to add a VLAN to the mapping:

```
Switch(config-if)# switchport private-vlan mapping 18 add 21
Switch(config-if)#
```

This example shows how to add a range of secondary VLANs to the mapping:

```
Switch(config-if)# switchport private-vlan mapping 18 add 22-24
Switch(config-if)#
```

This example shows how to add a range of secondary VLANs to the trunk mapping:

```
Switch(config-if)# switchport private-vlan mapping trunk 18 add 22-24
Switch(config-if)#
```

This example shows how to configure interface FastEthernet 5/2 as a PVLAN promiscuous port, map it to a PVLAN, and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/2
Switch(config-if)# switchport mode private-vlan promiscuous
Switch(config-if)# switchport private-vlan mapping 200 2
Switch(config-if)# end
Switch# show interfaces fastethernet 5/2 switchport
Name:Fa5/2
Switchport:Enabled
Administrative Mode:private-vlan promiscuous
Operational Mode:private-vlan promiscuous
Administrative Trunking Encapsulation:negotiate
Operational Trunking Encapsulation:native
Negotiation of Trunking:Off
Access Mode VLAN:1 (default)
Trunking Native Mode VLAN:1 (default)
Voice VLAN:none
Administrative Private VLAN Host Association:none
Administrative Private VLAN Promiscuous Mapping:200 (VLAN0200) 2 (VLAN0002)
Private VLAN Trunk Native VLAN:none
Administrative Private VLAN Trunk Encapsulation:dot1q
Administrative Private VLAN Trunk Normal VLANs:none
Administrative Private VLAN Trunk Private VLANs:none
Operational Private VLANs:
  200 (VLAN0200) 2 (VLAN0002)
Trunking VLANs Enabled:ALL
Pruning VLANs Enabled:2-1001
Capture Mode Disabled
Capture VLANs Allowed:ALL
```

This example shows how to configure interface FastEthernet 5/2 as a promiscuous trunk port and to verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/2
Switch(config-if)# switchport mode private-vlan trunk promiscuous
Switch(config-if)# switchport private-vlan trunk native vlan 10
Switch(config-if)# switchport private-vlan trunk allowed vlan 10, 3-4
Switch(config-if)# switchport private-vlan mapping trunk 3 301, 302
Switch(config-if)# end
Switch# show interfaces fastethernet 5/2 switchport
Name: Fa5/2
Switchport: Enabled
Administrative Mode: private-vlan trunk promiscuous
Operational Mode: private-vlan trunk promiscuous
Administrative Trunking Encapsulation: negotiate
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
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: 10
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: 3-4,10
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings:
    3 (VLAN0003) 301 (VLAN0301)  302 (VLAN0302)
Operational private-vlan:
  3 (VLAN0003) 301 (VLAN0301) 302 (VLAN0302)
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
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces private-vlan mapping | Displays PVLAN mapping information for VLAN SVIs. |

# switchport private-vlan trunk allowed vlan

To configure a list of the allowed normal VLANs on a private VLAN trunk port, use the **switchport private-vlan trunk allowed vlan** command. To remove all the allowed normal VLANs from a private VLAN trunk port, use the **no** form of this command.

**switchport private-vlan trunk allowed vlan** {*vlan-list*} **all** | **none** | [**add** | **remove** | **except**] *vlan_atom* [,*vlan_atom...*]

**no switchport private-vlan trunk allowed vlan**

## Syntax Description

| | |
|---|---|
| *vlan_list* | Sets the list of allowed VLANs; see the "Usage Guidelines" section for formatting guidelines for *vlan_list*. |
| **all** | Specifies all VLANs from 1 to 4094. This keyword is not supported on commands that do not permit all VLANs in the list to be set at the same time. |
| **none** | Indicates an empty list. This keyword is not supported on commands that require certain VLANs to be set or at least one VLAN to be set. |
| **add** | (Optional) Adds the defined list of VLANs to those currently set instead of replacing the list. |
| **remove** | (Optional) Removes the defined list of VLANs from those currently set instead of replacing the list. |
| **except** | (Optional) Lists the VLANs that should be calculated by inverting the defined list of VLANs. |
| *vlan_atom* | 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. |

## Defaults

All allowed normal VLANs are removed from a private VLAN trunk port.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

By default, no normal VLANs are allowed unless you explicitly configure the VLANs to be allowed.

Use this command only for normal VLANs on a private VLAN trunk port.

Use the **switchport private-vlan association trunk** command to configure a port that can carry private VLANs on a private VLAN trunk port.

## Examples

This example shows how to configure the private VLAN trunk port that carries normal VLANs 1 to10:

```
Switch(config-if)# switchport private-vlan trunk allowed vlan 1-10
Switch(config-if)#
```

This example shows how to remove all the allowed normal VLANs from a private VLAN trunk port:

```
Switch(config-if)# no switchport private-vlan trunk allowed vlan
Switch(config-if)#
```

This example shows how to configure interface FastEthernet 5/2 as a secondary trunk port, and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/2
Switch(config-if)# switchport mode private-vlan trunk secondary
Switch(config-if)# switchport private-vlan trunk native vlan 10
Switch(config-if)# switchport private-vlan trunk allowed vlan 10. 3-4
Switch(config-if)# switchport private-vlan association trunk 3 301
Switch(config-if)# end
Switch# show interfaces fastethernet 5/2 switchport
Name: Fa5/2
    Switchport: Enabled
    Administrative Mode: private-vlan trunk secondary
    Operational Mode: private-vlan trunk secondary
    Administrative Trunking Encapsulation: negotiate
    Operational Trunking Encapsulation: dot1q
    Negotiation of Trunking: On
    Access Mode VLAN: 1 (default)
    Trunking Native Mode VLAN: 1 (default)
    Administrative Native VLAN tagging: enabled
    Voice VLAN: none
    Administrative private-vlan host-association: none A
    dministrative private-vlan mapping: none
    Administrative private-vlan trunk native VLAN: 10
    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:
        3 (VLAN0003) 301 (VLAN0301)
    Administrative private-vlan trunk mappings: none
    Operational private-vlan: none
    Operational Normal VLANs: 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
Switch(config-if)#
```

This example shows how to configure interface FastEthernet 5/2 as a promiscuous trunk port and to verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/2
Switch(config-if)# switchport mode private-vlan trunk promiscuous
Switch(config-if)# switchport private-vlan trunk native vlan 10
Switch(config-if)# switchport private-vlan trunk allowed vlan 10, 3-4
Switch(config-if)# switchport private-vlan mapping trunk 3 301, 302
Switch(config-if)# end
Switch# show interfaces fastethernet 5/2 switchport
Name: Fa5/2
Switchport: Enabled
Administrative Mode: private-vlan trunk promiscuous
Operational Mode: private-vlan trunk promiscuous
Administrative Trunking Encapsulation: negotiate
Operational Trunking Encapsulation: dot1q
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
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: 10
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: 3-4,10
Administrative private-vlan trunk associations: none
Administrative private-vlan trunk mappings:
    3 (VLAN0003) 301 (VLAN0301)  302 (VLAN0302)
Operational private-vlan:
  3 (VLAN0003) 301 (VLAN0301) 302 (VLAN0302)
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
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces switchport | Displays the administrative and operational status of a switching (nonrouting) port. |
| switchport mode | Enables the interface type. |

# switchport private-vlan trunk native vlan tag

To control the tagging of the native VLAN traffic on 802.1Q private VLAN trunks, use the **switchport private-vlan trunk native vlan tag** command. To remove the control of tagging (and default to the global setting), use the **no** form of this command.

**switchport private-vlan trunk native vlan tag**

**no switchport private-vlan trunk native vlan tag**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The default setting is global; the settings on the port are determined by the global setting.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.2(18)EW | Removed **vlan-id** keyword. |

## Usage Guidelines

The configuration created with this command only applies to ports that are configured as private VLAN trunks.

