



## CHAPTER 2

# Catalyst 2960 Switch Cisco IOS Commands

## aaa accounting dot1x

Use the **aaa accounting dot1x** global configuration command to enable authentication, authorization, and accounting (AAA) accounting and to create method lists defining specific accounting methods on a per-line or per-interface basis for IEEE 802.1x sessions. Use the **no** form of this command to disable IEEE 802.1x accounting.

```
aaa accounting dot1x {name | default} start-stop {broadcast group {name | radius | tacacs+}
[group {name | radius | tacacs+} ... ] | group {name | radius | tacacs+} [group {name | radius
| tacacs+} ... ]}
```

```
no aaa accounting dot1x {name | default}
```

### Syntax Description

<b>name</b>	Name of a server group. This is optional when you enter it after the <b>broadcast group</b> and <b>group</b> keywords.
<b>default</b>	Use the accounting methods that follow as the default list for accounting services.
<b>start-stop</b>	Send a start accounting notice at the beginning of a process and a stop accounting notice at the end of a process. The start accounting record is sent in the background. The requested-user process begins regardless of whether or not the start accounting notice was received by the accounting server.
<b>broadcast</b>	Enable accounting records to be sent to multiple AAA servers and send accounting records to the first server in each group. If the first server is unavailable, the switch uses the list of backup servers to identify the first server.
<b>group</b>	Specify the server group to be used for accounting services. These are valid server group names: <ul style="list-style-type: none"><li>• <b>name</b>—Name of a server group.</li><li>• <b>radius</b>—List of all RADIUS hosts.</li><li>• <b>tacacs+</b>—List of all TACACS+ hosts.</li></ul> The <b>group</b> keyword is optional when you enter it after the <b>broadcast group</b> and <b>group</b> keywords. You can enter more than optional <b>group</b> keyword.
<b>radius</b>	(Optional) Enable RADIUS authorization.
<b>tacacs+</b>	(Optional) Enable TACACS+ accounting.



## ■ aaa accounting dot1x

**Defaults**

AAA accounting is disabled.

**Command Modes**

Global configuration

**Command History**

Release	Modification
12.2(25)FX	This command was introduced.

**Usage Guidelines**

This command requires access to a RADIUS server.

We recommend that you enter the **dot1x reauthentication** interface configuration command before configuring IEEE 802.1x RADIUS accounting on an interface.

**Examples**

This example shows how to configure IEEE 802.1x accounting:

```
Switch(config)# aaa new-model
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
<a href="#">aaa authentication dot1x</a>	Specifies one or more AAA methods for use on interfaces running IEEE 802.1x.
<a href="#">aaa new-model</a>	Enables the AAA access control model. For syntax information, see the <b>Cisco IOS Security Command Reference, Release 12.2 &gt; Authentication, Authorization, and Accounting &gt; Authentication Commands</b> .
<a href="#">dot1x reauthentication</a>	Enables or disables periodic reauthentication.
<a href="#">dot1x timeout reauth-period</a>	Sets the number of seconds between re-authentication attempts.



# aaa authentication dot1x

Use the **aaa authentication dot1x** global configuration command to specify the authentication, authorization, and accounting (AAA) method to use on ports complying with the IEEE 802.1x authentication. Use the **no** form of this command to disable authentication.

**aaa authentication dot1x {default} *method1***

**no aaa authentication dot1x {default}**

## Syntax Description

<b>default</b>	Use the listed authentication method that follows this argument as the default method when a user logs in.
<i>method1</i>	Enter the <b>group radius</b> keywords to use the list of all RADIUS servers for authentication.



### Note

Though other keywords are visible in the command-line help strings, only the **default** and **group radius** keywords are supported.

## Defaults

No authentication is performed.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

The *method* argument identifies the method that the authentication algorithm tries in the given sequence to validate the password provided by the client. The only method that is truly IEEE 802.1x-compliant is the **group radius** method, in which the client data is validated against a RADIUS authentication server.

If you specify **group radius**, you must configure the RADIUS server by entering the **radius-server host** global configuration command.

Use the **show running-config** privileged EXEC command to display the configured lists of authentication methods.

## Examples

This example shows how to enable AAA and how to create an IEEE 802.1x-compliant authentication list. This authentication first tries to contact a RADIUS server. If this action returns an error, the user is not allowed access to the network.

```
Switch(config)# aaa new-model
Switch(config)# aaa authentication dot1x default group radius
```

You can verify your settings by entering the **show running-config** privileged EXEC command.



Related Commands	Command	Description
	<b>aaa new-model</b>	Enables the AAA access control model. For syntax information, see the <b>Cisco IOS Security Command Reference, Release 12.2 &gt; Authentication, Authorization, and Accounting &gt; Authentication Commands</b> .
	<b>show running-config</b>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# aaa authorization network

Use the **aaa authorization network** global configuration command to configure the switch to use user-RADIUS authorization for all network-related service requests, such as IEEE 802.1x VLAN assignment. Use the **no** form of this command to disable RADIUS user authorization.

**aaa authorization network default group radius**

**no aaa authorization network default**

Syntax Description	<b>default group radius</b>	Use the list of all RADIUS hosts in the server group as the default authorization list.				
Defaults	Authorization is disabled.					
Command Modes	Global configuration					
Command History	<table><tr><th>Release</th><th>Modification</th></tr><tr><td>12.2(25)FX</td><td>This command was introduced.</td></tr></table>	Release	Modification	12.2(25)FX	This command was introduced.	
Release	Modification					
12.2(25)FX	This command was introduced.					
Usage Guidelines	<p>Use the <b>aaa authorization network default group radius</b> global configuration command to allow the switch to download IEEE 802.1x authorization parameters from the RADIUS servers in the default authorization list. The authorization parameters are used by features such as VLAN assignment to get parameters from the RADIUS servers.</p> <p>Use the <b>show running-config</b> privileged EXEC command to display the configured lists of authorization methods.</p>					
Examples	<p>This example shows how to configure the switch for user RADIUS authorization for all network-related service requests:</p> <pre>Switch(config)# <b>aaa authorization network default group radius</b></pre> <p>You can verify your settings by entering the <b>show running-config</b> privileged EXEC command.</p>					
Related Commands	<table><tr><th>Command</th><th>Description</th></tr><tr><td><b>show running-config</b></td><td>Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b>.</td></tr></table>	Command	Description	<b>show running-config</b>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .	
Command	Description					
<b>show running-config</b>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .					



# archive download-sw

Use the **archive download-sw** privileged EXEC command to download a new image from a TFTP server to the switch and to overwrite or keep the existing image.

**archive download-sw** {/force-reload | /imageonly | /leave-old-sw | /no-set-boot | /overwrite | /reload | /safe} *source-url*

Syntax Description		
	<b>/force-reload</b>	Unconditionally force a system reload after successfully downloading the software image.
	<b>/imageonly</b>	Download only the software image but not the HTML files associated with the embedded device manager. The HTML files for the existing version are deleted only if the existing version is being overwritten or removed.
	<b>/leave-old-sw</b>	Keep the old software version after a successful download.
	<b>/no-set-boot</b>	Do not alter the setting of the BOOT environment variable to point to the new software image after it is successfully downloaded.
	<b>/overwrite</b>	Overwrite the software image in flash memory with the downloaded one.
	<b>/reload</b>	Reload the system after successfully downloading the image unless the configuration has been changed and not been saved.
	<b>/safe</b>	Keep the current software image; do not delete it to make room for the new software image before the new image is downloaded. The current image is deleted after the download.
	<i>source-url</i>	<p>The source URL alias for a local or network file system. These options are supported:</p> <ul style="list-style-type: none"> <li>The syntax for the local flash file system: <b>flash:</b></li> <li>The syntax for the FTP: <b>ftp:[[/username[:password]@location]/directory]/image-name.tar</b></li> <li>The syntax for an HTTP server: <b>http://[[username:password]@]{hostname / host-ip}[/directory]/image-name.tar</b></li> <li>The syntax for a secure HTTP server: <b>https://[[username:password]@]{hostname / host-ip}[/directory]/image-name.tar</b></li> <li>The syntax for the Remote Copy Protocol (RCP): <b>rcp:[[/username@location]/directory]/image-name.tar</b></li> <li>The syntax for the TFTP: <b>tftp:[[/location]/directory]/image-name.tar</b></li> </ul> <p>The <i>image-name.tar</i> is the software image to download and install on the switch.</p>

## Defaults

The current software image is not overwritten with the downloaded image.

Both the software image and HTML files are downloaded.

The new image is downloaded to the flash: file system.



The BOOT environment variable is changed to point to the new software image on the flash: file system. Image names are case sensitive; the image file is provided in tar format.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

The **/imageonly** option removes the HTML files for the existing image if the existing image is being removed or replaced. Only the Cisco IOS image (without the HTML files) is downloaded.

Using the **/safe** or **/leave-old-sw** option can cause the new image download to fail if there is insufficient flash memory. If leaving the software in place prevents the new image from fitting in flash memory due to space constraints, an error results.

If you used the **/leave-old-sw** option and did not overwrite the old image when you downloaded the new one, you can remove the old image by using the **delete** privileged EXEC command. For more information, see the [“delete” section on page 2-65](#).

Use the **/overwrite** option to overwrite the image on the flash device with the downloaded one.

If you specify the command *without* the **/overwrite** option, the download algorithm verifies that the new image is not the same as the one on the switch flash device. If the images are the same, the download does not occur. If the images are different, the old image is deleted, and the new one is downloaded.

After downloading a new image, enter the **reload** privileged EXEC command to begin using the new image, or specify the **/reload** or **/force-reload** option in the **archive download-sw** command.

**Examples**

This example shows how to download a new image from a TFTP server at 172.20.129.10 and to overwrite the image on the switch:

```
Switch# archive download-sw /overwrite tftp://172.20.129.10/test-image.tar
```

This example shows how to download only the software image from a TFTP server at 172.20.129.10 to the switch:

```
Switch# archive download-sw /imageonly tftp://172.20.129.10/test-image.tar
```

This example shows how to keep the old software version after a successful download:

```
Switch# archive download-sw /leave-old-sw tftp://172.20.129.10/test-image.tar
```

Related Commands	Command	Description
	<a href="#">archive tar</a>	Creates a tar file, lists the files in a tar file, or extracts the files from a tar file.
	<a href="#">archive upload-sw</a>	Uploads an existing image on the switch to a server.
	<a href="#">delete</a>	Deletes a file or directory on the flash memory device.



# archive tar

Use the **archive tar** privileged EXEC command to create a tar file, list files in a tar file, or extract the files from a tar file.

```
archive tar {/create destination-url flash:/file-url} | {/table source-url} | {/xtract source-url
flash:/file-url [dir/file...]}
```

## Syntax Description

**/create** *destination-url*  
**flash:**/*file-url*

Create a new tar file on the local or network file system.

For *destination-url*, specify the destination URL alias for the local or network file system and the name of the tar file to create. These options are supported:

- The syntax for the local flash filesystem:  
**flash:**
- The syntax for the FTP:  
**ftp:**[[/*username[:password]*@*location*]/*directory*]/*tar-filename.tar*
- The syntax for an HTTP server:  
**http:**[[/*username:password*]@]{*hostname* /  
*host-ip*}/*directory*]/*image-name.tar*
- The syntax for a secure HTTP server:  
**https:**[[/*username:password*]@]{*hostname* /  
*host-ip*}/*directory*]/*image-name.tar*
- The syntax for the Remote Copy Protocol (RCP) is:  
**rnp:**[[/*username*@*location*]/*directory*]/*tar-filename.tar*
- The syntax for the TFTP:  
**tftp:**[[/*location*]/*directory*]/*tar-filename.tar*

The *tar-filename.tar* is the tar file to be created.

For **flash:**/*file-url*, specify the location on the local flash file system from which the new tar file is created.

An optional list of files or directories within the source directory can be specified to write to the new tar file. If none are specified, all files and directories at this level are written to the newly created tar file.



<b>/table</b> <i>source-url</i>	<p>Display the contents of an existing tar file to the screen.</p> <p>For <i>source-url</i>, specify the source URL alias for the local or network file system. These options are supported:</p> <ul style="list-style-type: none"> <li>• The syntax for the local flash file system: <b>flash:</b></li> <li>• The syntax for the FTP: <b>ftp:</b>[[//username[:password]@location]/directory]/tar-filename.tar</li> <li>• The syntax for an HTTP server: <b>http:</b>[[//username:password]@]{hostname / host-ip}/[directory]/image-name.tar</li> <li>• The syntax for a secure HTTP server: <b>https:</b>[[//username:password]@]{hostname / host-ip}/[directory]/image-name.tar</li> <li>• The syntax for the RCP: <b>rcp:</b>[[//username@location]/directory]/tar-filename.tar</li> <li>• The syntax for the TFTP: <b>tftp:</b>[[//location]/directory]/tar-filename.tar</li> </ul> <p>The <i>tar-filename.tar</i> is the tar file to display.</p>
<b>/xtract</b> <i>source-url</i> <b>flash:/file-url</b> [ <i>dir/file...</i> ]	<p>Extract files from a tar file to the local file system.</p> <p>For <i>source-url</i>, specify the source URL alias for the local file system. These options are supported:</p> <ul style="list-style-type: none"> <li>• The syntax for the local flash file system: <b>flash:</b></li> <li>• The syntax for the FTP: <b>ftp:</b>[[//username[:password]@location]/directory]/tar-filename.tar</li> <li>• The syntax for an HTTP server: <b>http:</b>[[//username:password]@]{hostname / host-ip}/[directory]/image-name.tar</li> <li>• The syntax for a secure HTTP server: <b>https:</b>[[//username:password]@]{hostname / host-ip}/[directory]/image-name.tar</li> <li>• The syntax for the RCP: <b>rcp:</b>[[//username@location]/directory]/tar-filename.tar</li> <li>• The syntax for the TFTP: <b>tftp:</b>[[//location]/directory]/tar-filename.tar</li> </ul> <p>The <i>tar-filename.tar</i> is the tar file from which to extract.</p> <p>For <b>flash:/file-url</b> [<i>dir/file...</i>], specify the location on the local flash file system into which the tar file is extracted. Use the <i>dir/file...</i> option to specify an optional list of files or directories within the tar file to be extracted. If none are specified, all files and directories are extracted.</p>

**Defaults**

There is no default setting.



**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines** Filenames and directory names are case sensitive.  
Image names are case sensitive.

### Examples

This example shows how to create a tar file. The command writes the contents of the *new-configs* directory on the local flash device to a file named *saved.tar* on the TFTP server at 172.20.10.30:

```
Switch# archive tar /create tftp:172.20.10.30/saved.tar flash:/new-configs
```

This example shows how to display the contents of the *c2960-lanbase-tar.12-25.FX* file that is in flash memory. The contents of the tar file appear on the screen:

```
Switch# archive tar /table flash:c2960-lanbase-tar.12-25.FX.tar
info (219 bytes)

c2960-lanbase-mz.12-25.FX/ (directory)
c2960-lanbase-mz.12-25.FX (610856 bytes)
c2960-lanbase-mz.12-25.FX/info (219 bytes)
info.ver (219 bytes)
```

This example shows how to display only the *c2960-lanbase-12-25.FX/html* directory and its contents:

```
Switch# archive tar /table flash:c2960-lanbase-12-25.FX.tar c2960-lanbase-12-25/html
c2960-lanbase-mz.12-25.FX/html/ (directory)
c2960-lanbase-mz.12-25.FX/html/const.htm (556 bytes)
c2960-lanbase-mz.12-25.FX/html/xhome.htm (9373 bytes)
c2960-lanbase-mz.12-25.FX/html/menu.css (1654 bytes)
<output truncated>
```

This example shows how to extract the contents of a tar file on the TFTP server at 172.20.10.30. This command extracts just the *new-configs* directory into the root directory on the local flash file system. The remaining files in the *saved.tar* file are ignored.