## Examples

This example shows how to enable 802.1Q native VLAN tagging on a PVLAN trunk:

```
Switch(config-if)# switchport private-vlan trunk native vlan tag
Switch(config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| show interfaces switchport | Displays the administrative and operational status of a switching (nonrouting) port. |
| switchport mode | Enables the interface type. |

# switchport trunk

To set the trunk characteristics when an interface is in trunking mode, use the **switchport trunk** command. To reset all of the trunking characteristics back to the original defaults, use the **no** form of this command.

**switchport trunk encapsulation** {**isl** | **dot1q** | **negotiate**}

**no switchport trunk encapsulation**

**switchport trunk native vlan** {**tag** | *vlan_id*}

**no switchport trunk native vlan** {**tag** | *vlan_id*}

**switchport trunk allowed vlan** *vlan_list*

**no switchport trunk allowed vlan** *vlan_list*

**switchport trunk pruning vlan** *vlan_list*

**no switchport trunk pruning vlan** *vlan_list*

## Syntax Description

| | |
|---|---|
| **encapsulation isl** | Sets the trunk encapsulation format to ISL. |
| **encapsulation dot1q** | Sets the trunk encapsulation format to 802.1Q. |
| **encapsulation negotiate** | Specifies that if DISL and DTP negotiation do not resolve the encapsulation format, ISL will be the selected format. |
| **native vlan** *tag* | Specifies the tagging of native VLAN traffic on 802.1Q trunks. |
| **native vlan** *vlan_id* | Sets the native VLAN for the trunk in 802.1Q trunking mode. |
| **allowed vlan** *vlan_list* | Sets the list of allowed VLANs that transmit this interface in tagged format when in trunking mode. See the "Usage Guidelines" section for formatting guidelines for *vlan_list*. |
| **pruning vlan** *vlan_list* | Sets the list of VLANs that are enabled for VTP pruning when the switch is in trunking mode. See the "Usage Guidelines" section for formatting guidelines for *vlan_list*. |

## Defaults

The default settings are as follows:

- The encapsulation type is dependent on the platform or interface hardware.
- The access VLANs and trunk interface native VLANs are a default VLAN that corresponds to the platform or the interface hardware.
- All VLAN lists include all VLANs.
- Native VLAN tagging is enabled on the port if enabled globally.

## Command Modes

Interface configuration mode

**Command History**

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |
| 12.1(12c)EW | Support for extended addressing was added. |
| 12.2(18)EW | Support for native VLAN tagging was added. |

**Usage Guidelines**

The *vlan_list* format is **all | none | [add | remove | except]** *vlan_atom*[,*vlan_atom...*], where:

- **all** specifies all VLANs from 1 to 4094. This keyword is not supported on commands that do not permit all VLANs in the list to be set at the same time.
- **none** indicates an empty list. This keyword is not supported 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.
- **remove** removes the defined list of VLANs from those currently set, instead of replacing the list.
- **except** lists the VLANs that should be calculated by inverting the defined list of VLANs.
- *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).

The **switchport trunk encapsulation** command is supported only for platforms and interface hardware that can support both ISL and 802.1Q formats.

If you enter the **negotiate** keywords, and DISL and DTP negotiation do not resolve the encapsulation format, ISL is the selected format. The **no** form of this command resets the trunk encapsulation format back to the default.

The **no** form of the **native vlan** command resets the native mode VLAN to the appropriate default VLAN for the device.

The **no** form of the **allowed vlan** command resets the list to the default list, which allows all VLANs.

The **no** form of the **pruning vlan** command resets the list to the default list, which enables all VLANs for VTP pruning.

These configuration guidelines and restrictions apply when using 802.1Q trunks and impose some limitations on the trunking strategy for a network:

- When connecting Cisco switches through an 802.1Q trunk, make sure that the native VLAN for an 802.1Q trunk is the same on both ends of the trunk link. If the native VLAN on one end of the trunk is different from the native VLAN on the other end, spanning-tree loops might result.
- Disabling spanning tree on the native VLAN of an 802.1Q trunk without disabling spanning tree on every VLAN in the network can cause spanning-tree loops. We recommend that you leave spanning tree enabled on the native VLAN of an 802.1Q trunk. If this is not possible, disable spanning tree on every VLAN in the network. Make sure that your network is free of physical loops before disabling spanning tree.
- When you connect two Cisco switches through 802.1Q trunks, the switches exchange spanning-tree BPDUs on each VLAN that is allowed on the trunks. The BPDUs on the native VLAN of the trunk are sent untagged to the reserved 802.1d spanning-tree multicast MAC address (01-80-C2-00-00-00). The BPDUs on all other VLANs on the trunk are sent tagged to the reserved SSTP multicast MAC address (01-00-0c-cc-cc-cd).

- Non-Cisco 802.1Q switches maintain only a single instance of spanning tree (MST) that defines the spanning-tree topology for all VLANs. When you connect a Cisco switch to a non-Cisco switch through an 802.1Q trunk, the MST of the non-Cisco switch and the native VLAN spanning tree of the Cisco switch combine to form a single spanning-tree topology known as the CST.
- Because Cisco switches transmit BPDUs to the SSTP multicast MAC address on the VLANs other than the native VLAN of the trunk, non-Cisco switches do not recognize these frames as BPDUs and flood them on all ports in the corresponding VLAN. Cisco switches connected to the non-Cisco 802.1Q network receive these flooded BPDUs. Because Cisco switches receive the flooded BPDUs, the switches can maintain a per-VLAN spanning-tree topology across a network of non-Cisco 802.1Q switches. The non-Cisco 802.1Q network separating the Cisco switches is treated as a single broadcast segment between all switches that are connected to the non-Cisco 802.1Q network through the 802.1Q trunks.
- Ensure that the native VLAN is the same on *all* of the 802.1Q trunks connecting the Cisco switches to the non-Cisco 802.1Q network.
- If you are connecting multiple Cisco switches to a non-Cisco 802.1Q network, all of the connections must be through the 802.1Q trunks. You cannot connect Cisco switches to a non-Cisco 802.1Q network through the ISL trunks or through the access ports. This action causes the switch to place the ISL trunk port or access port into the spanning-tree "port inconsistent" state and no traffic will pass through the port.

Follow these guidelines for native VLAN tagging:

- The **no switchport trunk native vlan tag** command disables the native VLAN tagging operation on a port. This overrides the global tagging configuration.
- The **switchport trunk native vlan tag** command can be used to reenable tagging on a disabled port.
- The **no** option is saved to NVRAM so that the user does not have to manually select the ports to disable the tagging operation each time that the switch reboots.
- When the **switchport trunk native vlan tag** command is enabled and active, all packets on the native VLAN are tagged, and incoming untagged data packets are dropped. Untagged control packets are accepted.

## Examples

This example shows how to cause a port interface that is configured as a switched interface to encapsulate in 802.1Q trunking format regardless of its default trunking format in trunking mode:

```
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)#
```

This example shows how to enable 802.1Q tagging on a port:

```
Switch(config-if)# switchport trunk native vlan tag
Switch(config-if)#
```

This example shows how to configure a secure MAC-address and a maximum limit of secure MAC addresses on Gigabit Ethernet port 1 for all VLANs:

```
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security maximum 3
```

This example shows how to configure a secure MAC-address on Gigabit Ethernet port 1 in a specific VLAN or range of VLANs:

```
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# switchport port-security
Switch(config-if)# vlan-range 2-6
Switch(config-if-vlan-range)# port-security maximum 3
```

This example shows how to configure a secure MAC-address in a VLAN on Gigabit Ethernet port 1:

```
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security mac-address sticky
Switch(config-if)# vlan-range 2-6
Switch(config-if-vlan-range)# port-security mac-address 1.1.1
Switch(config-if-vlan-range)# port-security mac-address sticky 1.1.2
Switch(config-if-vlan-range)# port-security mac-address sticky 1.1.3
```

You can verify your settings by using the **show port-security interface vlan** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **show interfaces switchport** | Displays the administrative and operational status of a switching (nonrouting) port. |

# system mtu

To set the maximum Layer 2 or Layer 3 payload size, use the **system mtu** command. To revert to the default MTU setting, use the **no** form of this command.

**system mtu** *datagram-size*

**no system mtu**

## Syntax Description

| | |
|---|---|
| *datagram-size* | Layer 2 payload size; valid values from 1500 to 1552 bytes. |

## Defaults

The default MTU setting is 1500 bytes.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

The *datagram-size* parameter specifies the Ethernet payload size, not the total Ethernet frame size, and the Layer 3 MTU is changed as a result of changing the **system mtu** command.

For ports from 3 to18 on model WS-X4418-GB and ports from 1 to 12 on model WS-X4412-2GB-TX, only the standard IEEE Ethernet payload size of 1500 bytes is supported.

For other modules, an Ethernet payload size of up to 1552 bytes is supported with a total Ethernet frame size of up to 1600 bytes.

## Examples

This example shows how to set the MTU size to 1550 bytes:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# system mtu 1550
Switch(config)# end
Switch#
```

This example shows how to revert to the default MTU setting:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# no system mtu
Switch(config)# end
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| **show interfaces** | Displays traffic on a specific interface. |
| **show system mtu** | Displays the global MTU setting. |

# test cable-diagnostics tdr

To test the condition of copper cables on 48-port 10/100/1000 BASE-T modules, use the **test cable-diagnostics tdr** command.

**test cable-diagnostics tdr** {**interface** {*interface interface-number*}

**Note** This command will be deprecated in future Cisco IOS releases. Please use the **diagnostic start** command.

## Syntax Description

| | |
|---|---|
| **interface** *interface* | Interface type; valid values are **fastethernet** and **gigabitethernet**. |
| *interface-number* | Module and port number. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.2(25)SG | Support for this command on the Catalyst 4500 series switch. |

## Usage Guidelines

The TDR test is supported on Catalyst 4500 series switches running Cisco IOS Release 12.2(25)SG for the following line cards only:

- WS-X4548-GB-RJ45
- WS-X4548-GB-RJ45V
- WS-X4524-GB-RJ45V
- WS-X4013+TS
- WS-C4948
- WS-C4948-10GE

The valid values for **interface** *interface* are **fastethernet** and **gigabitethernet**.

Do not start the test at the same time on both ends of the cable. Starting the test at both ends of the cable at the same time can lead to false test results.

Do not change the port configuration during any cable diagnostics test. This action may result in incorrect test results.

The interface must be operating before starting the TDR test. If the port is down, the results of the test will be invalid. Issue the **no shutdown** command on the port.

## Examples

This example shows how to start the TDR test on port 1 on module 2:

```
Switch# test cable-diagnostics tdr int gi2/1
Switch#
```

This example shows the message that displays when the TDR test is not supported on a module:

```
Switch# test cable-diagnostics tdr int gi2/1
00:03:15:%C4K_IOSDIAGMAN-4-TESTNOTSUPPORTEDONMODULE: Online cable
diag tdr test is not supported on this module
Switch#
```

**Note** The **show cable-diagnostic tdr** command is used to display the results of a TDR test. The test results will not be available until approximately 1 minute after the test starts. If you enter the **show cable-diagnostic tdr** command within 1 minute of the test starting, you may see a "TDR test is in progress on interface..." message.

## Related Commands

| Command | Description |
|---|---|
| show cable-diagnostics tdr | Displays the test results for the TDR cable diagnostics. |

# 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.

**traceroute mac** [**interface** *interface-id*] {*source-mac-address*} [**interface** *interface-id*] {*destination-mac-address*} [**vlan** *vlan-id*] [**detail**]

## Syntax Description

| | |
|---|---|
| **interface** *interface-id* | (Optional) Specifies the source or destination switch interface. |
| *source-mac-address* | MAC address of the source switch in hexadecimal format. |
| *destination-mac-address* | MAC address of the destination switch in hexadecimal format. |
| **vlan** *vlan-id* | (Optional) Specifies the VLAN on which to trace the Layer 2 path that the packets take from the source switch to the destination switch; valid VLAN IDs are from 1 to 4094. Do not enter leading zeros. |
| **detail** | (Optional) Displays detail information. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(15)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

Do not use leading zeros when entering a VLAN ID.

The Layer 2 traceroute feature is available on these switches:

- Catalyst 2950 switches running Release 12.1(12c)EA1 or later
- Catalyst 3550 switches running Release 12.1(12c)EA1 or later
- Catalyst 4500 series switches running Catalyst operating system Release 6.2 or later for the supervisor engine
- Catalyst 4500 series switches running Release 12.1(15)EW or later
- Catalyst 5000 family switches running Catalyst operating system Release 6.1 or later for the supervisor engine
- Catalyst 6500 series switches running Catalyst operating system Release 6.1 or later for the supervisor engine

For Layer 2 traceroute to functional properly, Cisco Discovery Protocol (CDP) must be enabled on all of the switches in the network. Do not disable CDP.

When the switch detects a device in the Layer 2 path that does not support Layer 2 traceroute, the switch 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 a 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 a 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 a message appears.

Layer 2 traceroute is not supported when multiple devices are attached to one port through hubs (for example, multiple CDP neighbors are detected on a port). When more than one CDP neighbor is detected on a port, the Layer 2 path is not identified, and a 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:

```
Switch# traceroute mac 0000.0201.0601 0000.0201.0201

Source 0000.0201.0601 found on con6[WS-C2950G-24-EI] (2.2.6.6)
con6 (2.2.6.6) :Fa0/1 =>Fa0/3
con5                 (2.2.5.5        )  :    Fa0/3 =>Gi0/1
con1                 (2.2.1.1        )  :    Gi0/1 =>Gi0/2
con2                 (2.2.2.2        )  :    Gi0/2 =>Fa0/1
Destination 0000.0201.0201 found on con2[WS-C3550-24] (2.2.2.2)
Layer 2 trace completed
Switch#
```

This example shows how to display the detailed Layer 2 path:

```
Switch# traceroute mac 0000.0201.0601 0000.0201.0201 detail
Source 0000.0201.0601 found on con6[WS-C2950G-24-EI] (2.2.6.6)
con6 / WS-C2950G-24-EI / 2.2.6.6 :
        Fa0/1 [auto, auto] =>Fa0/3 [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.
Switch#
```

This example shows the Layer 2 path when the switch is not connected to the source switch:

```
Switch# traceroute mac 0000.0201.0501 0000.0201.0201 detail
Source not directly connected, tracing source .....
Source 0000.0201.0501 found on con5[WS-C2950G-24-EI] (2.2.5.5)
con5 / WS-C2950G-24-EI / 2.2.5.5 :
        Fa0/1 [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.
Switch#
```

This example shows the Layer 2 path when the switch cannot find the destination port for the source MAC address:

```
Switch# traceroute mac 0000.0011.1111 0000.0201.0201
Error:Source Mac address not found.
Layer2 trace aborted.
Switch#
```

This example shows the Layer 2 path when the source and destination devices are in different VLANs:

```
Switch# traceroute mac 0000.0201.0601 0000.0301.0201
Error:Source and destination macs are on different vlans.
Layer2 trace aborted.
Switch#
```

This example shows the Layer 2 path when the destination MAC address is a multicast address:

```
Switch# traceroute mac 0000.0201.0601 0100.0201.0201
Invalid destination mac address
Switch#
```

This example shows the Layer 2 path when the source and destination switches belong to multiple VLANs:

```
Switch# traceroute mac 0000.0201.0601 0000.0201.0201
Error:Mac found on multiple vlans.
Layer2 trace aborted.
Switch#
```

This example shows how to display the Layer 2 path by specifying the interfaces on the source and destination switches:

```
Switch# traceroute mac interface fastethernet0/1 0000.0201.0601 interface fastethernet0/3 0000.0201.0201
Source 0000.0201.0601 found on con6[WS-C2950G-24-EI] (2.2.6.6)
con6 (2.2.6.6) :Fa0/1 =>Fa0/3
con5                (2.2.5.5        )  :    Fa0/3 =>Gi0/1
con1                (2.2.1.1        )  :    Gi0/1 =>Gi0/2
con2                (2.2.2.2        )  :    Gi0/2 =>Fa0/1
Destination 0000.0201.0201 found on con2[WS-C3550-24] (2.2.2.2)
Layer 2 trace completed
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| traceroute mac ip | Displays the Layer 2 path that is taken by the packets from the specified source IP address or hostname to the specified destination IP address or hostname. |

# traceroute mac ip

To display the Layer 2 path that is taken by the packets from the specified source IP address or hostname to the specified destination IP address or hostname, use the **traceroute mac** command.

**traceroute mac ip** {*source-ip-address* | *source-hostname*} {*destination-ip-address* | *destination-hostname*} [**detail**]

## Syntax Description

| | |
|---|---|
| *source-ip-address* | IP address of the source switch as a 32-bit quantity in dotted-decimal format. |
| *destination-ip-address* | IP address of the destination switch as a 32-bit quantity in dotted-decimal format. |
| *source-hostname* | IP hostname of the source switch. |
| *destination-hostname* | IP hostname of the destination switch. |
| **detail** | (Optional) Displays detailed traceroute MAC IP information. |

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

The Layer 2 traceroute feature is available on these switches:

- Catalyst 2950 switches running Release 12.1(12c)EA1 or later
- Catalyst 3550 switches running Release 12.1(12c)EA1 or later
- Catalyst 4500 series switches running Catalyst operating system Release 6.2 or later for the supervisor engine
- Catalyst 4500 series switches running Release 12.1(15)EW or later
- Catalyst 5000 family switches running Catalyst operating system Release 6.1 or later for the supervisor engine
- Catalyst 6500 series switches running Catalyst operating system Release 6.1 or later for the supervisor engine

For Layer 2 traceroute to functional properly, Cisco Discovery Protocol (CDP) must be enabled on all the switches in the network. Do not disable CDP.

When the switch detects a device in the Layer 2 path that does not support Layer 2 traceroute, the switch continues to send Layer 2 trace queries and lets them time out.

The maximum number of hops identified in the path is ten.

The **traceroute mac ip** command output shows the Layer 2 path when the specified source and destination IP addresses are in the same subnet. When you specify the IP addresses, the switch uses Address Resolution Protocol (ARP) to associate the IP addresses with the corresponding MAC addresses and the VLAN IDs.

- If an ARP entry exists for the specified IP address, the switch uses the associated MAC address and identifies the physical path.
- If an ARP entry does not exist, the switch 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 a message appears.

Layer 2 traceroute is not supported when multiple devices are attached to one port through hubs (for example, multiple CDP neighbors are detected on a port). 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 IP addresses and by using the **detail** keyword:

```
Switch# 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-C2950G-24-EI / 2.2.6.6 :
        Fa0/1 [auto, auto] =>Fa0/3 [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.
Switch#
```

This example shows how to display the Layer 2 path by specifying the source and destination hostnames:

```
Switch# 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) :Fa0/1 =>Fa0/3
con5                 (2.2.5.5        )  :    Fa0/3 =>Gi0/1
con1                 (2.2.1.1        )  :    Gi0/1 =>Gi0/2
con2                 (2.2.2.2        )  :    Gi0/2 =>Fa0/1
Destination 0000.0201.0201 found on con2
Layer 2 trace completed
Switch#
```

This example shows the Layer 2 path when Address Resolution Protocol (ARP) cannot associate the source IP address with the corresponding MAC address:

```
Switch# traceroute mac ip 2.2.66.66 2.2.77.77
Arp failed for destination 2.2.77.77.
Layer2 trace aborted.
Switch#
```

**Related Commands**

| Command | Description |
|---|---|
| traceroute mac | Displays the Layer 2 path taken by the packets from the specified source MAC address to the specified destination MAC address. |

# trust

To define a trust state for traffic classified through the **class** policy-map configuration command, use the **trust** policy-map class configuration command. To return to the default setting, use the **no** form of this command.

**trust** [**cos** | **dscp**]

**no trust** [**cos** | **dscp**]

## Syntax Description

| | |
|---|---|
| **cos** | (Optional) Classify an ingress packet by using the packet class of service (CoS) value. For an untagged packet, the port default CoS value is used. |
| **dscp** | (Optional) Classify an ingress packet by using the packet Differentiated Services Code Point (DSCP) values (most significant 6 bits of 8-bit service-type field). For a non-IP packet, the packet CoS value is used if the packet is tagged. If the packet is untagged, the default port CoS value is used to map CoS to DSCP. |

## Defaults

The action is not trusted.

## Command Modes

Policy-map class configuration

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

Use this command to distinguish the quality of service (QoS) trust behavior for certain traffic from other traffic. For example, inbound traffic with certain DSCP values can be trusted. You can configure a class map to match and trust the DSCP values in the inbound traffic.

Trust values set with this command supersede trust values set with the **qos trust** interface configuration command.

If you specify **trust cos**, QoS uses the received or default port CoS value and the CoS-to-DSCP map to generate a DSCP value for the packet.

If you specify **trust dscp**, QoS uses the DSCP value from the ingress packet. For non-IP packets that are tagged, QoS uses the received CoS value; for non-IP packets that are untagged, QoS uses the default port CoS value. In either case, the DSCP value for the packet is derived from the CoS-to-DSCP map.

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 define a port trust state to trust inbound DSCP values for traffic classified with “class1”:

```
Switch# configure terminal
Switch(config)# policy-map policy1
Switch(config-pmap)# class class1
Switch(config-pmap-c)# trust dscp
Switch(config-pmap-c)# police 1000000 20000 exceed-action policed-dscp-transmit
Switch(config-pmap-c)# exit
Switch#
```

You can verify your settings by entering the **show policy-map** privileged EXEC command.

## Related Commands

| Command | Description |
|---|---|
| **class** | Specifies the name of the class whose traffic policy you want to create or change. |
| **police** | Configures the Traffic Policing feature. |
| **policy-map** | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |
| **set** | Marks IP traffic by setting a class of service (CoS), a Differentiated Services Code Point (DSCP), or IP-precedence in the packet. |
| **show policy-map** | Displays information about the policy map. |

# tx-queue

To configure the transmit queue parameters for an interface, use the **tx-queue** command. To return to the default value, use the **no** form of this command.

**tx-queue** [*queue-id*] {**bandwidth** *bandwidth-rate* | **priority high** | **shape** *shape-rate*}

**no tx-queue**

## Syntax Description

| | |
|---|---|
| *queue-id* | (Optional) Number of the queue; valid values are from 1 to 4. |
| **bandwidth** *bandwidth-rate* | Specifies traffic bandwidth; valid values are from 16000 to 1000000000 bits per second. |
| **priority high** | Specifies high priority. |
| **shape** *shape-rate* | Specifies the maximum rate that packets are passed through a transmit queue; valid values are from 16000 to 1000000000 bits per second. |

## Defaults

The default settings are as follows:

- Encapsulation type is dependent on the platform or interface hardware.
- QoS enabled bandwidth rate is 4:255.
- QoS disabled bandwidth rate is 255:1.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

The bandwidth and shape rates cannot exceed the maximum speed of the interface.

The bandwidth can be configured only on the following:

- Uplink ports on Supervisor Engine III (WS-X4014)
- Ports on the WS-X4306-GB module
- The two 1000BASE-X ports on the WS-X4232-GB-RJ module
- The first two ports on the WS-X4418-GB module
- The two 1000BASE-X ports on the WS-X4412-2GB-TX module

Only transmit queue 3 can be configured to be a high-priority transmit queue.

## Examples

This example shows how to allocate bandwidth on queue 1 to 100 Mbps:

```
Switch(config-if)# tx-queue 1
Switch(config-if-tx-queue)# bandwidth 1000000000
Switch(config-if-tx-queue)#
```

This example shows how to configure transmit queue 3 to the high priority:

```
Switch(config-if)# tx-queue 3
Switch(config-if-tx-queue)# priority high
Switch(config-if-tx-queue)#
```

This example shows how to configure the traffic shaping rate of 64 kbps to transmit queue 1:

```
Switch(config-if)# tx-queue 1
Switch(config-if-tx-queue)# shape 64000
Switch(config-if-tx-queue)#
```

## Related Commands

| Command | Description |
|---|---|
| show qos interface | Displays queueing information. |

# udld (global configuration mode)

To enable aggressive or normal mode in the UDLD protocol and to set the configurable message timer time, use the **udld** command. Use the **no** form of this command to do the following:

- Disable normal mode UDLD on all the fiber ports by default
- Disable aggressive mode UDLD on all the fiber ports by default
- Disable the message timer

**udld enable | aggressive**

**no udld enable | aggressive**

**udld message time** *message-timer-time*

**no udld message time**

## Syntax Description

| | |
|---|---|
| **enable** | Enables UDLD in normal mode by default on all the fiber interfaces. |
| **aggressive** | Enables UDLD in aggressive mode by default on all the fiber interfaces. |
| **message time** *message-timer-time* | Sets the period of time between the UDLD probe messages on the ports that are in advertisement mode and are currently determined to be bidirectional; valid values are from 1 to 90 seconds. |

## Defaults

All fiber interfaces are disabled and the message timer time equals 15 seconds.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

If you enable aggressive mode, once all the neighbors of a port have aged out either in the advertisement or in the detection phase, UDLD restarts the linkup sequence to try to resynchronize with any potentially out-of-sync neighbor and shuts down the port if the message train from the link is still undetermined.

This command affects the fiber interfaces only. Use the **udld (interface configuration mode)** command to enable UDLD on the other interface types.

## Examples

This example shows how to enable UDLD on all the fiber interfaces:

```
Switch (config)# udld enable
Switch (config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show udld** | Displays the administrative and operational UDLD status. |
| **udld (interface configuration mode)** | Enables UDLD on an individual interface or prevents a fiber interface from being enabled by the **udld (global configuration mode)** command. |

# udld (interface configuration mode)

To enable UDLD on an individual interface or to prevent a fiber interface from being enabled by the **udld (global configuration mode)** command, use the **udld** command. To return to the **udld (global configuration mode)** command setting, or if the port is a nonfiber port to disable UDLD, use the **no** form of this command.

**udld** {**enable** | **aggressive** | **disable**}

**no udld** {**enable** | **aggressive** | **disable**}

## Syntax Description

| | |
|---|---|
| **enable** | Enables UDLD on this interface. |
| **aggressive** | Enables UDLD in aggressive mode on this interface. |
| **disable** | Disables UDLD on this interface. |

## Defaults

The fiber interfaces are enabled per the state of the global **udld** (**enable** or **aggressive**) command, and the nonfiber interfaces are enabled with UDLD disabled.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

If you enable aggressive mode, once all the neighbors of a port have aged out either in the advertisement or in the detection phase, UDLD restarts the linkup sequence to try to resynchronize with any potentially out-of-sync neighbor and shuts down the port if the message train from the link is still undetermined.

Use the **no udld enable** command on the fiber ports to return control of UDLD to the global **udld enable** command or to disable UDLD on the nonfiber ports.

Use the **udld aggressive** command on the fiber ports to override the setting of the global **udld** (**enable** or **aggressive**) command. Use the **no** form on the fiber ports to remove this setting, return control of UDLD enabling back to the global **udld** command or to disable UDLD on the nonfiber ports.

The **disable** keyword is supported on the fiber ports only. Use the **no** form of this command to remove this setting and return control of UDLD to the **udld (global configuration mode)** command.

If the port changes from fiber to nonfiber or vice versa, all configurations will be maintained because of a change of module or a GBIC change detected by the platform software.

## Examples

This example shows how to cause any port interface to enable UDLD, despite the current global **udld (global configuration mode)** setting:

```
Switch (config-if)# udld enable
Switch (config-if)#
```

This example shows how to cause any port interface to enable UDLD in aggressive mode, despite the current global **udld** (**enable** or **aggressive**) setting:

```
Switch (config-if)# udld aggressive
Switch (config-if)#
```

This example shows how to cause a fiber port interface to disable UDLD, despite the current global **udld (global configuration mode)** setting:

```
Switch (config-if)# udld disable
Switch (config-if)#
```

## Related Commands

| Command | Description |
|---|---|
| **show udld** | Displays the administrative and operational UDLD status. |
| **udld (global configuration mode)** | Enables aggressive or normal mode in the UDLD protocol and sets the configurable message timer time. |

# udld reset

To reset all the UDLD ports in the shutdown state, use the **udld reset** command.

**udld reset**

## Syntax Description

This command has no keywords or variables.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

If the interface configuration is still enabled for UDLD, these ports will begin to run UDLD again and may shut down if the reason for the shutdown has not been corrected.

The **udld reset** command permits the traffic to flow on the ports again; other features, such as spanning tree, PAgP, and DTP, operate normally if enabled.

## Examples

This example shows how to reset all the ports that are shut down by UDLD:

```
Switch# udld reset
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show udld | Displays the administrative and operational UDLD status. |

# unidirectional

To configure the nonblocking Gigabit Ethernet ports to unidirectionally send or receive traffic on an interface, use the **unidirectional** command. To disable unidirectional communication, use the **no** form of this command.

**unidirectional** {**receive-only** | **send-only**}

**no unidirectional** {**receive-only** | **send-only**}

## Syntax Description

| | |
|---|---|
| **receive-only** | Specifies the unidirectional reception. |
| **send-only** | Specifies the unidirectional transmission. |

## Defaults

Disabled

## Command Modes

Interface configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

Enabling port unidirectional mode automatically disables port UDLD. You must manually ensure that the unidirectional link does not create a spanning-tree loop in the network.

## Examples

This example shows how to set Gigabit Ethernet interface 1/1 to receive traffic unidirectionally:

```
Switch# config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet 1/1
Switch(config-if)# unidirectional receive-only
Switch(config-if)# end
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show interfaces switchport** | Displays the administrative and operational status of a switching (nonrouting) port. |

# username

To establish a username-based authentication system, use the **username** command.

**username** *name* **secret** {**0** | **5**} *password*

## Syntax Description

| | |
|---|---|
| *name* | User ID of the user. |
| **secret 0 \| 5** | Specifies the authentication system for the user; valid values are **0** (text immediately following is not encrypted) and **5** (text immediately following is encrypted using an MD5-type encryption method). |
| *password* | Password of the user. |

## Defaults

No username-based authentication system is established.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

Use this command to enable enhanced password security for the specified username. This command enables MD5 encryption on the password. MD5 encryption is a strong encryption method that is not retrievable. You cannot use MD5 encryption with protocols that require clear-text passwords, such as CHAP.

You can use this command for defining usernames that get special treatment. For example, you can define an “info” username that does not require a password but that connects the user to a general-purpose information service.

The **username** command provides both username and **secret** authentication for login purposes only.

The *name* argument can be only one word. White spaces and quotation marks are not allowed.

You can use multiple **username** commands to specify options for a single user.

For information about additional **username** commands, refer to the *Cisco IOS Command Reference*.

## Examples

This example shows how to specify an MD5 encryption on a password (warrior) for a username (xena):

```
Switch(config)# username xena secret 5 warrior
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **enable password** (refer to Cisco IOS documentation) | Sets a local password to control access to various privilege levels. |
| **enable secret** (refer to Cisco IOS documentation) | Specifies an additional layer of security over the enable password command. |
| **username** (refer to Cisco IOS documentation) | Establishes a username-based authentication system. |

# verify

To verify the checksum of a file on a Flash memory file system, use the **verify** command.

**verify** [**/md5**] [*flash-filesystem***:**] [*filename*] [*expected-md5-signature*]

## Syntax Description

| | |
|---|---|
| **/md5** | (Optional) Verifies the MD5 signatures. |
| *flash-filesystem***:** | (Optional) Device where the Flash resides; valid values are **bootflash:**, **slot0:**, **flash:**, or **sup-bootflash:**. |
| *filename* | (Optional) Name of the Cisco IOS image. |
| *expected-md5-signature* | (Optional) MD5 signature. |

## Defaults

The current working device is specified.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

Each software image that is distributed on the disk uses a single checksum for the entire image. This checksum is displayed only when the image is copied into the Flash memory.

The Readme file, which is included with the image on the disk, lists the name, file size, and checksum of the image. Review the contents of the Readme file before loading or duplicating the new image so that you can verify the checksum when you copy it into the Flash memory or on to a server.

Use the **verify /md5** command to verify the MD5 signature of a file before using it. This command validates the integrity of a copied file by comparing a precomputed MD5 signature with the signature that is computed by this command. If the two MD5 signatures match, the copied file is identical to the original file.

You can find the MD5 signature posted on the Cisco.com page with the image.

You can use the **verify /md5** command in one of the following ways:

- Verify the MD5 signatures manually by entering the **verify /md5** *filename* command.

  Check the displayed signature against the MD5 signature posted on the Cisco.com page.
- Allow the system to compare the MD5 signatures by entering the **verify /md5** {*flash-filesystem***:***filename*} {*expected-md5-signature*} command.

After completing the comparison, the system returns with a verified message. If an error is detected, the output is similar to the following:

```
Switch# verify /md5 slot0:c4-jsv-mz 0f
 ..................................
 ..................................
 ..................................
 ..................................
 ..................................
 ...............................Done!
 %Error verifying slot0:c4-jsv-mz
 Computed signature  = 0f369ed9e98756f179d4f29d6e7755d3
 Submitted signature = 0f
```

To display the contents of the Flash memory, enter the **show flash** command. The Flash contents listing does not include the checksum of the individual files. To recompute and verify the image checksum after the image has been copied into the Flash memory, enter the **verify** command.

A colon (:) is required after the specified device.

## Examples

This example shows how to use the **verify** command:

```
Switch# verify cat6k_r47_1.cbi
.....................................................
File cat6k_r47_1.cbi verified OK.
Switch#
```

This example shows how to manually verify the MD5 signature:

```
Switch# verify /md5 c4-jsv-mz
 ..............................................
 ..............................................
 ..............................................
 ..............................................
 ..............................................
 .........................................Done!
 verify /md5 (slot0:c4-jsv-mz) = 0f369ed9e98756f179d4f29d6e7755d3
Switch#
```

This example shows how to allow the system to compare the MD5 signatures:

```
Switch# verify /md5 slot0:c4-jsv-mz 0f369ed9e98756f179d4f29d6e7755d3
 ..............................................
 ..............................................
 ..............................................
 ..............................................
 ..............................................
 .........................................Done!
 verified /md5 (slot0:c6sup12-jsv-mz) = 0f369ed9e98756f179d4f29d6e7755d3
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| **show file system (Flash file system)** (refer to Cisco IOS documentation) | Displays available file systems. |
| **show flash** (refer to Cisco IOS documentation) | Displays the contents of flash memory. |

# vlan (VLAN Database mode)

To configure a specific VLAN, use the **vlan** command. To delete a VLAN, use the **no** form of this command.

**vlan** *vlan_id* [**are** *hops*] [**backupcrf** *mode*] [**bridge** *type* | *bridge-num*] [**media** *type*] [**mtu** *mtu-size*] [**name** *vlan-name*] [**parent** *parent-vlan-id*] [**ring** *ring-number*] [**said** *said-value*] [**state** {**suspend** | **active**}] [**stp type** *type*] [**tb-vlan1** *tb-vlan1-id*] [**tb-vlan2** *tb-vlan2-id*]

**no vlan** *vlan*

## Syntax Description

| | |
|---|---|
| *vlan_id* | Number of the VLAN; valid values are from 1 to 4094. |
| **are** *hops* | (Optional) Specifies the maximum number of All Route Explorer hops for this VLAN; valid values are from 0 to 13. Zero is assumed if no value is specified. |
| **backupcrf** *mode* | (Optional) Enables or disables the backup CRF mode of the VLAN; valid values are **enable** and **disable**. |
| **bridge** *type* | (Optional) Specifies the bridging characteristics of the VLAN or identification number of the bridge; valid *type* values are **srb** and **srt**. |
| *bridge_num* | (Optional) Valid bridge_num values are from 0 to 15. |
| **media** *type* | (Optional) Specifies the media type of the VLAN; valid values are **fast ethernet**, **fd-net**, **fddi**, **trcrf**, and **trbrf**. |
| **mtu** *mtu-size* | (Optional) Specifies the maximum transmission unit (packet size, in bytes) that the VLAN can use; valid values are from 576 to 18190. |
| **name** *vlan-name* | (Optional) Defines a text string used as the name of the VLAN (1 to 32 characters). |
| **parent** *parent-vlan-id* | (Optional) Specifies the ID number of the parent VLAN of FDDI or Token Ring-type VLANs; valid values are from 2 to 1001. |
| **ring** *ring-number* | (Optional) Specifies the ring number of FDDI or Token Ring-type VLANs; valid values are from 2 to 1001. |
| **said** *said-value* | (Optional) Specifies the security association identifier; valid values are from 1 to 4294967294. |
| **state** | (Optional) Specifies the state of the VLAN. |
| **suspend** | Specifies that the state of the VLAN is suspended. VLANs in the suspended state do not pass packets. |
| **active** | Specifies that the state of the VLAN is active. |
| **stp type** *type* | (Optional) Specifies the STP type; valid values are **ieee**, **ibm**, and **auto**. |
| **tb-vlan1** *tb-vlan1-id* | (Optional) Specifies the ID number of the first translational VLAN for this VLAN; valid values are from 2 to 1001. Zero is assumed if no value is specified. |
| **tb-vlan2** *tb-vlan2-id* | (Optional) Specifies the ID number of the second translational VLAN for this VLAN; valid values are from 2 to 1001. Zero is assumed if no value is specified. |

## Defaults

The defaults are as follows:

- The vlan-name is "VLANxxxx" where "xxxx" represents four numeric digits (including leading zeroes) equal to the VLAN ID number.
- The media type is Fast Ethernet.
- The state is active.
- The said-value is 100,000 plus the VLAN ID number.
- The mtu-size default is dependent upon the VLAN type:
  - fddi—1500
  - trcrf—1500 if V2 is not enabled; 4472 if it is enabled
  - fd-net—1500
  - trbrf—1500 if V2 is not enabled; 4472 if it is enabled
- No ring number is specified.
- No bridge number is specified.
- No parent VLAN is specified.
- No STP type is specified.
- No translational bridge VLAN is specified.

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

VLAN 1 parameters are factory configured and cannot be changed.

When you define *vlan-name*, the name must be unique within the administrative domain.

The SAID is documented in 802.10. When the **no** form is used, the VLANs SAID is returned to the default.

When you define the *said-value*, the name must be unique within the administrative domain.

The **bridge** *bridge-number* argument is used only for Token Ring-net and FDDI-net VLANs and is ignored in other types of VLANs. When the **no** form is used, the VLANs source-route bridging number returns to the default.

The parent VLAN resets to the default if the parent VLAN is deleted or the **media** keyword changes the VLAN type or the VLAN type of the parent VLAN.

The *tb-vlan1* and *tb-vlan2* are used to configure translational bridge VLANs of a specified type of VLAN and are not allowed in other types of VLANs. The translational bridge VLANs must be a different VLAN type than the affected VLAN; if two VLANs are specified, the two must be different VLAN types.

A translational bridge VLAN will reset to the default if the translational bridge VLAN is deleted or the **media** keyword changes the VLAN type or the VLAN type of the corresponding translational bridge VLAN.

## Examples

This example shows how to add a new VLAN with all the default parameters to the new VLAN database:

```
Switch(vlan)# vlan 2
```

**Note** If the VLAN already exists, no action occurs.

This example shows how to cause the device to add a new VLAN, specify the media type and parent VLAN ID number 3, and set all the other parameters to the defaults:

```
Switch(vlan)# vlan 2 media fastethernet parent 3
VLAN 2 modified:
    Media type FASTETHERNET
    Parent VLAN 3
```

This example shows how to delete VLAN 2:

```
Switch(vlan)# no vlan 2
Switch(vlan)#
```

This example shows how to return the MTU to the default for its type and the translational bridging VLANs to the default:

```
Switch(vlan)# no vlan 2 mtu tb-vlan1 tb-vlan2
Switch(vlan)#
```

## Related Commands

| Command | Description |
|---|---|
| show vlan | Displays VLAN information. |

# vlan access-map

To enter VLAN access-map command mode to create a VLAN access map, use the **vlan access-map** command. To remove a mapping sequence or the entire map, use the **no** form of this command.

**vlan access-map** *name* [*seq#* ]

**no vlan access-map** *name* [*seq#* ]

## Syntax Description

| | |
|---|---|
| *name* | VLAN access-map tag. |
| *seq#* | (Optional) Map sequence number; valid values are from 0 to 65535. |

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

If you enter the sequence number of an existing map sequence, you enter VLAN access-map mode. If you do not specify a sequence number, a number is automatically assigned. You can enter one match clause and one action clause per map sequence. If you enter the **no vlan access-map name** [*seq#* ] command without entering a sequence number, the whole map is removed. Once you enter VLAN access-map mode, the following commands are available:

- **action**—Sets the action to be taken (forward or drop).
- **default**—Returns a command to its default settings.
- **end**—Exits from configuration mode.
- **exit**—Exits from VLAN access-map configuration mode.
- **match**—Sets the values to match (IP address or MAC address).
- **no**—Negates a command or reset its defaults.

## Examples

This example shows how to enter VLAN access-map mode:

```
Switch(config)# vlan access-map cisco
Switch(config-access-map)#
```

## Related Commands

| Command | Description |
|---|---|
| match | Specifies a match clause by selecting one or more ACLs for a VLAN access-map sequence. |
| show vlan access-map | Displays the contents of a VLAN access map. |

# vlan configuration

To configure a service-policy on a VLAN, use the **vlan configuration** command to enter the VLAN feature configuration mode.

**vlan configuration** {*vlan*}

## Syntax Description

| | |
|---|---|
| *vlan* | Specifies a list of VLANs. "," "-" operators can be used; such as, 1-10,20. |

## Defaults

This command has no default settings.

## Command Modes

Configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(40)SG | This command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6E. |

## Usage Guidelines

Configuring of service-policies in this mode is supported on the Supervisor Engine 6-E and Catalyst 4900M chassis.

In Supervisor Engines V through 10GE and earlier, a service-policy has to attach to SVI to apply VLAN-based policies. Even though an SVI is not needed in all cases, such as when you use your Catalyst 4500 series switch as a pure Layer 2 switch, you are required to create an SVI.

To remove the requirement of creating an SVI, VLAN configuration mode is introduced on the Supervisor Engine 6-E and Catalyst 4900M chassis. With this command you can specify lists of VLANs and the input and output policies that are applied. To configure your system in this mode there is no requirement for you to create SVIs, or create VLAN or VTP mode interactions. Once the VLAN becomes active the configuration becomes active on that VLAN. You can use "-" or "," extensions to specifying VLAN list.