```
Switch# archive tar /xtract tftp:/172.20.10.30/saved.tar flash:/ new-configs
```

Related Commands	Command	Description
	<a href="#">archive download-sw</a>	Downloads a new image from a TFTP server to the switch.
	<a href="#">archive upload-sw</a>	Uploads an existing image on the switch to a server.



# archive upload-sw

Use the **archive upload-sw** privileged EXEC command to upload an existing switch image to a server.

**archive upload-sw** [/version *version\_string*] **destination-url**

Syntax Description	
<b>/version</b> <i>version_string</i>	(Optional) Specify the specific version string of the image to be uploaded.
<b>destination-url</b>	<p>The destination URL alias for a local or network file system. These options are supported:</p> <ul style="list-style-type: none"> <li>The syntax for the local flash file system: <b>flash:</b></li> <li>The syntax for the FTP: <b>ftp:[[/username[:password]@location]/directory]/image-name.tar</b></li> <li>The syntax for an HTTP server: <b>http://[[username:password]@]{hostname / host-ip}[/directory]/image-name.tar</b></li> <li>The syntax for a secure HTTP server: <b>https://[[username:password]@]{hostname / host-ip}[/directory]/image-name.tar</b></li> <li>The syntax for the Remote Copy Protocol (RCP): <b>rcp:[[/username@location]/directory]/image-name.tar</b></li> <li>The syntax for the TFTP: <b>tftp:[[/location]/directory]/image-name.tar</b></li> </ul> <p>The <b>image-name.tar</b> is the name of software image to be stored on the server.</p>

<b>Defaults</b>	Uploads the currently running image from the flash: file system.
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<b>Command Modes</b>	Privileged EXEC
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Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

Use the upload feature only if the HTML files associated with the embedded device manager have been installed with the existing image.

The files are uploaded in this sequence: the Cisco IOS image, the HTML files, and info. After these files are uploaded, the software creates the tar file.

Image names are case sensitive.



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**Examples**

This example shows how to upload the currently running image to a TFTP server at 172.20.140.2:

```
Switch# archive upload-sw tftp://172.20.140.2/test-image.tar
```

---

**Related Commands**

Command	Description
<a href="#">archive download-sw</a>	Downloads a new image to the switch.
<a href="#">archive tar</a>	Creates a tar file, lists the files in a tar file, or extracts the files from a tar file.



# auto qos voip

Use the **auto qos voip** interface configuration command to automatically configure quality of service (QoS) for voice over IP (VoIP) within a QoS domain. Use the **no** form of this command to return to the default setting.

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

**no auto qos voip** [ **cisco-phone** | **cisco-softphone** | **trust** ]

## Syntax Description

<b>cisco-phone</b>	Identify this port as connected to a Cisco IP Phone, and automatically configure QoS for VoIP. The QoS labels of incoming packets are trusted only when the telephone is detected.
<b>cisco-softphone</b>	Identify this port as connected to a device running the Cisco SoftPhone, and automatically configure QoS for VoIP.
<b>trust</b>	Identify this port as connected to a trusted switch or router, and automatically configure QoS for VoIP. The QoS labels of incoming packets are trusted. For nonrouted ports, the CoS value of the incoming packet is trusted.

## Defaults

Auto-QoS is disabled on the port.

When auto-QoS is enabled, it uses the ingress packet label to categorize traffic, to assign packet labels, and to configure the ingress and egress queues as shown in [Table 2-1](#).

**Table 2-1** Traffic Types, Packet Labels, and Queues

	VoIP Data Traffic	VoIP Control Traffic	Routing Protocol Traffic	STP <sup>1</sup> BPDU <sup>2</sup> Traffic	Real-Time Video Traffic	All Other Traffic
DSCP <sup>3</sup>	46	24, 26	48	56	34	—
CoS <sup>4</sup>	5	3	6	7	3	—
CoS-to-Ingress Queue Map	2, 3, 4, 5, 6, 7 (queue 2)					0, 1 (queue 1)
CoS-to-Egress Queue Map	5 (queue 1)	3, 6, 7 (queue 2)			4 (queue 3)	2 (queue 3) 0, 1 (queue 4)

1. STP = Spanning Tree Protocol
2. BPDU = bridge protocol data unit
3. DSCP = Differentiated Services Code Point
4. CoS = class of service



Table 2-2 shows the generated auto-QoS configuration for the ingress queues.

**Table 2-2 Auto-QoS Configuration for the Ingress Queues**

Ingress Queue	Queue Number	CoS-to-Queue Map	Queue Weight (Bandwidth)	Queue (Buffer) Size
SRR <sup>1</sup> shared	1	0, 1	81 percent	67 percent
Priority	2	2, 3, 4, 5, 6, 7	19 percent	33 percent

1. SRR = shaped round robin. Ingress queues support shared mode only.

Table 2-3 shows the generated auto-QoS configuration for the egress queues.

**Table 2-3 Auto-QoS Configuration for the Egress Queues**

Egress Queue	Queue Number	CoS-to-Queue Map	Queue Weight (Bandwidth)	Queue (Buffer) Size for Gigabit-Capable Ports	Queue (Buffer) Size for 10/100 Ethernet Ports
Priority (shaped)	1	5	10 percent	16 percent	10 percent
SRR shared	2	3, 6, 7	10 percent	6 percent	10 percent
SRR shared	3	2, 4	60 percent	17 percent	26 percent
SRR shared	4	0, 1	20 percent	61 percent	54 percent

#### Command Modes

Interface configuration

#### Command History

Release	Modification
12.2(25)FX	This command was introduced.

#### Usage Guidelines

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

Auto-QoS configures the switch for VoIP with Cisco IP Phones on switch and routed ports and for VoIP with devices running the Cisco SoftPhone application. These releases support only Cisco IP SoftPhone Version 1.3(3) or later. Connected devices must use Cisco Call Manager Version 4 or later.

To take advantage of the auto-QoS defaults, you should enable auto-QoS before you configure other QoS commands. You can fine-tune the auto-QoS configuration *after* you enable auto-QoS.



#### Note

The switch applies the auto-QoS-generated commands as if the commands were entered from the command-line interface (CLI). An existing user configuration can cause the application of the generated commands to fail or to be overridden by the generated commands. These actions occur without warning. If all the generated commands are successfully applied, any user-entered configuration that was not overridden remains in the running configuration. Any user-entered configuration that was overridden can be retrieved by reloading the switch without saving the current configuration to memory. If the generated commands fail to be applied, the previous running configuration is restored.



If this is the first port on which you have enabled auto-QoS, the auto-QoS-generated global configuration commands are executed followed by the interface configuration commands. If you enable auto-QoS on another port, only the auto-QoS-generated interface configuration commands for that port are executed.

When you enable the auto-QoS feature on the first port, these automatic actions occur:

- QoS is globally enabled (**mls qos** global configuration command), and other global configuration commands are added.
- When you enter the **auto qos voip cisco-phone** interface configuration command on a port at the edge of the network that is connected to a Cisco IP Phone, the switch enables the trusted boundary feature. The switch 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 port is set to trust the QoS label received in the packet. When a Cisco IP Phone is absent, the ingress classification is set to not trust the QoS label in the packet. The switch configures ingress and egress queues on the port according to the settings in [Table 2-2](#) and [Table 2-3](#).
- When you enter the **auto qos voip cisco-softphone** interface configuration command on a port at the edge of the network that is connected to a device running the Cisco SoftPhone, the switch uses policing to decide whether a packet is in or out of profile and to specify the action on the packet. If the packet does not have a DSCP value of 24, 26, or 46 or is out of profile, the switch changes the DSCP value to 0. The switch configures ingress and egress queues on the port according to the settings in [Table 2-2](#) and [Table 2-3](#).
- When you enter the **auto qos voip trust** interface configuration command on a port connected to the interior of the network, the switch trusts the CoS value for nonrouted ports in ingress packets (the assumption is that traffic has already been classified by other edge devices). The switch configures the ingress and egress queues on the port according to the settings in [Table 2-2](#) and [Table 2-3](#).

You can enable auto-QoS on static, dynamic-access, and voice VLAN access, and trunk ports. When enabling auto-QoS with a Cisco IP Phone on a routed port, you must assign a static IP address to the IP phone.

**Note**

When a device running Cisco SoftPhone is connected to a switch or routed port, the switch supports only one Cisco SoftPhone application per port.

After auto-QoS is enabled, do not modify a policy map or aggregate policer that includes *AutoQoS* in its name. If you need to modify the policy map or aggregate policer, make a copy of it, and change the copied policy map or policer. To use the new policy map instead of the generated one, remove the generated policy map from the interface, and apply the new policy map.

To display the QoS configuration that is automatically generated when auto-QoS is enabled, enable debugging before you enable auto-QoS. Use the **debug auto qos** privileged EXEC command to enable auto-QoS debugging. For more information, see the [debug auto qos](#) command.

To disable auto-QoS on a port, use the **no auto qos voip** interface configuration command. Only the auto-QoS-generated interface configuration commands for this port are removed. If this is the last port on which auto-QoS is enabled and you enter the **no auto qos voip** command, auto-QoS is considered disabled even though the auto-QoS-generated global configuration commands remain (to avoid disrupting traffic on other ports affected by the global configuration). You can use the **no mls qos** global configuration command to disable the auto-QoS-generated global configuration commands. With QoS disabled, there is no concept of trusted or untrusted ports because the packets are not modified (the CoS, DSCP, and IP precedence values in the packet are not changed). Traffic is switched in pass-through mode (packets are switched without any rewrites and classified as best effort without any policing).



**Examples**

This example shows how to enable auto-QoS and to trust the QoS labels received in incoming packets when the switch or router connected to the port is a trusted device:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# auto qos voip trust
```

You can verify your settings by entering the **show auto qos interface interface-id** privileged EXEC command.

**Related Commands**

Command	Description
<a href="#">debug auto qos</a>	Enables debugging of the auto-QoS feature.
<a href="#">mls qos cos</a>	Defines the default CoS value of a port or assigns the default CoS to all incoming packets on the port.
<a href="#">mls qos map {cos-dscp dscp1 ... dscp8   dscp-cos dscp-list to cos}</a>	Defines the CoS-to-DSCP map or the DSCP-to-CoS map.
<a href="#">mls qos queue-set output buffers</a>	Allocates buffers to a queue-set.
<a href="#">mls qos srr-queue input bandwidth</a>	Assigns shaped round robin (SRR) weights to an ingress queue.
<a href="#">mls qos srr-queue input buffers</a>	Allocates the buffers between the ingress queues.
<a href="#">mls qos srr-queue input cos-map</a>	Maps CoS values to an ingress queue or maps CoS values to a queue and to a threshold ID.
<a href="#">mls qos srr-queue input dscp-map</a>	Maps DSCP values to an ingress queue or maps DSCP values to a queue and to a threshold ID.
<a href="#">mls qos srr-queue input priority-queue</a>	Configures the ingress priority queue and guarantees bandwidth.
<a href="#">mls qos srr-queue output cos-map</a>	Maps CoS values to an egress queue or maps CoS values to a queue and to a threshold ID.
<a href="#">mls qos srr-queue output dscp-map</a>	Maps DSCP values to an egress queue or maps DSCP values to a queue and to a threshold ID.
<a href="#">mls qos trust</a>	Configures the port trust state.
<a href="#">queue-set</a>	Maps a port to a queue-set.
<a href="#">show auto qos</a>	Displays auto-QoS information.
<a href="#">show mls qos interface</a>	Displays QoS information at the port level.
<a href="#">srr-queue bandwidth shape</a>	Assigns the shaped weights and enables bandwidth shaping on the four egress queues mapped to a port.
<a href="#">srr-queue bandwidth share</a>	Assigns the shared weights and enables bandwidth sharing on the four egress queues mapped to a port.



# boot boothlpr

Use the **boot boothlpr** global configuration command to load a special Cisco IOS image, which when loaded into memory, can load a second Cisco IOS image into memory and launch it. This variable is used only for internal development and testing. Use the **no** form of this command to return to the default setting.

**boot boothlpr** *filesystem:/file-url*

**no boot boothlpr**

Syntax Description	<i>filesystem:</i>	Alias for a flash file system. Use <b>flash:</b> for the system board flash device.
	<i>/file-url</i>	The path (directory) and name of a bootable helper image.

Defaults	No helper image is loaded.
----------	----------------------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	Filenames and directory names are case sensitive.
	This command changes the setting of the BOOTHLP environment variable. For more information, see <a href="#">Appendix A, “Catalyst 2960 Switch Bootloader Commands.”</a>

Related Commands	Command	Description
	<a href="#">show boot</a>	Displays the settings of the boot environment variables.



# boot config-file

Use the **boot config-file** global configuration command to specify the filename that Cisco IOS uses to read and write a nonvolatile copy of the system configuration. Use the **no** form of this command to return to the default setting.

**boot config-file flash:/file-url**

**no boot config-file**

Syntax Description	<b>flash:/file-url</b> The path (directory) and name of the configuration file.	
Defaults	The default configuration file is flash:config.text.	
Command Modes	Global configuration	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.
Usage Guidelines	<p>Filenames and directory names are case sensitive.</p> <p>This command changes the setting of the CONFIG_FILE environment variable. For more information, see <a href="#">Appendix A, “Catalyst 2960 Switch Bootloader Commands.”</a></p>	
Related Commands	Command	Description
	<a href="#">show boot</a>	Displays the settings of the boot environment variables.



# boot enable-break

Use the **boot enable-break** global configuration command to enable interrupting the automatic boot process. Use the **no** form of this command to return to the default setting.

**boot enable-break**

**no boot enable-break**

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

<b>Defaults</b>	Disabled. The automatic boot process cannot be interrupted by pressing the Break key on the console.
-----------------	--

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

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	When you enter this command, you can interrupt the automatic boot process by pressing the Break key on the console after the flash file system is initialized.
-------------------------	--

**Note**

Despite the setting of this command, you can interrupt the automatic boot process at any time by pressing the MODE button on the switch front panel.

This command changes the setting of the ENABLE\_BREAK environment variable. For more information, see [Appendix A, “Catalyst 2960 Switch Bootloader Commands.”](#)

Related Commands	Command	Description
	<a href="#">show boot</a>	Displays the settings of the boot environment variables.



# boot helper

Use the **boot helper** global configuration command to dynamically load files during boot loader initialization to extend or patch the functionality of the boot loader. Use the **no** form of this command to return to the default.

**boot helper** *filesystem:/file-url ...*

**no boot helper**

Syntax Description	<i>filesystem:</i>	Alias for a flash file system. Use <b>flash:</b> for the system board flash device.
	<i>/file-url</i>	The path (directory) and a list of loadable files to dynamically load during loader initialization. Separate each image name with a semicolon.

Defaults	No helper files are loaded.
----------	-----------------------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	This variable is used only for internal development and testing.
	Filenames and directory names are case sensitive.
	This command changes the setting of the HELPER environment variable. For more information, see <a href="#">Appendix A, “Catalyst 2960 Switch Bootloader Commands.”</a>

Related Commands	Command	Description
	<b>show boot</b>	Displays the settings of the boot environment variables.



# boot helper-config-file

Use the **boot helper-config-file** global configuration command to specify the name of the configuration file to be used by the Cisco IOS helper image. If this is not set, the file specified by the CONFIG\_FILE environment variable is used by all versions of Cisco IOS that are loaded. Use the **no** form of this command to return to the default setting.

**boot helper-config-file** *filesystem:/file-url*

**no boot helper-config file**

Syntax Description	<i>filesystem:</i>	Alias for a flash file system. Use <b>flash:</b> for the system board flash device.
	<i>/file-url</i>	The path (directory) and helper configuration file to load.

Defaults	No helper configuration file is specified.
----------	--

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	This variable is used only for internal development and testing.
	Filenames and directory names are case sensitive.
	This command changes the setting of the HELPER_CONFIG_FILE environment variable. For more information, see <a href="#">Appendix A, “Catalyst 2960 Switch Bootloader Commands.”</a>

Related Commands	Command	Description
	<a href="#">show boot</a>	Displays the settings of the boot environment variables.



# boot manual

Use the **boot manual** global configuration command to enable manually booting the switch during the next boot cycle. Use the **no** form of this command to return to the default setting.

**boot manual**

**no boot manual**

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

<b>Defaults</b>	Manual booting is disabled.
-----------------	-----------------------------

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

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	The next time you reboot the system, the switch is in boot loader mode, which is shown by the <i>switch:</i> prompt. To boot up the system, use the <b>boot</b> boot loader command, and specify the name of the bootable image.
-------------------------	--

This command changes the setting of the MANUAL\_BOOT environment variable. For more information, see [Appendix A, “Catalyst 2960 Switch Bootloader Commands.”](#)

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<a href="#">show boot</a>	Displays the settings of the boot environment variables.



# boot private-config-file

Use the **boot private-config-file** global configuration command to specify the filename that Cisco IOS uses to read and write a nonvolatile copy of the private configuration. Use the **no** form of this command to return to the default setting.

**boot private-config-file** *filename*

**no boot private-config-file**

Syntax Description	<i>filename</i>	The name of the private configuration file.
--------------------	-----------------	---

Defaults	The default configuration file is <i>private-config</i> .
----------	---

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	Filenames are case sensitive.
------------------	-------------------------------

Examples	This example shows how to specify the name of the private configuration file to be <i>pconfig</i> : <pre>Switch(config)# boot private-config-file pconfig</pre>
----------	--

Related Commands	Command	Description
	<a href="#">show boot</a>	Displays the settings of the boot environment variables.



# boot system

Use the **boot system** global configuration command to specify the Cisco IOS image to load during the next boot cycle. Use the **no** form of this command to return to the default setting.

**boot system** *filesystem:/file-url* ...

**no boot system**

## Syntax Description

<i>filesystem:</i>	Alias for a flash file system. Use <b>flash:</b> for the system board flash device.
<i>/file-url</i>	The path (directory) and name of a bootable image. Separate image names with a semicolon.

## Defaults

The switch attempts to automatically boot up the system by using information in the BOOT environment variable. If this variable is not set, the switch attempts to load and execute the first executable image it can by performing a recursive, depth-first search throughout the flash file system. In a depth-first search of a directory, each encountered subdirectory is completely searched before continuing the search in the original directory.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

Filenames and directory names are case sensitive.

If you are using the **archive download-sw** privileged EXEC command to maintain system images, you never need to use the **boot system** command. The **boot system** command is automatically manipulated to load the downloaded image.

This command changes the setting of the BOOT environment variable. For more information, see [Appendix A, “Catalyst 2960 Switch Bootloader Commands.”](#)

## Related Commands

Command	Description
<a href="#">show boot</a>	Displays the settings of the boot environment variables.



# channel-group

Use the **channel-group** interface configuration command to assign an Ethernet port to an EtherChannel group, to enable an EtherChannel mode, or both. Use the **no** form of this command to remove an Ethernet port from an EtherChannel group.

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

**no channel-group**

PAgP modes:

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

LACP modes:

**channel-group** *channel-group-number* **mode** { **active** | **passive** }

On mode:

**channel-group** *channel-group-number* **mode on**

## Syntax Description

<i>channel-group-number</i>	Specify the channel group number. The range is 1 to 6.
<b>mode</b>	Specify the EtherChannel mode.
<b>active</b>	Unconditionally enable Link Aggregation Control Protocol (LACP).  Active mode places a port into a negotiating state in which the port initiates negotiations with other ports by sending LACP packets. A channel is formed with another port group in either the active or passive mode.
<b>auto</b>	Enable the Port Aggregation Protocol (PAgP) only if a PAgP device is detected.  Auto mode places a port into a passive negotiating state in which the port responds to PAgP packets it receives but does not start PAgP packet negotiation. A channel is formed only with another port group in desirable mode. When <b>auto</b> is enabled, silent operation is the default.
<b>desirable</b>	Unconditionally enable PAgP.  Desirable mode places a port into an active negotiating state in which the port starts negotiations with other ports by sending PAgP packets. An EtherChannel is formed with another port group that is in the desirable or auto mode. When <b>desirable</b> is enabled, silent operation is the default.
<b>non-silent</b>	(Optional) Use in PAgP mode with the <b>auto</b> or <b>desirable</b> keyword when traffic is expected from the other device.
<b>on</b>	Enable <b>on</b> mode.  In <b>on</b> mode, a usable EtherChannel exists only when both connected port groups are in the <b>on</b> mode.
<b>passive</b>	Enable LACP only if a LACP device is detected.  Passive mode places a port into a negotiating state in which the port responds to received LACP packets but does not initiate LACP packet negotiation. A channel is formed only with another port group in active mode.



**Defaults**

No channel groups are assigned.  
No mode is configured.

**Command Modes**

Interface configuration

**Command History**

Release	Modification
12.2(25)FX	This command was introduced.

**Usage Guidelines**

For Layer 2 EtherChannels, you do not have to create a port-channel interface first by using the **interface port-channel** global configuration command before assigning a physical port to a channel group. Instead, you can use the **channel-group** interface configuration command. It automatically creates the port-channel interface when the channel group gets its first physical port if the logical interface is not already created. If you create the port-channel interface first, the *channel-group-number* can be the same as the *port-channel-number*, or you can use a new number. If you use a new number, the **channel-group** command dynamically creates a new port channel.

After you configure an EtherChannel, configuration changes that you make on the port-channel interface apply to all the physical ports assigned to the port-channel interface. Configuration changes applied to the physical port affect only the port where you apply the configuration. To change the parameters of all ports in an EtherChannel, apply configuration commands to the port-channel interface, for example, spanning-tree commands or commands to configure a Layer 2 EtherChannel as a trunk.

If you do not specify **non-silent** with the **auto** or **desirable** mode, silent is assumed. The silent mode is used when the switch is connected to a device that is not PAgP-capable and seldom, if ever, sends packets. A example of a silent partner is a file server or a packet analyzer that is not generating traffic. In this case, running PAgP on a physical port prevents that port from ever becoming operational. However, it allows PAgP to operate, to attach the port to a channel group, and to use the port for transmission. Both ends of the link cannot be set to silent.

In the **on** mode, an EtherChannel exists only when a port group in the **on** mode is connected to another port group in the **on** mode.

**Caution**

You should use care when using the **on** mode. This is a manual configuration, and ports on both ends of the EtherChannel must have the same configuration. If the group is misconfigured, packet loss or spanning-tree loops can occur.

Do not configure an EtherChannel in both the PAgP and LACP modes. EtherChannel groups running PAgP and LACP can coexist on the same switch. Individual EtherChannel groups can run either PAgP or LACP, but they cannot interoperate.

If you set the protocol by using the **channel-protocol** interface configuration command, the setting is not overridden by the **channel-group** interface configuration command.

Do not configure a port that is an active or a not-yet-active member of an EtherChannel as an IEEE 802.1x port. If you try to enable IEEE 802.1x authentication on an EtherChannel port, an error message appears, and IEEE 802.1x authentication is not enabled.

Do not configure a secure port as part of an EtherChannel or an EtherChannel port as a secure port.



For a complete list of configuration guidelines, see the “Configuring EtherChannels” chapter in the software configuration guide for this release.

### Examples

This example shows how to configure an EtherChannel. It assigns two static-access ports in VLAN 10 to channel 5 with the PAGP mode **desirable**:

```
Switch# configure terminal
Switch(config)# interface range gigabitethernet0/1 -2
Switch(config-if-range)# switchport mode access
Switch(config-if-range)# switchport access vlan 10
Switch(config-if-range)# channel-group 5 mode desirable
Switch(config-if-range)# end
```

This example shows how to configure an EtherChannel. It assigns two static-access ports in VLAN 10 to channel 5 with the LACP mode **active**:

```
Switch# configure terminal
Switch(config)# interface range gigabitethernet0/1 -2
Switch(config-if-range)# switchport mode access
Switch(config-if-range)# switchport access vlan 10
Switch(config-if-range)# channel-group 5 mode active
Switch(config-if-range)# end
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

### Related Commands

Command	Description
<a href="#">channel-protocol</a>	Restricts the protocol used on a port to manage channeling.
<a href="#">interface port-channel</a>	Accesses or creates the port channel.
<a href="#">show etherchannel</a>	Displays EtherChannel information for a channel.
<a href="#">show lacp</a>	Displays LACP channel-group information.
<a href="#">show pagp</a>	Displays PAGP channel-group information.
<a href="#">show running-config</a>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# channel-protocol

Use the **channel-protocol** interface configuration command to restrict the protocol used on a port to manage channeling. Use the **no** form of this command to return to the default setting.

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

**no channel-protocol**

Syntax Description	<b>lacp</b>	Configure an EtherChannel with the Link Aggregation Control Protocol (LACP).
	<b>pagp</b>	Configure an EtherChannel with the Port Aggregation Protocol (PAgP).

Defaults	No protocol is assigned to the EtherChannel.
----------	--

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

Use the **channel-protocol** command only to restrict a channel to LACP or PAgP. If you set the protocol by using the **channel-protocol** command, the setting is not overridden by the **channel-group** interface configuration command.

You must use the **channel-group** interface configuration command to configure the EtherChannel parameters. The **channel-group** command also can set the mode for the EtherChannel.

You cannot enable both the PAgP and LACP modes on an EtherChannel group.

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

**Examples**

This example shows how to specify LACP as the protocol that manages the EtherChannel:

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

You can verify your settings by entering the **show etherchannel [channel-group-number] protocol** privileged EXEC command.

Related Commands	Command	Description
	<b>channel-group</b>	Assigns an Ethernet port to an EtherChannel group.
	<b>show etherchannel protocol</b>	Displays protocol information the EtherChannel.



# class

Use the **class** policy-map configuration command to define a traffic classification match criteria (through the **police**, **set**, and **trust** policy-map class configuration commands) for the specified class-map name. Use the **no** form of this command to delete an existing class map.

**class** *class-map-name*

**no class** *class-map-name*

Syntax Description	<i>class-map-name</i>	Name of the class map.
Defaults	No policy map class-maps are defined.	
Command Modes	Policy-map configuration	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	<p>Before using the <b>class</b> command, you must use the <b>policy-map</b> global configuration command to identify the policy map and to enter policy-map configuration mode. After specifying a policy map, you can configure a policy for new classes or modify a policy for any existing classes in that policy map. You attach the policy map to a port by using the <b>service-policy</b> interface configuration command.</p> <p>After entering the <b>class</b> command, you enter policy-map class configuration mode, and these configuration commands are available:</p> <ul style="list-style-type: none"> <li>• <b>exit</b>: exits policy-map class configuration mode and returns to policy-map configuration mode.</li> <li>• <b>no</b>: returns a command to its default setting.</li> <li>• <b>police</b>: defines a policer or aggregate policer for the classified traffic. The policer specifies the bandwidth limitations and the action to take when the limits are exceeded. For more information, see the <b>police</b> and <b>police aggregate</b> policy-map class commands.</li> <li>• <b>set</b>: specifies a value to be assigned to the classified traffic. For more information, see the <b>set</b> command.</li> <li>• <b>trust</b>: defines a trust state for traffic classified with the <b>class</b> or the <b>class-map</b> command. For more information, see the <b>trust</b> command.</li> </ul> <p>To return to policy-map configuration mode, use the <b>exit</b> command. To return to privileged EXEC mode, use the <b>end</b> command.</p> <p>The <b>class</b> command performs the same function as the <b>class-map global configuration command</b>. Use the <b>class</b> command when a new classification, which is not shared with any other ports, is needed. Use the <b>class-map</b> command when the map is shared among many ports.</p>
------------------	--



## Examples

This example shows how to create a policy map called *policy1*. When attached to the ingress direction, it matches all the incoming traffic defined in *class1*, sets the IP Differentiated Services Code Point (DSCP) to 10, and polices the traffic at an average rate of 1 Mb/s and bursts at 20 KB. Traffic exceeding the profile is marked down to a DSCP value gotten from the policed-DSCP map and then sent.