## Examples

This example shows how to configure a service policy while in VLAN configuration mode and display the new service policy:

```
Switch#configure terminal
Switch(config)#vlan configuration 30-40
Switch(config-vlan-config)#service-policy input p1
Switch(config-vlan-config)#end
Switch#show running configuration | begin vlan configuration
!
vlan configuration 30-40
   service-policy input p1
!
vlan internal allocation policy ascending !
vlan 2-1000
!
Switch#
```

This example shows how to display the new service policy:

```
Switch#show policy-map vlan 30
vlan 30

  Service-policy input: p1

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
      police:
         rate 128000 bps, burst 4000 bytes
          conformed 0 packets, 0 bytes; action:
            transmit
          exceeded 0 packets, 0 bytes; action:
            drop
          conformed 0 bps, exceeded 0 bps
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| vlan (VLAN Database mode) | Configures a specific VLAN. |
| policy-map | Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode. |

# vlan database

To enter VLAN configuration mode, use the **vlan database** command.

**vlan database**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

From VLAN configuration mode, you can access the VLAN database editing buffer manipulation commands, including:

- **abort**—Exits mode without applying the changes.
- **apply**—Applies the current changes and bumps the revision number.
- **exit**—Applies the changes, bumps the revision number, and exits VLAN configuration mode.
- **no**—Negates a command or sets its defaults; valid values are **vlan** and **vtp**.
- **reset**—Abandons the current changes and rereads the current database.
- **show**—Displays the database information.
- **vlan**—Accesses the subcommands to add, delete, or modify values that are associated with a single VLAN. For information about the **vlan** subcommands, see the **vlan (VLAN Database mode)** command.
- **vtp**—Accesses the subcommands to perform VTP administrative functions. For information about the **vtp** subcommands, see the **vtp client** command.

## Examples

This example shows how to enter VLAN configuration mode:

```
Switch# vlan database
Switch(vlan)#
```

This example shows how to exit VLAN configuration mode without applying changes after you are in VLAN configuration mode:

```
Switch(vlan)# abort
Aborting....
Switch#
```

This example shows how to delete a VLAN after you are in VLAN configuration mode:

```
Switch(vlan)# no vlan 100
Deleting VLAN 100...
Switch(vlan)#
```

This example shows how to turn off pruning after you are in VLAN configuration mode:

```
Switch(vlan)# no vtp pruning
Pruning switched OFF
Switch(vlan)#
```

## Related Commands

| Command | Description |
|---|---|
| show vlan | Displays VLAN information. |

# vlan dot1q tag native

To enable tagging of the native VLAN frames on all 802.1Q trunk ports, use the **vlan dot1q tag native command.** To disable tagging of native VLAN frames, use the **no** form of this command.

**vlan dot1q tag native**

**no vlan dot1q tag native**

## Syntax Description

This command has no arguments or keywords.

## Defaults

802.1Q native VLAN tagging is disabled.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.2(18)EW | This command was first introduced on the Catalyst 4500 series switch. |

## Usage Guidelines

When enabled, the native VLAN packets exiting all 802.1Q trunk ports are tagged unless the port is explicitly configured to disable native VLAN tagging.

When disabled, the native VLAN packets exiting all 802.1Q trunk ports are not tagged.

You can use this command with 802.1Q tunneling. This feature operates on an edge switch of a service-provider network and expands VLAN space by using a VLAN-in-VLAN hierarchy and by tagging the tagged packets. You must use the 802.1Q trunk ports for sending out the packets to the service-provider network. However, the packets going through the core of the service-provider network might also be carried on the 802.1Q trunks. If the native VLANs of an 802.1Q trunk match the native VLAN of a tunneling port on the same switch, the traffic on the native VLAN is not tagged on the sending trunk port. This command ensures that the native VLAN packets on all 802.1Q trunk ports are tagged.

## Examples

This example shows how to enable 802.1Q tagging on the native VLAN frames and verify the configuration:

```
Switch# config terminal
Switch (config)# vlan dot1q tag native
Switch (config)# end
Switch# show vlan dot1q tag native
dot1q native vlan tagging is enabled
```

## Related Commands

| Command | Description |
|---|---|
| switchport private-vlan trunk native vlan tag | Configures the tagging of the native VLAN traffic on 802.1Q private VLAN trunks. |
| switchport trunk | Sets the trunk characteristics when an interface is in trunking mode. |

# vlan filter

To apply a VLAN access map, use the **vlan filter** command. To clear the VLAN access maps from VLANs or interfaces, use the **no** form of this command.

**vlan filter** *map-name* {**vlan-list** *vlan-list*}

**no vlan filter** *map-name* {**vlan-list** [*vlan-list*]}

## Syntax Description

| | |
|---|---|
| *map-name* | VLAN access-map tag. |
| **vlan-list** *vlan-list* | Specifies the VLAN list; see the "Usage Guidelines" section for valid values. |

## Defaults

This command has no default settings.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(12c)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

When configuring an action clause in a VLAN access map, note the following:

- You can apply the VLAN access map to one or more VLANs.
- The *vlan-list* parameter can be a single VLAN ID, a list of VLAN IDs, or VLAN ID ranges (*vlan-id-vlan-id*). Multiple entries are separated by (-), (hyphen), or (,) (comma).
- You can apply only one VLAN access map to each VLAN.

When entering the **no** form of this command, the *vlan-list* parameter is optional (but the keyword **vlan-list** is required). If you do not enter the *vlan-list* parameter, the VACL is removed from all the VLANs where the *map-name* is applied.

## Examples

This example shows how to apply a VLAN access map on VLANs 7 through 9:

```
Switch(config)# vlan filter ganymede vlan-list 7-9
Switch(config)#
```

# vlan internal allocation policy

To configure the internal VLAN allocation scheme, use the **vlan internal allocation policy** command. To return to the default setting, use the **no** form of this command.

**vlan internal allocation policy** {**ascending** | **descending**}

**no vlan internal allocation policy**

## Syntax Description

| | |
|---|---|
| **ascending** | Specifies to allocate internal VLANs from 1006 to 4094. |
| **descending** | Specifies to allocate internal VLANs from 4094 to 1006. |

## Defaults

The default is the ascending allocation scheme.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(19)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

You can configure internal VLAN allocation to be from 1006 and up or from 4094 and down.

The internal VLANs and user-configured VLANs share the 1006 to 4094 VLAN spaces. A “first come, first served” policy is used in allocating these spaces.

The **vlan internal allocation policy** command allows you to configure the allocation direction of the internal VLAN.

During system bootup, the internal VLANs that are required for features in the startup-config file are allocated first. The user-configured VLANs in the startup-config file are configured next. If you configure a VLAN that conflicts with an existing internal VLAN, the VLAN that you configured is put into a nonoperational status until the internal VLAN is freed and becomes available.

After you enter the **write mem** command and the system reloads, the reconfigured allocation scheme is used by the port manager.

## Examples

This example shows how to configure the VLANs in a descending order as the internal VLAN allocation policy:

```
Switch(config)# vlan internal allocation policy descending
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show vlan internal usage** | Displays information about the internal VLAN allocation. |

# vmps reconfirm (global configuration)

To change the reconfirmation interval for the VLAN Query Protocol (VQP) client, use the **vmps reconfirm** command. To return to the default setting, use the **no** form of this command.

**vmps reconfirm** *interval*

**no vmps reconfirm**

## Syntax Description

| | |
|---|---|
| *interval* | Queries to the VLAN Membership Policy Server (VMPS) to reconfirm dynamic VLAN assignments; valid values are from 1 to 120 minutes. |

## Defaults

The reconfirmation interval is 60 minutes.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Examples

This example shows how to set the VQP client to reconfirm dynamic VLAN entries every 20 minutes:

```
Switch(config)# vmps reconfirm 20
Switch(config)#
```

You can verify your setting by entering the **show vmps** command and examining information in the Reconfirm Interval row.

## Related Commands

| Command | Description |
|---|---|
| **show vmps** | Displays the VLAN Query Protocol (VQP) version, reconfirmation interval, retry count, VLAN Membership Policy Server (VMPS) IP addresses, current servers, and primary servers. |
| **vmps reconfirm (privileged EXEC)** | Sends VLAN Query Protocol (VQP) queries to reconfirm all the dynamic VLAN assignments with the VLAN Membership Policy Server (VMPS). |

# vmps reconfirm (privileged EXEC)

To immediately send VLAN Query Protocol (VQP) queries to reconfirm all the dynamic VLAN assignments with the VLAN Membership Policy Server (VMPS), use the **vmps reconfirm** command.

**vmps reconfirm**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command has no default settings.

## Command Modes

Privileged EXEC mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

You can verify your setting by entering the **show vmps** command and examining the VMPS Action row of the Reconfirmation Status section. The **show vmps** command shows the result of the last time that the assignments were reconfirmed either because the reconfirmation timer expired or because the **vmps reconfirm** command was entered.

## Examples

This example shows how to immediately send VQP queries to the VMPS:

```
Switch# vmps reconfirm
Switch#
```

## Related Commands

| Command | Description |
|---|---|
| show vmps | Displays the VLAN Query Protocol (VQP) version, reconfirmation interval, retry count, VLAN Membership Policy Server (VMPS) IP addresses, current servers, and primary servers. |
| vmps reconfirm (global configuration) | Changes the reconfirmation interval for the VLAN Query Protocol (VQP) client. |

# vmps retry

To configure the per-server retry count for the VLAN Query Protocol (VQP) client, use the **vmps retry** command. To return to the default setting, use the **no** form of this command.

**vmps retry** *count*

**no vmps retry**

## Syntax Description

| | |
|---|---|
| *count* | Number of attempts to contact the VLAN Membership Policy Server (VMPS) by the client before querying the next server in the list; valid values are from 1 to 10. |

## Defaults

The retry count is 3.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(13)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

You can verify your setting by entering the **show vmps** command and examining information in the Server Retry Count row.