```
Switch(config)# policy-map policy1
Switch(config-pmap)# class class1
Switch(config-pmap-c)# set dscp 10
Switch(config-pmap-c)# police 1000000 20000 exceed-action policed-dscp-transmit
Switch(config-pmap-c)# exit
```

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

## Related Commands

Command	Description
<b>class-map</b>	Creates a class map to be used for matching packets to the class whose name you specify.
<b>police</b>	Defines a policer for classified traffic.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy.
<b>set</b>	Classifies IP traffic by setting a DSCP or IP-precedence value in the packet.
<b>show policy-map</b>	Displays quality of service (QoS) policy maps.
<b>trust</b>	Defines a trust state for the traffic classified through the <b>class</b> policy-map configuration command or the <b>class-map</b> global configuration command.



# class-map

Use the **class-map** global configuration command to create a class map to be used for matching packets to the class name you specify and to enter class-map configuration mode. Use the **no** form of this command to delete an existing class map and to return to global configuration mode.

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

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

Syntax Description	<b>match-all</b>	(Optional) Perform a logical-AND of all matching statements under this class map. All criteria in the class map must be matched.
	<b>match-any</b>	(Optional) Perform a logical-OR of the matching statements under this class map. One or more criteria must be matched.
	<i>class-map-name</i>	Name of the class map.

Defaults	No class maps are defined. If neither the <b>match-all</b> or <b>match-any</b> keyword is specified, the default is <b>match-all</b> .
----------	---

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	<p>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.</p> <p>The <b>class-map</b> command and its subcommands are used to define packet classification, marking, and aggregate policing as part of a globally named service policy applied on a per-port basis.</p> <p>After you are in quality of service (QoS) class-map configuration mode, these configuration commands are available:</p> <ul style="list-style-type: none"><li>• <b>description</b>: describes the class map (up to 200 characters). The <b>show class-map</b> privileged EXEC command displays the description and the name of the class-map.</li><li>• <b>exit</b>: exits from QoS class-map configuration mode.</li><li>• <b>match</b>: configures classification criteria. For more information, see the <a href="#">match (class-map configuration)</a> command.</li><li>• <b>no</b>: removes a match statement from a class map.</li><li>• <b>rename</b>: renames the current class map. If you rename a class map with a name that is already used, the message <code>A class-map with this name already exists</code> appears.</li></ul>
------------------	--



To define packet classification on a physical-port basis, only one **match** command per class map is supported. In this situation, the **match-all** and **match-any** keywords are equivalent.

Only one access control list (ACL) can be configured in a class map. The ACL can have multiple access control entries (ACEs).

### Examples

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

```
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
```

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

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

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

### Related Commands

Command	Description
<b>class</b>	Defines a traffic classification match criteria (through the <b>police</b> , <b>set</b> , and <b>trust</b> policy-map class configuration commands) for the specified class-map name.
<b>match (class-map configuration)</b>	Defines the match criteria to classify traffic.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy.
<b>show class-map</b>	Displays QoS class maps.



# clear dot1x

Use the **clear dot1x** privileged EXEC command to clear IEEE 802.1x information for the switch or for the specified port.

**clear dot1x** {**all** | **interface** *interface-id*}

Syntax Description	<b>all</b>	Clear all IEEE 802.1x information for the switch.
	<b>interface</b> <i>interface-id</i>	Clear IEEE 802.1x information for the specified interface.

Defaults	No default is defined.
----------	------------------------

Command Modes	Privileged EXEC
---------------	-----------------

Command History	Release	Modification
	12.2(25)SEE	This command was introduced.

Usage Guidelines	You can clear all the information by using the <b>clear dot1x all</b> command, or you can clear only the information for the specified interface by using the <b>clear dot1x interface</b> <i>interface-id</i> command.
------------------	---

Examples	This example shows how to clear all IEEE 802.1x information:
	Switch# <b>clear dot1x all</b>
	This example shows how to clear IEEE 802.1x information for the specified interface:
	Switch# <b>clear dot1x interface gigabithernet0/1</b>
	You can verify that the information was deleted by entering the <b>show dot1x</b> privileged EXEC command.

Related Commands	Command	Description
	<a href="#">show dot1x</a>	Displays IEEE 802.1x statistics, administrative status, and operational status for the switch or for the specified port.



# clear eap sessions

Use the **clear eap sessions** privileged EXEC command to clear Extensible Authentication Protocol (EAP) session information for the switch or for the specified port.

**clear eap sessions** [**credentials** *name* [**interface** *interface-id*] | **interface** *interface-id* | **method** *name* | **transport** *name*] [**credentials** *name* | **interface** *interface-id* | **transport** *name*] ...

Syntax Description	<b>credentials</b> <i>name</i>	Clear EAP credential information for the specified profile.
	<b>interface</b> <i>interface-id</i>	Clear EAP information for the specified interface.
	<b>method</b> <i>name</i>	Clear EAP information for the specified method.
	<b>transport</b> <i>name</i>	Clear EAP transport information for the specified lower level.

**Defaults** No default is defined.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(25)SEE	This command was introduced.

**Usage Guidelines** You can clear all counters by using the **clear eap sessions** command, or you can clear only the specific information by using the keywords.

**Examples** This example shows how to clear all EAP information:

```
Switch# clear eap
```

This example shows how to clear EAP-session credential information for the specified profile:

```
Switch# clear eap sessions credential type1
```

You can verify that the information was deleted by entering the **show dot1x** privileged EXEC command.

Related Commands	Command	Description
	<a href="#">show eap</a>	Displays EAP registration and session information for the switch or for the specified port



# clear errdisable interface

Use the **clear errdisable interface** privileged EXEC command on the switch stack or on a standalone switch to re-enable a VLAN that was error disabled.

**clear errdisable interface** *interface-id* **vlan** [*vlan-list*]

Syntax Description	<i>vlan list</i>	(Optional) Specify a list of VLANs to be re-enabled. If a vlan-list is not specified, then all VLANs are re-enabled.
--------------------	------------------	--

Command Default	No default is defined
-----------------	-----------------------

Command Modes	Privileged EXEC
---------------	-----------------

Command History	Release	Modification
	12.2(37)SE	This command was introduced.

Usage Guidelines	You can re-enable a port by using the <b>shutdown</b> and <b>no shutdown</b> interface configuration commands, or you can clear error disable for VLANs by using the <b>clear errdisable interface</b> command.
------------------	---

Examples	This example shows how to re-enable all VLANs that were error-disabled on port Gi4/0/2.
----------	---

```
Switch# clear errdisable interface GigabitEthernet4/0/2 vlan
```

Related Commands	Command	Description
	<a href="#">errdisable detect cause</a>	Enables error-disabled detection for a specific cause or all causes.
	<a href="#">errdisable recovery</a>	Configures the recovery mechanism variables.
	<a href="#">show errdisable detect</a>	Displays error-disabled detection status.
	<a href="#">show errdisable recovery</a>	Display error-disabled recovery timer information.
	<a href="#">show interfaces status err-disabled</a>	Displays interface status of a list of interfaces in error-disabled state.



# clear ip dhcp snooping

Use the **clear ip dhcp snooping** privileged EXEC command to clear the DHCP snooping binding database, the DHCP snooping binding database agent statistics, or the DHCP snooping statistics counters.

**clear ip dhcp snooping {binding | database statistics | statistics}**

Syntax Description	<b>binding</b>	Clear the DHCP snooping binding database.
	<b>database statistics</b>	Clear the DHCP snooping binding database agent statistics.
	<b>statistics</b>	Clear the DHCP snooping statistics counter.

**Defaults** No default is defined.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(25)FX	This command was introduced.
	12.2(37)SE	The <b>statistics</b> keyword was introduced.

**Usage Guidelines** When you enter the **clear ip dhcp snooping database statistics** command, the switch does not update the entries in the binding database and in the binding file before clearing the statistics.

**Examples** This example shows how to clear the DHCP snooping binding database agent statistics:

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

You can verify that the statistics were cleared by entering the **show ip dhcp snooping database** privileged EXEC command.

This example shows how to clear the DHCP snooping statistics counters:

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

You can verify that the statistics were cleared by entering the **show ip dhcp snooping statistics** user EXEC command.



Related Commands	Command	Description
	<b>ip dhcp snooping</b>	Enables DHCP snooping on a VLAN.
	<b>ip dhcp snooping database</b>	Configures the DHCP snooping binding database agent or the binding file.
	<b>show ip dhcp snooping binding</b>	Displays the status of DHCP snooping database agent.
	<b>show ip dhcp snooping database</b>	Displays the DHCP snooping binding database agent statistics.
	<b>show ip dhcp snooping statistics</b>	Displays the DHCP snooping statistics.



# clear lacp

Use the **clear lacp** privileged EXEC command to clear Link Aggregation Control Protocol (LACP) channel-group counters.

**clear lacp** { *channel-group-number* **counters** | **counters** }

Syntax Description	<i>channel-group-number</i>	(Optional) Channel group number. The range is 1 to 6.
	<b>counters</b>	Clear traffic counters.

Defaults	No default is defined.
----------	------------------------

Command Modes	Privileged EXEC
---------------	-----------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	You can clear all counters by using the <b>clear lacp counters</b> command, or you can clear only the counters for the specified channel group by using the <b>clear lacp <i>channel-group-number</i> counters</b> command.
------------------	---

Examples	This example shows how to clear all channel-group information:
----------	--

```
Switch# clear lacp counters
```

This example shows how to clear LACP traffic counters for group 4:

```
Switch# clear lacp 4 counters
```

You can verify that the information was deleted by entering the **show lacp counters** or the **show lacp 4 counters** privileged EXEC command.

Related Commands	Command	Description
	<a href="#">show lacp</a>	Displays LACP channel-group information.



# clear mac address-table

Use the **clear mac address-table** privileged EXEC command to delete from the MAC address table a specific dynamic address, all dynamic addresses on a particular interface, or all dynamic addresses on a particular VLAN. This command also clears the MAC address notification global counters.

```
clear mac address-table { dynamic [address mac-addr | interface interface-id | vlan vlan-id] | notification }
```

Syntax Description	<b>dynamic</b>	Delete all dynamic MAC addresses.
	<b>dynamic address</b> <i>mac-addr</i>	(Optional) Delete the specified dynamic MAC address.
	<b>dynamic interface</b> <i>interface-id</i>	(Optional) Delete all dynamic MAC addresses on the specified physical port or port channel.
	<b>dynamic vlan</b> <i>vlan-id</i>	(Optional) Delete all dynamic MAC addresses for the specified VLAN. The range is 1 to 4094.
	<b>notification</b>	Clear the notifications in the history table and reset the counters.

Defaults	No default is defined.
----------	------------------------

Command Modes	Privileged EXEC
---------------	-----------------


Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

Examples	This example shows how to remove a specific MAC address from the dynamic address table:
----------	---

```
Switch# clear mac address-table dynamic address 0008.0070.0007
```

You can verify that the information was deleted by entering the **show mac address-table** privileged EXEC command.



 clear mac address-table

Related Commands	Command	Description
	<a href="#">mac address-table notification</a>	Enables the MAC address notification feature.
	<a href="#">show mac access-group</a>	Displays the MAC address table static and dynamic entries.
	<a href="#">show mac address-table notification</a>	Displays the MAC address notification settings for all interfaces or the specified interface.
	<a href="#">snmp trap mac-notification</a>	Enables the Simple Network Management Protocol (SNMP) MAC address notification trap on a specific interface.



# clear mac address-table move update

Use the **clear mac address-table move update** privileged EXEC command to clear the mac address-table-move update-related counters.

## clear mac address-table move update

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

<b>Defaults</b>	No default is defined.
-----------------	------------------------

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

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(25)SED	This command was introduced.

<b>Examples</b>	This example shows how to clear the mac address-table move update related counters.
-----------------	---

Switch# **clear mac address-table move update**

You can verify that the information was cleared by entering the **show mac address-table move update** privileged EXEC command.

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>mac address-table move update {receive   transmit}</b>	Configures MAC address-table move update on the switch.
	<b>show mac address-table move update</b>	Displays the MAC address-table move update information on the switch.



# clear pagp

Use the **clear pagp** privileged EXEC command to clear Port Aggregation Protocol (PAgP) channel-group information.

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

## Syntax Description

<i>channel-group-number</i>	(Optional) Channel group number. The range is 1 to 6.
<b>counters</b>	Clear traffic counters.

## Defaults

No default is defined.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

You can clear all counters by using the **clear pagp counters** command, or you can clear only the counters for the specified channel group by using the **clear pagp channel-group-number counters** command.

## Examples

This example shows how to clear all channel-group information:

```
Switch# clear pagp counters
```

This example shows how to clear PAgP traffic counters for group 10:

```
Switch# clear pagp 10 counters
```

You can verify that information was deleted by entering the **show pagp** privileged EXEC command.

## Related Commands

Command	Description
<a href="#">show pagp</a>	Displays PAgP channel-group information.



# clear port-security

Use the **clear port-security** privileged EXEC command to delete from the MAC address table all secure addresses or all secure addresses of a specific type (configured, dynamic, or sticky) on the switch or on an interface.

**clear port-security** { **all** | **configured** | **dynamic** | **sticky** } [[**address** *mac-addr* | **interface** *interface-id*] [**vlan** { *vlan-id* | { **access** | **voice** } }]]

Syntax Description	
<b>all</b>	Delete all secure MAC addresses.
<b>configured</b>	Delete configured secure MAC addresses.
<b>dynamic</b>	Delete secure MAC addresses auto-learned by hardware.
<b>sticky</b>	Delete secure MAC addresses, either auto-learned or configured.
<b>address</b> <i>mac-addr</i>	(Optional) Delete the specified dynamic secure MAC address.
<b>interface</b> <i>interface-id</i>	(Optional) Delete all the dynamic secure MAC addresses on the specified physical port or VLAN.
<b>vlan</b>	(Optional) Delete the specified secure MAC address from the specified VLAN. Enter one of these options after you enter the <b>vlan</b> keyword: <ul style="list-style-type: none"> <li><i>vlan-id</i>—On a trunk port, specify the VLAN ID of the VLAN on which this address should be cleared.</li> <li><b>access</b>—On an access port, clear the specified secure MAC address on the access VLAN.</li> <li><b>voice</b>—On an access port, clear the specified secure MAC address on the voice VLAN.</li> </ul>
<b>Note</b>	The <b>voice</b> keyword is available only if voice VLAN is configured on a port and if that port is not the access VLAN.

**Defaults** No default is defined.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Examples** This example shows how to clear all secure addresses from the MAC address table:

```
Switch# clear port-security all
```

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

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



## ■ clear port-security

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

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

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

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

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

## Related Commands

Command	Description
<b>switchport port-security</b>	Enables port security on an interface.
<b>switchport port-security mac-address</b> <i>mac-address</i>	Configures secure MAC addresses.
<b>switchport port-security maximum</b> <i>value</i>	Configures a maximum number of secure MAC addresses on a secure interface.
<b>show port-security</b>	Displays the port security settings defined for an interface or for the switch.



# clear spanning-tree counters

Use the **clear spanning-tree counters** privileged EXEC command to clear the spanning-tree counters.

**clear spanning-tree counters** [**interface** *interface-id*]

Syntax Description	<b>interface</b> <i>interface-id</i> (Optional) Clear all spanning-tree counters on the specified interface. Valid interfaces include physical ports, VLANs, and port channels. The VLAN range is 1 to 4094. The port-channel range is 1 to 6.
--------------------	--

Defaults	No default is defined.
----------	------------------------

Command Modes	Privileged EXEC
---------------	-----------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	If the <i>interface-id</i> is not specified, spanning-tree counters are cleared for all interfaces.
------------------	---

Examples	This example shows how to clear spanning-tree counters for all interfaces:  Switch# <b>clear spanning-tree counters</b>
----------	---

Related Commands	Command	Description
	<a href="#">show spanning-tree</a>	Displays spanning-tree state information.



# clear spanning-tree detected-protocols

Use the **clear spanning-tree detected-protocols** privileged EXEC command to restart the protocol migration process (force the renegotiation with neighboring switches) on all interfaces or on the specified interface.

**clear spanning-tree detected-protocols** [**interface** *interface-id*]

Syntax Description	<b>interface</b> <i>interface-id</i> (Optional) Restart the protocol migration process on the specified interface. Valid interfaces include physical ports, VLANs, and port channels. The VLAN range is 1 to 4094. The port-channel range is 1 to 6.	
Defaults	No default is defined.	
Command Modes	Privileged EXEC	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.
Usage Guidelines	<p>A switch running the rapid per-VLAN spanning-tree plus (rapid-PVST+) protocol or the Multiple Spanning Tree Protocol (MSTP) supports a built-in protocol migration mechanism that enables it to interoperate with legacy IEEE 802.1D switches. If a rapid-PVST+ switch or an MSTP switch receives a legacy IEEE 802.1D configuration bridge protocol data unit (BPDU) with the protocol version set to 0, it sends only IEEE 802.1D BPDUs on that port. A multiple spanning-tree (MST) switch can also detect that a port is at the boundary of a region when it receives a legacy BPDU, an MST BPDU (Version 3) associated with a different region, or a rapid spanning-tree (RST) BPDU (Version 2).</p> <p>However, the switch does not automatically revert to the rapid-PVST+ or the MSTP mode if it no longer receives IEEE 802.1D BPDUs because it cannot learn whether the legacy switch has been removed from the link unless the legacy switch is the designated switch. Use the <b>clear spanning-tree detected-protocols</b> command in this situation.</p>	
Examples	<p>This example shows how to restart the protocol migration process on a port:</p> <pre>Switch# clear spanning-tree detected-protocols interface gigabitethernet0/1</pre>	
Related Commands	Command	Description
	<a href="#">show spanning-tree</a>	Displays spanning-tree state information.
	<a href="#">spanning-tree link-type</a>	Overrides the default link-type setting and enables rapid spanning-tree changes to the forwarding state.



# clear vmmps statistics

Use the **clear vmmps statistics** privileged EXEC command to clear the statistics maintained by the VLAN Query Protocol (VQP) client.

## clear vmmps statistics

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

<b>Defaults</b>	No default is defined.
-----------------	------------------------

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

<b>Command History</b>	Release	Modification
	12.2(25)FX	This command was introduced.

<b>Examples</b>	This example shows how to clear VLAN Membership Policy Server (VMPS) statistics:
-----------------	--

Switch# **clear vmmps statistics**

You can verify that information was deleted by entering the **show vmmps statistics** privileged EXEC command.

<b>Related Commands</b>	Command	Description
	<a href="#">show vmmps</a>	Displays the VQP version, reconfirmation interval, retry count, VMPS IP addresses, and the current and primary servers.



# clear vtp counters

Use the **clear vtp counters** privileged EXEC command to clear the VLAN Trunking Protocol (VTP) and pruning counters.

## clear vtp counters

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

**Defaults** No default is defined.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Examples** This example shows how to clear the VTP counters:

```
Switch# clear vtp counters
```

You can verify that information was deleted by entering the **show vtp counters** privileged EXEC command.

Related Commands	Command	Description
	<a href="#">show vtp</a>	Displays general information about the VTP management domain, status, and counters.



# cluster commander-address

You do not need to enter this command from a standalone cluster member switch. The cluster command switch automatically provides its MAC address to cluster member switches when these switches join the cluster. The cluster member switch adds this information and other cluster information to its running configuration file. Use the **no** form of this global configuration command from the cluster member switch console port to remove the switch from a cluster only during debugging or recovery procedures.

**cluster commander-address** *mac-address* [**member** *number* **name** *name*]

**no cluster commander-address**

Syntax Description	<i>mac-address</i>	MAC address of the cluster command switch.
	<b>member</b> <i>number</i>	(Optional) Number of a configured cluster member switch. The range is 0 to 15.
	<b>name</b> <i>name</i>	(Optional) Name of the configured cluster up to 31 characters.

**Defaults** The switch is not a member of any cluster.

**Command Modes** Global configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

This command is available only on the cluster command switch.

A cluster member can have only one cluster command switch.

The cluster member switch retains the identity of the cluster command switch during a system reload by using the *mac-address* parameter.

You can enter the **no** form on a cluster member switch to remove it from the cluster during debugging or recovery procedures. You would normally use this command from the cluster member switch console port only when the member has lost communication with the cluster command switch. With normal switch configuration, we recommend that you remove cluster member switches only by entering the **no cluster member n** global configuration command on the cluster command switch.

When a standby cluster command switch becomes active (becomes the cluster command switch), it removes the cluster commander address line from its configuration.



---

**Examples**

This is partial sample output from the running configuration of a cluster member.

```
Switch(config)# show running-configuration
```

```
<output truncated>
```

```
cluster commander-address 00e0.9bc0.a500 member 4 name my_cluster
```

```
<output truncated>
```

This example shows how to remove a member from the cluster by using the cluster member console.

```
Switch # configure terminal
```

```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
Switch(config)# no cluster commander-address
```

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

---

**Related Commands**

Command	Description
<a href="#">debug cluster</a>	Displays the cluster status and a summary of the cluster to which the switch belongs.



# cluster discovery hop-count

Use the **cluster discovery hop-count** global configuration command on the cluster command switch to set the hop-count limit for extended discovery of candidate switches. Use the **no** form of this command to return to the default setting.

**cluster discovery hop-count** *number*

**no cluster discovery hop-count**

<b>Syntax Description</b>	<i>number</i>	Number of hops from the cluster edge that the cluster command switch limits the discovery of candidates. The range is 1 to 7.
---------------------------	---------------	---

<b>Defaults</b>	The hop count is set to 3.
-----------------	----------------------------

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

<b>Command History</b>	Release	Modification
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	This command is available only on the cluster command switch. This command does not operate on cluster member switches.
	If the hop count is set to 1, it disables extended discovery. The cluster command switch discovers only candidates that are one hop from the edge of the cluster. The edge of the cluster is the point between the last discovered cluster member switch and the first discovered candidate switch.

<b>Examples</b>	This example shows how to set hop count limit to 4. This command is executed on the cluster command switch.
	Switch(config)# <b>cluster discovery hop-count 4</b>
	You can verify your setting by entering the <b>show cluster</b> privileged EXEC command.

<b>Related Commands</b>	Command	Description
	<a href="#">show cluster</a>	Displays the cluster status and a summary of the cluster to which the switch belongs.
	<a href="#">show cluster candidates</a>	Displays a list of candidate switches.



# cluster enable

Use the **cluster enable** global configuration command on a command-capable switch to enable it as the cluster command switch, assign a cluster name, and to optionally assign a member number to it. Use the **no** form of the command to remove all members and to make the cluster command switch a candidate switch.

**cluster enable** *name* [*command-switch-member-number*]

**no cluster enable**

Syntax Description	<i>name</i>	Name of the cluster up to 31 characters. Valid characters include only alphanumerics, dashes, and underscores.
	<i>command-switch-member-number</i>	(Optional) Assign a member number to the cluster command switch of the cluster. The range is 0 to 15.

Defaults	The switch is not a cluster command switch.
	No cluster name is defined.
	The member number is 0 when the switch is the cluster command switch.

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	Enter this command on any command-capable switch that is not part of any cluster. This command fails if a device is already configured as a member of the cluster.
	You must name the cluster when you enable the cluster command switch. If the switch is already configured as the cluster command switch, this command changes the cluster name if it is different from the previous cluster name.

Examples	This example shows how to enable the cluster command switch, name the cluster, and set the cluster command switch member number to 4.
	Switch(config)# <b>cluster enable Engineering-IDF4 4</b>
	You can verify your setting by entering the <b>show cluster</b> privileged EXEC command on the cluster command switch.



Related Commands	Command	Description
	<a href="#">show cluster</a>	Displays the cluster status and a summary of the cluster to which the switch belongs.



# cluster holdtime

Use the **cluster holdtime** global configuration command to set the duration in seconds before a switch (either the command or cluster member switch) declares the other switch down after not receiving heartbeat messages. Use the **no** form of this command to set the duration to the default value.

**cluster holdtime** *holdtime-in-secs*

**no cluster holdtime**

<b>Syntax Description</b>	<i>holdtime-in-secs</i>	Duration in seconds before a switch (either a command or cluster member switch) declares the other switch down. The range is 1 to 300 seconds.
---------------------------	-------------------------	--

<b>Defaults</b>	The default holdtime is 80 seconds.
-----------------	-------------------------------------

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

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	Enter this command with the <b>cluster timer</b> global configuration command only on the cluster command switch. The cluster command switch propagates the values to all its cluster members so that the setting is consistent among all switches in the cluster.
-------------------------	--

The holdtime is typically set as a multiple of the interval timer (**cluster timer**). For example, it takes (holdtime-in-secs divided by the interval-in-secs) number of heartbeat messages to be missed in a row to declare a switch down.

<b>Examples</b>	This example shows how to change the interval timer and the duration on the cluster command switch.
-----------------	---

```
Switch(config)# cluster timer 3
Switch(config)# cluster holdtime 30
```

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

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<a href="#">show cluster</a>	Displays the cluster status and a summary of the cluster to which the switch belongs.



# cluster member

Use the **cluster member** global configuration command on the cluster command switch to add candidates to a cluster. Use the **no** form of the command to remove members from the cluster.

**cluster member** [*n*] **mac-address** *H.H.H* [**password** *enable-password*] [**vlan** *vlan-id*]

**no cluster member** *n*

Syntax Description	<i>n</i>	The number that identifies a cluster member. The range is 0 to 15.
	<b>mac-address</b> <i>H.H.H</i>	MAC address of the cluster member switch in hexadecimal format.
	<b>password</b> <i>enable-password</i>	Enable password of the candidate switch. The password is not required if there is no password on the candidate switch.
	<b>vlan</b> <i>vlan-id</i>	(Optional) VLAN ID through which the candidate is added to the cluster by the cluster command switch. The range is 1 to 4094.

Defaults	A newly enabled cluster command switch has no associated cluster members.
----------	---

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	<p>Enter this command only on the cluster command switch to add a candidate to or remove a member from the cluster. If you enter this command on a switch other than the cluster command switch, the switch rejects the command and displays an error message.</p> <p>You must enter a member number to remove a switch from the cluster. However, you do not need to enter a member number to add a switch to the cluster. The cluster command switch selects the next available member number and assigns it to the switch that is joining the cluster.</p> <p>You must enter the enable password of the candidate switch for authentication when it joins the cluster. The password is not saved in the running or startup configuration. After a candidate switch becomes a member of the cluster, its password becomes the same as the cluster command-switch password.</p> <p>If a switch does not have a configured hostname, the cluster command switch appends a member number to the cluster command-switch hostname and assigns it to the cluster member switch.</p> <p>If you do not specify a VLAN ID, the cluster command switch automatically chooses a VLAN and adds the candidate to the cluster.</p>
------------------	--



## Examples

This example shows how to add a switch as member 2 with MAC address 00E0.1E00.2222 and the password *key* to a cluster. The cluster command switch adds the candidate to the cluster through VLAN 3.

```
Switch(config)# cluster member 2 mac-address 00E0.1E00.2222 password key vlan 3
```

This example shows how to add a switch with MAC address 00E0.1E00.3333 to the cluster. This switch does not have a password. The cluster command switch selects the next available member number and assigns it to the switch that is joining the cluster.

```
Switch(config)# cluster member mac-address 00E0.1E00.3333
```

You can verify your settings by entering the **show cluster members** privileged EXEC command on the cluster command switch.

## Related Commands

Command	Description
<a href="#">show cluster</a>	Displays the cluster status and a summary of the cluster to which the switch belongs.
<a href="#">show cluster candidates</a>	Displays a list of candidate switches.
<a href="#">show cluster members</a>	Displays information about the cluster members.



# cluster outside-interface

Use the **cluster outside-interface** global configuration command to configure the outside interface for cluster Network Address Translation (NAT) so that a member without an IP address can communicate with devices outside the cluster. Use the **no** form of this command to return to the default setting.

**cluster outside-interface** *interface-id*

**no cluster outside-interface**

Syntax Description	<i>interface-id</i>	Interface to serve as the outside interface. Valid interfaces include physical interfaces, port-channels, or VLANs. The port-channel range is 1 to 6. The VLAN range is 1 to 4094.
--------------------	---------------------	--

Defaults	The default outside interface is automatically selected by the cluster command switch.
----------	--

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	Enter this command only on the cluster command switch. If you enter this command on a cluster member switch, an error message appears.
------------------	--

Examples	<p>This example shows how to set the outside interface to VLAN 1:</p> <pre>Switch(config)# cluster outside-interface vlan 1</pre> <p>You can verify your setting by entering the <b>show running-config</b> privileged EXEC command.</p>
----------	--

Related Commands	Command	Description
	<b>show running-config</b>	Displays the current operating configuration. For syntax information, select the <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# cluster run

Use the **cluster run** global configuration command to enable clustering on a switch. Use the **no** form of this command to disable clustering on a switch.

**cluster run**

**no cluster run**

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

<b>Defaults</b>	Clustering is enabled on all switches.
-----------------	--

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

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	When you enter the <b>no cluster run</b> command on a cluster command switch, the cluster command switch is disabled. Clustering is disabled, and the switch cannot become a candidate switch.
	When you enter the <b>no cluster run</b> command on a cluster member switch, it is removed from the cluster. Clustering is disabled, and the switch cannot become a candidate switch.
	When you enter the <b>no cluster run</b> command on a switch that is not part of a cluster, clustering is disabled on this switch. This switch cannot then become a candidate switch.

<b>Examples</b>	This example shows how to disable clustering on the cluster command switch:
-----------------	---

```
Switch(config)# no cluster run
```

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

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<a href="#">show cluster</a>	Displays the cluster status and a summary of the cluster to which the switch belongs.



# cluster standby-group

Use the **cluster standby-group** global configuration command to enable cluster command-switch redundancy by binding the cluster to an existing Hot Standby Router Protocol (HSRP). Entering the **routing-redundancy** keyword enables the same HSRP group to be used for cluster command-switch redundancy and routing redundancy. Use the **no** form of this command to return to the default setting.

**cluster standby-group** *HSRP-group-name* [**routing-redundancy**]

**no cluster standby-group**

Syntax Description	<i>HSRP-group-name</i>	Name of the HSRP group that is bound to the cluster. The group name is limited to 32 characters.
	<b>routing-redundancy</b>	(Optional) Enable the same HSRP standby group to be used for cluster command-switch redundancy and routing redundancy.

Defaults	The cluster is not bound to any HSRP group.
----------	---

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	Enter this command only on the cluster command switch. If you enter it on a cluster member switch, an error message appears.
------------------	--

The cluster command switch propagates the cluster-HSRP binding information to all cluster-HSRP capable members. Each cluster member switch stores the binding information in its NVRAM. The HSRP group name must be a valid standby group; otherwise, the command exits with an error.

The same group name should be used on all members of the HSRP standby group that is to be bound to the cluster. The same HSRP group name should also be used on all cluster-HSRP capable members for the HSRP group that is to be bound. (When not binding a cluster to an HSRP group, you can use different names on the cluster commander and the members.)

Examples	This example shows how to bind the HSRP group named <i>my_hsrp</i> to the cluster. This command is executed on the cluster command switch.
----------	--

```
Switch(config)# cluster standby-group my_hsrp
```

This example shows how to use the same HSRP group named *my\_hsrp* for routing redundancy and cluster redundancy.

```
Switch(config)# cluster standby-group my_hsrp routing-redundancy
```



This example shows the error message when this command is executed on a cluster command switch and the specified HSRP standby group does not exist:

```
Switch(config)# cluster standby-group my_hsrp
%ERROR: Standby (my_hsrp) group does not exist
```

This example shows the error message when this command is executed on a cluster member switch:

```
Switch(config)# cluster standby-group my_hsrp routing-redundancy
%ERROR: This command runs on a cluster command switch
```

You can verify your settings by entering the **show cluster** privileged EXEC command. The output shows whether redundancy is enabled in the cluster.

Related Commands	Command	Description
	<b>standby ip</b>	Enables HSRP on the interface. For syntax information, select <b>Cisco IOS IP Command Reference, Volume 1 of 3:Addressing and Services, Release 12.2 &gt; IP Services Commands</b> .
	<a href="#">show cluster</a>	Displays the cluster status and a summary of the cluster to which the switch belongs.
	<b>show standby</b>	Displays standby group information. For syntax information, select <b>Cisco IOS IP Command Reference, Volume 1 of 3:Addressing and Services, Release 12.2 &gt; IP Services Commands</b> .



# cluster timer

Use the **cluster timer** global configuration command to set the interval in seconds between heartbeat messages. Use the **no** form of this command to set the interval to the default value.

**cluster timer** *interval-in-secs*

**no cluster timer**

Syntax Description	<i>interval-in-secs</i>	Interval in seconds between heartbeat messages. The range is 1 to 300 seconds.
--------------------	-------------------------	--

Defaults	The interval is 8 seconds.
----------	----------------------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	<p>Enter this command with the <b>cluster holdtime</b> global configuration command only on the cluster command switch. The cluster command switch propagates the values to all its cluster members so that the setting is consistent among all switches in the cluster.</p> <p>The holdtime is typically set as a multiple of the heartbeat interval timer (<b>cluster timer</b>). For example, it takes (holdtime-in-secs divided by the interval-in-secs) number of heartbeat messages to be missed in a row to declare a switch down.</p>
------------------	---

Examples	<p>This example shows how to change the heartbeat interval timer and the duration on the cluster command switch:</p>
----------	--

```
Switch(config)# cluster timer 3
Switch(config)# cluster holdtime 30
```

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



Related Commands	Command	Description
	<a href="#">show cluster</a>	Displays the cluster status and a summary of the cluster to which the switch belongs.



# define interface-range

Use the **define interface-range** global configuration command to create an interface-range macro. Use the **no** form of this command to delete the defined macro.

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

**no define interface-range** *macro-name interface-range*

Syntax Description	<i>macro-name</i>	Name of the interface-range macro; up to 32 characters.
	<i>interface-range</i>	Interface range; for valid values for interface ranges, see “Usage Guidelines.”

**Defaults** This command has no default setting.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines** The macro name is a 32-character maximum character string.

A macro can contain up to five ranges.

All interfaces in a range must be the same type; that is, all Fast Ethernet ports, all Gigabit Ethernet ports, all EtherChannel ports, or all VLANs, but you can combine multiple interface types in a macro.

When entering the *interface-range*, use this format:

- *type {first-interface} - {last-interface}*
- You must add a space between the first interface number and the hyphen when entering an *interface-range*. For example, **gigabitethernet 0/1 - 2** is a valid range; **gigabitethernet 0/1-2** is not a valid range

Valid values for *type* and *interface*:

- **vlan** *vlan-id* , where the VLAN ID is 1 to 4094



**Note** Though options exist in the command-line interface to set multiple VLAN IDs, it is not supported.

VLAN interfaces must have been configured with the **interface vlan** command (the **show running-config** privileged EXEC command displays the configured VLAN interfaces). VLAN interfaces not displayed by the **show running-config** command cannot be used in *interface-ranges*.

- **port-channel** *port-channel-number*, where *port-channel-number* is from 1 to 6



■ define interface-range

- **fastethernet** module/{*first port*} - {*last port*}
- **gigabitethernet** module/{*first port*} - {*last port*}

For physical interfaces:

- module is always 0.
- the range is *type 0/number - number* (for example, **gigabitethernet 0/1 - 2**).

When you define a range, you must enter a space before the hyphen (-), for example:

**gigabitethernet0/1 - 2**

You can also enter multiple ranges. When you define multiple ranges, you must enter a space after the first entry before the comma (.). The space after the comma is optional, for example:

**fastethernet0/3, gigabitethernet0/1 - 2**

**fastethernet0/3 -4, gigabitethernet0/1 - 2**

**Examples**

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

```
Switch(config)# define interface-range macro1 fastethernet0/1 - 2, gigabitethernet0/1 - 2
```

**Related Commands**

Command	Description
<a href="#">interface range</a>	Executes a command on multiple ports at the same time.
<b>show running-config</b>	Displays the current operating configuration, including defined macros. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# delete

Use the **delete** privileged EXEC command to delete a file or directory on the flash memory device.

**delete** [/force] [/recursive] filesystem:/file-url

Syntax Description	<b>/force</b>	(Optional) Suppress the prompt that confirms the deletion.
	<b>/recursive</b>	(Optional) Delete the named directory and all subdirectories and the files contained in it.
	<b>filesystem:</b>	Alias for a flash file system.  The syntax for the local flash file system: <b>flash:</b>
	<b>/file-url</b>	The path (directory) and filename to delete.

Command Modes	Privileged EXEC
---------------	-----------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	If you use the <b>/force</b> keyword, you are prompted once at the beginning of the deletion process to confirm the deletion.
	If you use the <b>/recursive</b> keyword without the <b>/force</b> keyword, you are prompted to confirm the deletion of every file.
	The prompting behavior depends on the setting of the <b>file prompt</b> global configuration command. By default, the switch prompts for confirmation on destructive file operations. For more information about this command, see the <i>Cisco IOS Command Reference for Release 12.1</i> .

Examples	This example shows how to remove the directory that contains the old software image after a successful download of a new image:  Switch# <b>delete /force /recursive flash:/old-image</b>
	You can verify that the directory was removed by entering the <b>dir filesystem:</b> privileged EXEC command.

Related Commands	Command	Description
	<a href="#">archive download-sw</a>	Downloads a new image to the switch and overwrites or keeps the existing image.



## deny (MAC access-list configuration)

Use the **deny** MAC access-list configuration command to prevent non-IP traffic from being forwarded if the conditions are matched. Use the **no** form of this command to remove a deny condition from the named MAC access list.

**{deny | permit} {any | host src-MAC-addr | src-MAC-addr mask} {any | host dst-MAC-addr | dst-MAC-addr mask} [type mask | aarp | amber | cos cos | dec-spanning | decnet-iv | diagnostic | dsm | etype-6000 | etype-8042 | lat | lavc-sca | lsap lsap mask | mop-console | mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp]**

**no {deny | permit} {any | host src-MAC-addr | src-MAC-addr mask} {any | host dst-MAC-addr | dst-MAC-addr mask} [type mask | aarp | amber | cos cos | dec-spanning | decnet-iv | diagnostic | dsm | etype-6000 | etype-8042 | lat | lavc-sca | lsap lsap mask | mop-console | mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp]**

Syntax Description	
<b>any</b>	Keyword to specify to deny any source or destination MAC address.
<b>host</b> <i>src MAC-addr   src-MAC-addr mask</i>	Define a host MAC address and optional subnet mask. If the source address for a packet matches the defined address, non-IP traffic from that address is denied.
<b>host</b> <i>dst-MAC-addr   dst-MAC-addr mask</i>	Define a destination MAC address and optional subnet mask. If the destination address for a packet matches the defined address, non-IP traffic to that address is denied.
<i>type mask</i>	(Optional) Use the Ethertype number of a packet with Ethernet II or SNAP encapsulation to identify the protocol of the packet.  The <i>type</i> is 0 to 65535, specified in hexadecimal.  The <i>mask</i> is a mask of <i>don't care</i> bits applied to the Ethertype before testing for a match.
<b>aarp</b>	(Optional) Select Ethertype AppleTalk Address Resolution Protocol that maps a data-link address to a network address.
<b>amber</b>	(Optional) Select EtherType DEC-Amber.
<b>cos</b> <i>cos</i>	(Optional) Select a class of service (CoS) number from 0 to 7 to set priority. Filtering on CoS can be performed only in hardware. A warning message reminds the user if the <b>cos</b> option is configured.
<b>dec-spanning</b>	(Optional) Select EtherType Digital Equipment Corporation (DEC) spanning tree.
<b>decnet-iv</b>	(Optional) Select EtherType DECnet Phase IV protocol.
<b>diagnostic</b>	(Optional) Select EtherType DEC-Diagnostic.
<b>dsm</b>	(Optional) Select EtherType DEC-DSM.
<b>etype-6000</b>	(Optional) Select EtherType 0x6000.
<b>etype-8042</b>	(Optional) Select EtherType 0x8042.
<b>lat</b>	(Optional) Select EtherType DEC-LAT.
<b>lavc-sca</b>	(Optional) Select EtherType DEC-LAVC-SCA.



<b>lsap</b> <i>lsap-number mask</i>	(Optional) Use the LSAP number (0 to 65535) of a packet with 802.2 encapsulation to identify the protocol of the packet.  <i>mask</i> is a mask of <i>don't care</i> bits applied to the LSAP number before testing for a match.
<b>mop-console</b>	(Optional) Select EtherType DEC-MOP Remote Console.
<b>mop-dump</b>	(Optional) Select EtherType DEC-MOP Dump.
<b>msdos</b>	(Optional) Select EtherType DEC-MSDOS.
<b>mumps</b>	(Optional) Select EtherType DEC-MUMPS.
<b>netbios</b>	(Optional) Select EtherType DEC- Network Basic Input/Output System (NETBIOS).
<b>vines-echo</b>	(Optional) Select EtherType Virtual Integrated Network Service (VINES) Echo from Banyan Systems.
<b>vines-ip</b>	(Optional) Select EtherType VINES IP.
<b>xns-idp</b>	(Optional) Select EtherType Xerox Network Systems (XNS) protocol suite (0 to 65535), an arbitrary Ethertype in decimal, hexadecimal, or octal.



**Note**

Though visible in the command-line help strings, **appletalk** is not supported as a matching condition.

To filter IPX traffic, you use the *type mask* or **lsap** *lsap mask* keywords, depending on the type of IPX encapsulation being used. Filter criteria for IPX encapsulation types as specified in Novell terminology and Cisco IOS terminology are listed in [Table 2-4](#).

**Table 2-4 IPX Filtering Criteria**

IPX Encapsulation Type		Filter Criterion
Cisco IOS Name	Novel Name	
arpa	Ethernet II	Ethertype 0x8137
snap	Ethernet-snap	Ethertype 0x8137
sap	Ethernet 802.2	LSAP 0xE0E0
novell-ether	Ethernet 802.3	LSAP 0xFFFF

**Defaults**

This command has no defaults. However; the default action for a MAC-named ACL is to deny.

**Command Modes**

MAC-access list configuration

**Command History**

Release	Modification
12.2(25)FX	This command was introduced.



**Usage Guidelines**

You enter MAC-access list configuration mode by using the **mac access-list extended** global configuration command.

If you use the **host** keyword, you cannot enter an address mask; if you do not use the **host** keyword, you must enter an address mask.

When an access control entry (ACE) is added to an access control list, an implied **deny-any-any** condition exists at the end of the list. That is, if there are no matches, the packets are denied. However, before the first ACE is added, the list permits all packets.

For more information about named MAC extended access lists, see the software configuration guide for this release.

**Examples**

This example shows how to define the named MAC extended access list to deny NETBIOS traffic from any source to MAC address 00c0.00a0.03fa. Traffic matching this list is denied.