## Examples

This example shows how to set the retry count to 7:

```
Switch(config)# vmps retry 7
```

## Related Commands

| Command | Description |
|---|---|
| **show vmps** | Displays the VLAN Query Protocol (VQP) version, reconfirmation interval, retry count, VLAN Membership Policy Server (VMPS) IP addresses, current servers, and primary servers. |

# vmps server

To configure the primary VLAN Membership Policy Server (VMPS) and up to three secondary servers, use the **vmps server** command. To remove a VMPS server, use the **no** form of this command.

**vmps server** *ipaddress* [**primary**]

**no vmps server** *ipaddress*

## Syntax Description

| | |
|---|---|
| *ipaddress* | IP address or host name of the primary or secondary VMPS servers. If you specify a hostname, the Domain Name System (DNS) server must be configured. |
| **primary** | (Optional) Determines whether primary or secondary VMPS servers are being configured. |

## Defaults

No primary or secondary VMPS servers are defined.

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(4)EA1 | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

The first server that you entered is automatically selected as the primary server whether or not **primary** is entered. You can override the first server address by using **primary** in a subsequent command.

If a member switch in a cluster configuration does not have an IP address, the cluster does not use the VMPS server that is configured for that member switch. Instead, the cluster uses the VMPS server on the command switch, and the command switch proxies the VMPS requests. The VMPS server treats the cluster as a single switch and uses the IP address of the command switch to respond to requests.

When using the **no** form without specifying the *ipaddress*, all configured servers are deleted. If you delete all servers when dynamic-access ports are present, the switch cannot forward the packets from the new sources on these ports because it cannot query the VMPS.

You can verify your setting by entering the **show vmps** command and examining information in the VMPS Domain Server row.

## Examples

This example shows how to configure the server with IP address 191.10.49.20 as the primary VMPS server. The servers with IP addresses 191.10.49.21 and 191.10.49.22 are configured as secondary servers:

```
Switch(config)# vmps server 191.10.49.20 primary
Switch(config)# vmps server 191.10.49.21
Switch(config)# vmps server 191.10.49.22
Switch(config)#
```

This example shows how to delete the server with IP address 191.10.49.21:

```
Switch(config)# no vmps server 191.10.49.21
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show vmps** | Displays the VLAN Query Protocol (VQP) version, reconfirmation interval, retry count, VLAN Membership Policy Server (VMPS) IP addresses, current servers, and primary servers. |

# vtp (global configuration mode)

To modify the name of a VTP configuration storage file, use the **vtp** command. To clear a filename, use the **no** form of this command.

**vtp** {{**file** *filename*} | {**if-id** *name*}}

**no vtp** {{**file** *filename*} | {**if-id** *name*}}

## Syntax Description

| | |
|---|---|
| **file** *filename* | Specifies the IFS file where VTP configuration will be stored. |
| **if-id** *name* | Specifies the name of the interface providing the VTP updater ID for this device, where the **if-id** *name* is an ASCII string limited to 255 characters. |

## Defaults

Disabled

## Command Modes

Global configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

You cannot use the **vtp file** command to load a new database. You can use it only to rename the file in which the existing database is stored.

You can use the **vtp if-id** command to specify the name of the interface providing the VTP updater ID for this device. The VTP updater is the device that adds, deletes, or modifies VLANs to a network, and triggers a VTP updater to inform the rest of the system of the changes.

## Examples

This example shows how to specify the IFS file system file where VTP configuration is stored:

```
Switch(config)# vtp file vtpconfig
Setting device to store VLAN database at filename vtpconfig.
Switch(config)#
```

This example shows how to specify the name of the interface providing the VTP updater ID:

```
Switch(config)# vtp if-id fastethernet
Switch(config)#
```

## Related Commands

| Command | Description |
|---|---|
| show vtp | Displays VTP statistics and domain information. |

# vtp client

To place a device in VTP client mode, use the **vtp client** command. To return to VTP server mode, use the **no** form of this command.

**vtp client**

**no vtp client**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

If the receiving switch is in client mode, the client switch changes its configuration to duplicate the configuration of the server. If you have switches in client mode, make sure to make all VTP or VLAN configuration changes on a switch in server mode.

The **vtp server** command is the functional equivalent of **no vtp client** except that it does not return an error if the device is not in client mode.

## Examples

This example shows how to place the device in VTP client mode:

```
Switch(vlan-config)# vtp client
Switch(vlan-config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show vtp** | Displays VTP statistics and domain information. |
| **vtp (global configuration mode)** | Configures the name of a VTP configuration storage file. |

# vtp domain

To configure the administrative domain name for a device, use the **vtp domain** command.

**vtp domain** *domain-name*

## Syntax Description

| | |
|---|---|
| *domain-name* | Name of the domain. |

## Defaults

This command has no default settings.

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

When you define the *domain-name*, the domain name is case sensitive and can be from 1 to 32 characters.

You must set a domain name before you can transmit any VTP advertisements.

Even if you do not set a domain name, the device will leave the no-management-domain state upon receiving the first VTP summary packet on any port that is currently trunking.

If the device receives its domain from a summary packet, it resets its configuration revision number to zero. Once the device leaves the no-management-domain state, it can never be configured to reenter the number except by cleaning NVRAM and reloading.

## Examples

This example shows how to set the devices administrative domain:

```
Switch(vlan-config)# vtp domain DomainChandon
Switch(vlan-config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show vtp** | Displays VTP statistics and domain information. |
| **vtp (global configuration mode)** | Configures the name of a VTP configuration storage file. |

# vtp password

To create a VTP domain password, use the **vtp password** command. To delete the password, use the **no** form of this command.

**vtp password** *password-value*

**no vtp password**

## Syntax Description

| | |
|---|---|
| *password-value* | An ASCII string, from 1 to 32 characters, identifying the administrative domain for the device. |

## Defaults

Disabled

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Examples

This example shows how to create a VTP domain password:

```
Switch(vlan-config)# vtp password DomainChandon
Switch(vlan-config)#
```

This example shows how to delete the VTP domain password:

```
Switch(vlan-config)# no vtp password
Clearing device VLAN database password.
Switch(vlan-config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show vtp** | Displays VTP statistics and domain information. |
| **vtp (global configuration mode)** | Configures the name of a VTP configuration storage file. |

# vtp pruning

To enable pruning in the VLAN database, use the **vtp pruning** command. To disable pruning in the VLAN database, use the **no** form of this command.

**vtp pruning**

**no vtp pruning**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

VTP pruning causes information about each pruning-eligible VLAN to be removed from VTP updates if there are no stations belonging to that VLAN.

## Examples

This example shows how to enable pruning in the VLAN database:

```
Switch(vlan-config)# vtp pruning
Pruning switched ON
Switch(vlan-config)#
```

This example shows how to disable pruning in the VLAN database:

```
Switch(vlan-config)# no vtp pruning
Pruning switched OFF
Switch(vlan-config)#
```

## Related Commands

| Command | Description |
|---|---|
| show vtp | Displays VTP statistics and domain information. |
| vtp (global configuration mode) | Configures the name of a VTP configuration storage file. |

# vtp server

To place the device in VTP server mode, use the **vtp server** command.

**vtp server**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Enabled

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

If you make a change to the VTP or VLAN configuration on a switch in server mode, that change is propagated to all the switches in the same VTP domain.

You can set VTP to either server or client mode only when you disable dynamic VLAN creation.

If the receiving switch is in server mode, the configuration is not changed.

The **vtp server** command is the functional equivalent of **no vtp client**, except that it does not return an error if the device is not in client mode.

## Examples

This example shows how to place the device in VTP server mode:

```
Switch(vlan-config)# vtp server
Switch(vlan-config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show vtp** | Displays VTP statistics and domain information. |
| **vtp (global configuration mode)** | Configures the name of a VTP configuration storage file. |

# vtp transparent

To place a device in VTP transparent mode, use the **vtp transparent** command. To return to VTP server mode, use the **no** form of this command.

**vtp transparent**

**no vtp transparent**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

The **vtp transparent** command disables VTP from the domain but does not remove the domain from the switch.

If the receiving switch is in transparent mode, the configuration is not changed. The switches in transparent mode do not participate in VTP. If you make VTP or VLAN configuration changes on a switch in transparent mode, the changes are not propagated to the other switches in the network.

The **vtp server** command is similar to the **no vtp transparent** command, except that it does not return an error if the device is not in transparent mode.

## Examples

This example shows how to place the device in VTP transparent mode:

```
Switch(vlan-config)# vtp transparent
Switch(vlan-config)#
```

This example shows how to return the device to VTP server mode:

```
Switch(vlan-config)# no vtp transparent
Switch(vlan-config)#
```

## Related Commands

| Command | Description |
|---|---|
| **show vtp** | Displays VTP statistics and domain information. |
| **vtp (global configuration mode)** | Configures the name of a VTP configuration storage file. |

# vtp v2-mode

To enable version 2 mode, use the **vtp v2-mode** command. To disable version 2 mode, use the **no** form of this command.

**vtp v2-mode**

**no vtp v2-mode**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

VLAN configuration mode

## Command History

| Release | Modification |
|---|---|
| 12.1(8a)EW | Support for this command was introduced on the Catalyst 4500 series switch.. |

## Usage Guidelines

All switches in a VTP domain must run the same version of VTP. VTP version 1 and VTP version 2 do not operate on switches in the same VTP domain.

If all switches in a domain are VTP version 2-capable, you only need to enable VTP version 2 on one switch; the version number is then propagated to the other version 2-capable switches in the VTP domain.

If you toggle the version 2 mode, the parameters of certain default VLANs will be modified.

## Examples

This example shows how to enable version 2 mode in the VLAN database:

```
Switch(vlan-config)# vtp v2-mode
Switch(vlan-config)#
```

This example shows how to disable version 2 mode in the VLAN database:

```
Switch(vlan-config)# no vtp v2-mode
Switch(vlan-config)#
```

## Related Commands

| Command | Description |
|---|---|
| show vtp | Displays VTP statistics and domain information. |
| vtp (global configuration mode) | Configures the name of a VTP configuration storage file. |

APPENDIX A

# Abbreviations

## A

| | |
|---|---|
| ACE | access control entry |
| ACL | access control list |
| AFI | authority and format identifier |
| Agport | aggregation port |
| AMP | Active Monitor Present |
| APaRT | Automated Packet Recognition and Translation |
| ARP | Address Resolution Protocol |

## B

| | |
|---|---|
| BEM | best effort method |
| BGP | Border Gateway Protocol |
| BPDU | bridge protocol data unit |
| BRF | bridge relay function |
| BSC | Bisync |
| BSTUN | Block Serial Tunnel |
| BUS | broadcast and unknown server |
| BVI | bridge-group virtual interface |

## C

| | |
|---|---|
| CAM | content-addressable memory |
| CAR | committed access rate |
| CCA | circuit card assembly |
| CDP | Cisco Discovery Protocol |
| CEF | Cisco Express Forwarding |
| CHAP | Challenge Handshake Authentication Protocol |
| CIR | committed information rate |
| CLI | command-line interface |
| CLNS | Connection-Less Network Service |
| CMNS | Connection-Mode Network Service |
| COPS | Common Open Policy Server |
| COPS-DS | Common Open Policy Server Differentiated Services |
| CoS | class of service |
| CPLD | Complex Programmable Logic Device |
| CRC | cyclic redundancy check |
| CRF | concentrator relay function |
| CST | Common Spanning Tree |

## D

| | |
|---|---|
| DAI | Dynamic ARP Inspection |
| DBL | Dynamic Buffer Limiting |
| DCC | Data Country Code |
| dCEF | distributed Cisco Express Forwarding |
| DDR | dial-on-demand routing |
| DE | discard eligibility |

| | |
|---|---|
| DEC | Digital Equipment Corporation |
| DFI | Domain-Specific Part Format Identifier |
| DFP | Dynamic Feedback Protocol |
| DISL | Dynamic Inter-Switch Link |
| DLC | Data Link Control |
| DLSw | Data Link Switching |
| DMP | data movement processor |
| DNS | Domain Name System |
| DoD | Department of Defense |
| DOS | denial of service |
| DRAM | dynamic RAM |
| DRiP | Dual Ring Protocol |
| DSAP | destination service access point |
| DSCP | differentiated services code point |
| DSPU | downstream SNA Physical Units |
| DTP | Dynamic Trunking Protocol |
| DTR | data terminal ready |
| DVMRP | Distance Vector Multicast Rotuing Protocol |
| DXI | data exchange interface |

## E

| | |
|---|---|
| EAP | Extensible Authentication Protocol |
| EARL | Enhanced Address Recognition Logic |
| EEPROM | electrically erasable programmable read-only memory |
| EHSA | enhanced high system availability |

| | |
|---|---|
| EIA | Electronic Industries Association |
| ELAN | Emulated Local Area Network |
| EOBC | Ethernet out-of-band channel |
| ESI | end-system identifier |

## F

| | |
|---|---|
| FECN | forward explicit congestion notification |
| FM | feature manager |
| FRU | field replaceable unit |
| FSM | feasible successor metrics |

## G

| | |
|---|---|
| GARP | General Attribute Registration Protocol |
| GMRP | GARP Multicast Registration Protocol |
| GVRP | GARP VLAN Registration Protocol |

## I

| | |
|---|---|
| ICC | Inter-card Communication |
| ICD | International Code Designator |
| ICMP | Internet Control Message Protocol |
| IDB | interface descriptor block |
| IDP | initial domain part or Internet Datagram Protocol |
| IDPROM | ID Programmable Read-Only Memory |
| IFS | IOS File System |
| IGMP | Internet Group Management Protocol |
| IGRP | Interior Gateway Routing Protocol |

| | |
|---|---|
| ILMI | Integrated Local Management Interface |
| IP | Internet Protocol |
| IPC | interprocessor communication |
| IPX | Internetwork Packet Exchange |
| IS-IS | Intermediate System-to-Intermediate System Intradomain Routing Protocol |
| ISL | Inter-Switch Link |
| ISO | International Organization of Standardization |
| ISR | Integrated SONET router |
| ISSU | In Service Software Upgrade |

## L

| | |
|---|---|
| L2 | Layer 2 |
| L3 | Layer 3 |
| L4 | Layer 4 |
| LAN | local area network |
| LANE | LAN Emulation |
| LAPB | Link Access Procedure, Balanced |
| LDA | Local Director Acceleration |
| LCP | Link Control Protocol |
| LEC | LAN Emulation Client |
| LECS | LAN Emulation Configuration Server |
| LEM | link error monitor |
| LER | link error rate |
| LES | LAN Emulation Server |
| LLC | Logical Link Control |
| LTL | Local Target Logic |

## M

| | |
|---|---|
| MAC | Media Access Control |
| MCL | Mismatched Command List |
| MD5 | Message Digest 5 |
| MET | Multicast Expansion Table |
| MFIB | Multicast Forwarding Information Base |
| MIB | Management Information Base |
| MII | media-independent interface |
| MLS | Multilayer Switching |
| MLSE | maintenance loop signaling entity |
| MOP | Maintenance Operation Protocol |
| MOTD | message-of-the-day |
| MRM | multicast routing monitor |
| MRQ | Multicast Replication Queue |
| MSDP | Multicast Source Discovery Protocol |
| MST | Multiple Spanning Tree |
| MTU | maximum transmission unit |
| MVAP | multiple VLAN access port |

## N

| | |
|---|---|
| NBP | Name Binding Protocol |
| NCIA | Native Client Interface Architecture |
| NDE | NetFlow Data Export |
| NET | network entity title |
| NetBIOS | Network Basic Input/Output System |
| NFFC | NetFlow Feature Card |

| | |
|---|---|
| NMP | Network Management Processor |
| NSAP | network service access point |
| NTP | Network Time Protocol |
| NVRAM | nonvolatile RAM |

## O

| | |
|---|---|
| OAM | Operation, Administration, and Maintenance |
| OSI | Open System Interconnection |
| OSPF | open shortest path first |

## P

| | |
|---|---|
| PAE | port access entity |
| PAgP | Port Aggregation Protocol |
| PBD | packet buffer daughterboard |
| PC | Personal Computer (formerly PCMCIA) |
| PCM | pulse code modulation |
| PCR | peak cell rate |
| PDP | policy decision point |
| PDU | protocol data unit |
| PEM | Power Entry Module |
| PEP | policy enforcement point |
| PGM | Pragmatic General Multicast |
| PHY | physical sublayer |
| PIB | policy information base |
| PIM | Protocol Independent Multicast |
| PM | Port manager |

| | |
|---|---|
| PPP | Point-to-Point Protocol |
| PRC | Parser Return Code |
| PRID | Policy Rule Identifiers |
| PVLAN | Private VLAN |
| PVST+ | Per VLAN Spanning Tree+ |

## Q

| | |
|---|---|
| QM | QoS manager |
| QoS | quality of service |

## R

| | |
|---|---|
| RACL | router interface access control list |
| RADIUS | Remote Access Dial-In User Service |
| RAM | random-access memory |
| RCP | Remote Copy Protocol |
| RGMP | Router Group Management Protocol |
| RIF | Routing Information Field |
| RMON | remote network monitor |
| ROM | read-only memory |
| RP | route processor or rendezvous point |
| RPC | remote procedure call |
| RPF | reverse path forwarding |
| RPR | Router Processor Redundancy |
| RSPAN | remote SPAN |
| RST | reset |

| | |
|---|---|
| RSVP | ReSerVation Protocol |
| Rx | Receive |

## S

| | |
|---|---|
| SAID | Security Association Identifier |
| SAP | service access point |
| SCM | service connection manager |
| SCP | Switch-Module Configuration Protocol |
| SDLC | Synchronous Data Link Control |
| SGBP | Stack Group Bidding Protocol |
| SIMM | single in-line memory module |
| SLB | server load balancing |
| SLCP | Supervisor Line-Card Processor |
| SLIP | Serial Line Internet Protocol |
| SMDS | Software Management and Delivery Systems |
| SMF | software MAC filter |
| SMP | Standby Monitor Present |
| SMRP | Simple Multicast Routing Protocol |
| SMT | Station Management |
| SNAP | Subnetwork Access Protocol |
| SNMP | Simple Network Management Protocol |
| SPAN | Switched Port Analyzer |
| SRB | source-route bridging |
| SRT | source-route transparent bridging |
| SSTP | Cisco Shared Spanning Tree |
| STP | Spanning Tree Protocol |

| | |
|---|---|
| SVC | switched virtual circuit |
| SVI | switched virtual interface |

## T

| | |
|---|---|
| TACACS+ | Terminal Access Controller Access Control System Plus |
| TARP | Target Identifier Address Resolution Protocol |
| TCAM | Ternary Content Addressable Memory |
| TCL | table contention level |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| TFTP | Trivial File Transfer Protocol |
| TIA | Telecommunications Industry Association |
| TLV | type-length-value |
| TopN | Utility that allows the user to analyze port traffic by reports |
| TOS | type of service |
| TrBRF | Token Ring Bridge Relay Function |
| TrCRF | Token Ring Concentrator Relay Function |
| TTL | Time To Live |
| TVX | valid transmission |
| Tx | Transmit |

## U

| | |
|---|---|
| UDLD | UniDirectional Link Detection Protocol |
| UDP | User Datagram Protocol |
| UNI | User-Network Interface |
| UTC | Coordinated Universal Time |

## V

| | |
|---|---|
| VACL | VLAN access control list |
| VCC | virtual channel circuit |
| VCD | virtual circuit descriptor |
| VCI | virtual circuit identifier |
| VCR | Virtual Configuration Register |
| VINES | Virtual Network System |
| VLAN | virtual LAN |
| VMPS | VLAN Membership Policy Server |
| VTP | VLAN Trunking Protocol |
| VVID | voice VLAN ID |

## W

| | |
|---|---|
| WFQ | weighted fair queueing |
| WRED | weighted random early detection |
| WRR | weighted round-robin |

## X

| | |
|---|---|
| XNS | Xerox Network System |

# INDEX

## Symbols



## Numerics



## A

## B



## C

## D

## E



## F



## G

## H



## I

## J



## L



## M

## N



## O



## P

## Q

## R



## S

## T

## U



## V