```
Switch(config-ext-macl)# deny any host 00c0.00a0.03fa netbios.
```

This example shows how to remove the deny condition from the named MAC extended access list:

```
Switch(config-ext-macl)# no deny any 00c0.00a0.03fa 0000.0000.0000 netbios.
```

This example denies all packets with Ethertype 0x4321:

```
Switch(config-ext-macl)# deny any any 0x4321 0
```

You can verify your settings by entering the **show access-lists** privileged EXEC command.

**Related Commands**

Command	Description
<b>mac access-list extended</b>	Creates an access list based on MAC addresses for non-IP traffic.
<b>permit (MAC access-list configuration)</b>	Permits non-IP traffic to be forwarded if conditions are matched.
<b>show access-lists</b>	Displays access control lists configured on a switch.



# dot1x

Use the **dot1x** global configuration command to globally enable IEEE 802.1x authentication. Use the **no** form of this command to return to the default setting.

**dot1x {critical {eapol | recovery delay *milliseconds*} | system-auth-control}**

**no dot1x {credentials | critical {eapol | recovery delay} | system-auth-control}**



## Note

Though visible in the command-line help strings, the **credentials** *name* keywords are not supported.

## Syntax Description

<b>critical {eapol   recovery delay <i>milliseconds</i>}</b>	Configure the inaccessible authentication bypass parameters. For more information, see the <a href="#">dot1x critical (global configuration)</a> command.
<b>system-auth-control</b>	Enable IEEE 802.1x authentication globally on the switch.

## Defaults

IEEE 802.1x authentication is disabled.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.
12.2(25)SEE	The <b>critical {eapol   recovery delay <i>milliseconds</i>}</b> keywords were added. The <b>guest-vlan supplicant keyword</b> was removed.

## Usage Guidelines

You must enable authentication, authorization, and accounting (AAA) and specify the authentication method list before globally enabling IEEE 802.1x authentication. A method list describes the sequence and authentication methods to be used to authenticate a user.

Before globally enabling IEEE 802.1x authentication on a switch, remove the EtherChannel configuration from the interfaces on which IEEE 802.1x authentication and EtherChannel are configured.

If you are using a device running the Cisco Access Control Server (ACS) application for IEEE 802.1x authentication with EAP-Transparent LAN Services (TLS) and with EAP-MD5, make sure that the device is running ACS Version 3.2.1 or later.



---

**Examples**

This example shows how to globally enable IEEE 802.1x authentication on a switch:

```
Switch(config)# dot1x system-auth-control
```

You can verify your settings by entering the **show dot1x** [**interface** *interface-id*] privileged EXEC command.

---

**Related Commands**

Command	Description
<a href="#">dot1x critical (global configuration)</a>	Configures the parameters for the inaccessible authentication bypass feature on the switch.
<a href="#">dot1x guest-vlan</a>	Enables and specifies an active VLAN as an IEEE 802.1x guest VLAN.
<a href="#">dot1x port-control</a>	Enables manual control of the authorization state of the port.
<a href="#">show dot1x</a> [ <b>interface</b> <i>interface-id</i> ]	Displays IEEE 802.1x status for the specified port.



# dot1x auth-fail max-attempts

Use the **dot1x auth-fail max-attempts** interface configuration command to configure the maximum allowable authentication attempts before a port is moved to the restricted VLAN. 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**

Syntax Description	<i>max-attempts</i>	Specify a maximum number of authentication attempts allowed before a port is moved to the restricted VLAN. The range is 1 to 3, the default value is 3.
--------------------	---------------------	---

Defaults	The default value is 3 attempts.
----------	----------------------------------

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)SED	This command was introduced.

Usage Guidelines	If you reconfigure the maximum number of authentication attempts allowed by the VLAN, the change takes effect after the re-authentication timer expires.
------------------	--

Examples	This example shows how to set 2 as the maximum number of authentication attempts allowed before the port is moved to the restricted VLAN on port 3:
----------	---

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet0/3
Switch(config-if)# dot1x auth-fail max-attempts 2
Switch(config-if)# end
Switch(config)# end
Switch#
```

You can verify your settings by entering the **show dot1x [interface interface-id]** privileged EXEC command.



Related Commands	Command	Description
	<b>dot1x auth-fail vlan</b> [ <i>vlan id</i> ]	Enables the optional restricted VLAN feature.
	<b>dot1x max-reauth-req</b> [ <i>count</i> ]	Sets the maximum number of times that the switch restarts the authentication process before a port changes to the unauthorized state.
	<b>show dot1x</b> [ <b>interface</b> <i>interface-id</i> ]	Displays IEEE 802.1x status for the specified port.



# dot1x auth-fail vlan

Use the **dot1x auth-fail vlan** interface configuration command to enable the restricted VLAN on a port. To return to the default setting, use the **no** form of this command.

**dot1x auth-fail vlan** *vlan-id*

**no dot1x auth-fail vlan**

Syntax Description	<i>vlan-id</i>	Specify a VLAN in the range of 1 to 4094.
--------------------	----------------	---

Defaults	No restricted VLAN is configured.
----------	-----------------------------------

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)SED	This command was introduced.

Usage Guidelines	You can configure a restricted VLAN on ports configured as follows:
	<ul style="list-style-type: none"><li>single-host (default) mode</li><li>auto mode for authorization</li></ul> <p>You should enable re-authentication. The ports in restricted VLANs do not receive re-authentication requests if it is disabled. To start the re-authentication process, the restricted VLAN must receive a link-down event or an Extensible Authentication Protocol (EAP) logoff event from the port. If a host is connected through a hub, the port might never receive a link-down event when that host is disconnected, and, as a result, might not detect any new hosts until the next re-authentication attempt occurs.</p> <p>If the supplicant fails authentication, the port is moved to a restricted VLAN, and an EAP <i>success</i> message is sent to the supplicant. Because the supplicant is not notified of the actual authentication failure, there might be confusion about this restricted network access. An EAP success message is sent for these reasons:</p>

- If the EAP success message is not sent, the supplicant tries to authenticate every 60 seconds (the default) by sending an EAP-start message.
- Some hosts (for example, devices running Windows XP) cannot implement DHCP until they receive an EAP success message.

A supplicant might cache an incorrect username and password combination after receiving an EAP success message from the authenticator and re-use that information in every re-authentication. Until the supplicant sends the correct username and password combination, the port remains in the restricted VLAN.

Internal VLANs used for Layer 3 ports cannot be configured as restricted VLANs.

You cannot configure a VLAN to be both a restricted VLAN and a voice VLAN. If you do this, a syslog message is generated.



When a restricted VLAN port is moved to an unauthorized state, the authentication process restarts. If the supplicant fails the authentication process again, the authenticator waits in the held state. After the supplicant has correctly re-authenticated, all IEEE 802.1x ports are reinitialized and treated as normal IEEE 802.1x ports.

When you reconfigure a restricted VLAN as a different VLAN, any ports in the restricted VLAN are also moved, and the ports stay in their currently authorized state.

When you shut down or remove a restricted VLAN from the VLAN database, any ports in the restricted VLAN are immediately moved to an unauthorized state, and the authentication process restarts. The authenticator does not wait in a held state because the restricted VLAN configuration still exists. While the restricted VLAN is inactive, all authentication attempts are counted so that when the restricted VLAN becomes active, the port is immediately placed in the restricted VLAN.

The restricted VLAN is supported only in single host mode (the default port mode). For this reason, when a port is placed in a restricted VLAN, the supplicant's MAC address is added to the MAC address table, and any other MAC address that appears on the port is treated as a security violation.

## Examples

This example shows how to configure a restricted VLAN on port 1:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# dot1x auth-fail vlan 40
Switch(config-if)# end
Switch#
```

You can verify your configuration by entering the **show dot1x [interface interface-id]** privileged EXEC command.

## Related Commands

Command	Description
<b>dot1x auth-fail max-attempts</b> [max-attempts]	Configures the number of authentication attempts allowed before assigning a supplicant to the restricted VLAN.
<b>show dot1x [interface interface-id]</b>	Displays IEEE 802.1x status for the specified port.



# dot1x control-direction

Use the **dot1x control-direction** interface configuration command to enable the IEEE 802.1x authentication with the wake-on-LAN (WoL) feature and to configure the port control as unidirectional or bidirectional. Use the **no** form of this command to return to the default setting.

**dot1x control-direction {both | in}**

**no dot1x control-direction**

Syntax Description	<b>both</b>	Enable bidirectional control on port. The port cannot receive packets from or send packets to the host.
	<b>in</b>	Enable unidirectional control on port. The port can send packets to the host but cannot receive packets from the host.

Defaults	The port is in bidirectional mode.
----------	------------------------------------

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)SED	This command was introduced

Usage Guidelines	Use the <b>both</b> keyword or the <b>no</b> form of this command to return to the default setting, bidirectional mode.
	For more information about WoL, see the “Using IEEE 802.1x Authentication with Wake-on-LAN” section in the “Configuring IEEE 802.1x Port-Based Authentication” chapter in the software configuration guide.

Examples	This example shows how to enable unidirectional control:
----------	--

```
Switch(config-if)# dot1x control-direction in
```

This example shows how to enable bidirectional control:
---

```
Switch(config-if)# dot1x control-direction both
```

You can verify your settings by entering the **show dot1x all** privileged EXEC command.

The **show dot1x all** privileged EXEC command output is the same for all switches except for the port names and the state of the port. If a host is attached to the port but is not yet authenticated, a display similar to this appears:

```
Supplicant MAC 0002.b39a.9275
AuthSM State = CONNECTING
BendSM State = IDLE
PortStatus = UNAUTHORIZED
```



If you enter the **dot1x control-direction in** interface configuration command to enable unidirectional control, this appears in the **show dot1x all** command output:

```
ControlDirection = In
```

If you enter the **dot1x control-direction in** interface configuration command and the port cannot support this mode due to a configuration conflict, this appears in the **show dot1x all** command output:

```
ControlDirection = In (Disabled due to port settings)
```

#### Related Commands

Command	Description
<b>show dot1x</b> [all   interface <i>interface-id</i> ]	Displays control-direction port setting status for the specified interface.



## dot1x critical (global configuration)

Use the **dot1x critical** global configuration command on a standalone switch to configure the parameters for the inaccessible authentication bypass feature, also referred to as critical authentication or the authentication, authorization, and accounting (AAA) fail policy. To return to default settings, use the **no** form of this command.

```
dot1x critical { eapol | recovery delay milliseconds }
```

```
no dot1x critical { eapol | recovery delay }
```

Syntax Description	<b>eapol</b>	Specify that the switch sends an EAPOL-Success message when the switch puts the critical port in the critical-authentication state.
	<b>recovery delay</b> <i>milliseconds</i>	Set the recovery delay period in milliseconds. The range is from 1 to 10000 milliseconds.

**Defaults**

The switch does not send an EAPOL-Success message to the host when the switch successfully authenticates the critical port by putting the critical port in the critical-authentication state.

The recovery delay period is 1000 milliseconds (1 second).

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(25)SEE	This command was introduced.

**Usage Guidelines**

Use the **eapol** keyword to specify that the switch sends an EAPOL-Success message when the switch puts the critical port in the critical-authentication state.

Use the **recovery delay** *milliseconds* keyword to set the recovery delay period during which the switch waits to re-initialize a critical port when a RADIUS server that was unavailable becomes available. The default recovery delay period is 1000 milliseconds. A port can be re-initialized every second.

To enable inaccessible authentication bypass on a port, use the **dot1x critical** interface configuration command. To configure the access VLAN to which the switch assigns a critical port, use the **dot1x critical vlan** *vlan-id* interface configuration command.

**Examples**

This example shows how to set 200 as the recovery delay period on the switch:

```
Switch# dot1x critical recovery delay 200
```

You can verify your configuration by entering the **show dot1x** privileged EXEC command.



## ■ dot1x critical (global configuration)

Related Commands	Command	Description
	<a href="#">dot1x critical (interface configuration)</a>	Enables the inaccessible authentication bypass feature, and configures the access VLAN for the feature.
	<a href="#">show dot1x</a>	Displays IEEE 802.1x status for the specified port.



## dot1x critical (interface configuration)

Use the **dot1x critical** interface configuration command on a standalone switch to enable the inaccessible-authentication-bypass feature, also referred to as critical authentication or the authentication, authorization, and accounting (AAA) fail policy. You can also configure the access VLAN to which the switch assigns the critical port when the port is in the critical-authentication state. To disable the feature or return to default, use the **no** form of this command.

**dot1x critical** [**recovery action reinitialize** | **vlan** *vlan-id*]

**no dot1x critical** [**recovery** | **vlan**]

Syntax Description	<b>recovery action reinitialize</b>	Enable the inaccessible-authentication-bypass recovery feature, and specify that the recovery action is to authenticate the port when an authentication server is available.
	<b>vlan</b> <i>vlan-id</i>	Specify the access VLAN to which the switch can assign a critical port. The range is from 1 to 4094.

### Defaults

The inaccessible-authentication-bypass feature is disabled.  
The recovery action is not configured.  
The access VLAN is not configured.

### Command Modes

Interface configuration

### Command History

Release	Modification
12.2(25)SEE	This command was introduced.

### Usage Guidelines

To specify the access VLAN to which the switch assigns a critical port when the port is in the critical-authentication state, use the **vlan** *vlan-id* keywords. The specified type of VLAN must match the type of port, as follows:

- If the critical port is an access port, the VLAN must be an access VLAN.
- If the critical port is a private VLAN host port, the VLAN must be a secondary private VLAN.
- If the critical port is a routed port, you can specify a VLAN, but this is optional.

If the client is running Windows XP and the critical port to which the client is connected is in the critical-authentication state, Windows XP might report that the interface is not authenticated.

If the Windows XP client is configured for DHCP and has an IP address from the DHCP server, receiving an EAP-Success message on a critical port might not re-initiate the DHCP configuration process.



You can configure the inaccessible authentication bypass feature and the restricted VLAN on an IEEE 802.1x port. If the switch tries to re-authenticate a critical port in a restricted VLAN and all the RADIUS servers are unavailable, the switch changes the port state to the critical authentication state, and it remains in the restricted VLAN.

You can configure the inaccessible bypass feature and port security on the same switch port.

## Examples

This example shows how to enable the inaccessible authentication bypass feature on port 21:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet0/21
Switch(config-if)# dot1x critical
Switch(config-if)# end
Switch(config)# end
Switch#
```

You can verify your configuration by entering the **show dot1x [interface interface-id]** privileged EXEC command.

## Related Commands

Command	Description
<b>dot1x critical (global configuration)</b>	Configures the parameters for the inaccessible authentication bypass feature on the switch.
<b>show dot1x [interface interface-id]</b>	Displays IEEE 802.1x status for the specified port.



# dot1x default

Use the **dot1x default** interface configuration command to reset the IEEE 802.1x parameters to their default values.

## dot1x default

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

### Defaults

These are the default values:

- The per-port IEEE 802.1x protocol enable state is disabled (force-authorized).
- The number of seconds between re-authentication attempts is 3600 seconds.
- The periodic re-authentication is disabled.
- The quiet period is 60 seconds.
- The retransmission time is 30 seconds.
- The maximum retransmission number is 2 times.
- The host mode is single host.
- The client timeout period is 30 seconds.
- The authentication server timeout period is 30 seconds.

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

### Command History

Release	Modification
12.2(25)FX	This command was introduced.

### Examples

This example shows how to reset the IEEE 802.1x parameters on a port:

```
Switch(config-if)# dot1x default
```

You can verify your settings by entering the **show dot1x [interface interface-id]** privileged EXEC command.

### Related Commands

Command	Description
<a href="#">show dot1x [interface interface-id]</a>	Displays IEEE 802.1x status for the specified port.



# dot1x fallback

Use the **dot1xfallback** interface configuration command on the to configure a port to use web authentication as a fallback method for clients that do not support IEEE 802.1x authentication. To return to the default setting, use the **no** form of this command.

**dot1x fallback** *profile*

**no dot1x fallback**

Syntax Description	<i>profile</i> Specify a fallback profile for clients that do not support IEEE 802.1x authentication.	
Defaults	No fallback is enabled.	
Command Modes	Interface configuration	
Command History	Release	Modification
	12.2(35)SE	This command was introduced.
Usage Guidelines	You must enter the <b>dot1x port-control</b> auto interface configuration command on a switch port before entering this command.	
Examples	<p>This example shows how to specify a fallback profile to a switch port that has been configured for IEEE 802.1x authentication:</p> <pre>Switch# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Switch(config)# interface gigabitethernet0/3 Switch(config-if)# dot1x fallback profile1 Switch(config-fallback-profile)# exit Switch(config)# end</pre> <p>You can verify your settings by entering the <b>show dot1x [interface interface-id]</b> privileged EXEC command.</p>	



## Related Commands

Command	Description
<b>show dot1x</b> [ <b>interface</b> <i>interface-id</i> ]	Displays IEEE 802.1x status for the specified port.
<b>fallback profile</b>	Create a web authentication fallback profile.
<b>ip admission</b>	Enable web authentication on a port
<b>ip admission name proxy http</b>	Enable web authentication globally on a switch



# dot1x guest-vlan

Use the **dot1x guest-vlan** interface configuration command to specify an active VLAN as an IEEE 802.1x guest VLAN. Use the **no** form of this command to return to the default setting.

**dot1x guest-vlan** *vlan-id*

**no dot1x guest-vlan**

Syntax Description	<i>vlan-id</i>	Specify an active VLAN as an IEEE 802.1x guest VLAN. The range is 1 to 4094.
--------------------	----------------	--

Defaults	No guest VLAN is configured.
----------	------------------------------

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	<p>You can configure a guest VLAN on one of these switch ports:</p> <ul style="list-style-type: none"> <li>• A static-access port that belongs to a nonprivate VLAN.</li> <li>• A private-VLAN port that belongs to a secondary private VLAN. All the hosts connected to the switch port are assigned to private VLANs, whether or not the posture validation was successful. The switch determines the primary private VLAN by using the primary- and secondary-private-VLAN associations on the switch.</li> </ul> <p>For each IEEE 802.1x port on the switch, you can configure a guest VLAN to provide limited services to clients (a device or workstation connected to the switch) not running IEEE 802.1x authentication. These users might be upgrading their systems for IEEE 802.1x authentication, and some hosts, such as Windows 98 systems, might not be IEEE 802.1x-capable.</p> <p>When you enable a guest VLAN on an IEEE 802.1x port, the switch assigns clients to a guest VLAN when it does not receive a response to its Extensible Authentication Protocol over LAN (EAPOL) request/identity frame or when EAPOL packets are not sent by the client.</p> <p>The switch maintains the EAPOL packet history. If another EAPOL packet is detected on the interface during the lifetime of the link, the guest VLAN feature is disabled. If the port is already in the guest VLAN state, the port returns to the unauthorized state, and authentication restarts. The EAPOL history is reset upon loss of link.</p> <p>Any number of non-IEEE 802.1x-capable clients are allowed access when the switch port is moved to the guest VLAN. If an IEEE 802.1x-capable client joins the same port on which the guest VLAN is configured, the port is put into the unauthorized state in the RADIUS-configured or user-configured access VLAN, and authentication is restarted.</p> <p>Guest VLANs are supported on IEEE 802.1x ports in single-host or multiple-hosts mode.</p>
------------------	---



You can configure any active VLAN except an Remote Switched Port Analyzer (RSPAN) VLAN or a voice VLAN as an IEEE 802.1x guest VLAN. The guest VLAN feature is not supported on trunk ports; it is supported only on access ports.

After you configure a guest VLAN for an IEEE 802.1x port to which a DHCP client is connected, you might need to get a host IP address from a DHCP server. You can change the settings for restarting the IEEE 802.1x authentication process on the switch before the DHCP process on the client times out and tries to get a host IP address from the DHCP server. Decrease the settings for the IEEE 802.1x authentication process (**dot1x timeout quiet-period** and **dot1x timeout tx-period** interface configuration commands). The amount to decrease the settings depends on the connected IEEE 802.1x client type.

The switch supports *MAC authentication bypass* in Cisco IOS Release 12.2(25)SEE and later. When it is enabled on an IEEE 802.1x port, the switch can authorize clients based on the client MAC address when IEEE 802.1x authentication times out while waiting for an EAPOL message exchange. After detecting a client on an IEEE 802.1x port, the switch waits for an Ethernet packet from the client. The switch sends the authentication server a RADIUS-access/request frame with a username and password based on the MAC address. If authorization succeeds, the switch grants the client access to the network. If authorization fails, the switch assigns the port to the guest VLAN if one is specified. For more information, see the “Using IEEE 802.1x Authentication with MAC Authentication Bypass” section in the “Configuring IEEE 802.1x Port-Based Authentication” chapter of the software configuration guide.

## Examples

This example shows how to specify VLAN 5 as an IEEE 802.1x guest VLAN:

```
Switch(config-if)# dot1x guest-vlan 5
```

This example shows how to set 3 as the quiet time on the switch, to set 15 as the number of seconds that the switch waits for a response to an EAP-request/identity frame from the client before resending the request, and to enable VLAN 2 as an IEEE 802.1x guest VLAN when an IEEE 802.1x port is connected to a DHCP client:

```
Switch(config-if)# dot1x timeout quiet-period 3
Switch(config-if)# dot1x timeout tx-period 15
Switch(config-if)# dot1x guest-vlan 2
```

This example shows how to enable the optional guest VLAN behavior and to specify VLAN 5 as an IEEE 802.1x guest VLAN:

```
Switch(config)# dot1x guest-vlan supplicant
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# dot1x guest-vlan 5
```

You can verify your settings by entering the **show dot1x [interface interface-id]** privileged EXEC command.

## Related Commands

Command	Description
<b>dot1x</b>	Enables the optional guest VLAN supplicant feature.
<b>show dot1x [interface interface-id]</b>	Displays IEEE 802.1x status for the specified port.



## dot1x host-mode

Use the **dot1x host-mode** interface configuration command to allow a single host (client) or multiple hosts 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** }

**no dot1x host-mode** [**multi-host** | **single-host** ]

Syntax Description	<b>multi-host</b>	Enable multiple-hosts mode on the switch.
	<b>single-host</b>	Enable single-host mode on the switch.

**Defaults** The default is single-host mode.

**Command Modes** Interface configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**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.

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 globally, to enable IEEE 802.1x authentication on a port, and to enable multiple-hosts mode:

```
Switch(config)# dot1x system-auth-control
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# dot1x port-control auto
Switch(config-if)# dot1x host-mode multi-host
```

You can verify your settings by entering the **show dot1x [interface interface-id]** privileged EXEC command.

Related Commands	<b>Command</b>	<b>Description</b>
	<b>show dot1x [interface interface-id]</b>	Displays IEEE 802.1x status for the specified port.



# dot1x initialize

Use the **dot1x initialize** privileged EXEC command to manually return the specified IEEE 802.1x-enabled port to an unauthorized state before initiating a new authentication session on the port.

**dot1x initialize** [**interface** *interface-id*]

Syntax Description	<b>interface</b> <i>interface-id</i> (Optional) Port to be initialized.	
Defaults	There is no default setting.	
Command Modes	Privileged EXEC	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.
Usage Guidelines	<p>Use this command to initialize the IEEE 802.1x state machines and to set up a fresh environment for authentication. After you enter this command, the port status becomes unauthorized.</p> <p>There is not a <b>no</b> form of this command.</p>	
Examples	<p>This example shows how to manually initialize a port:</p> <pre>Switch# dot1x initialize interface gigabitethernet0/22</pre> <p>You can verify the unauthorized port status by entering the <b>show dot1x</b> [<b>interface</b> <i>interface-id</i>] privileged EXEC command.</p>	
Related Commands	Command	Description
	<b>show dot1x</b> [ <b>interface</b> <i>interface-id</i> ]	Displays IEEE 802.1x status for the specified port.



# dot1x mac-auth-bypass

Use the **dot1x mac-auth-bypass** interface configuration command to enable the MAC authentication bypass feature. Use the **no** form of this command to disable MAC authentication bypass feature.

```
dot1x mac-auth-bypass [eap]
no dot1x mac-auth-bypass
```

Syntax Description	<b>eap</b>	(Optional) Configure the switch to use Extensible Authentication Protocol (EAP) for authentication.
--------------------	------------	---

Defaults	MAC authentication bypass is disabled.
----------	--

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)SEE	This command was introduced.

**Usage Guidelines**

Unless otherwise stated, the MAC authentication bypass usage guidelines are the same as the IEEE 802.1x authentication guidelines.

If you disable MAC authentication bypass from a port after the port has been authenticated with its MAC address, the port state is not affected.

If the port is in the unauthorized state and the client MAC address is not the authentication-server database, the port remains in the unauthorized state. However, if the client MAC address is added to the database, the switch can use MAC authentication bypass to re-authorize the port.

If the port is in the authorized state, the port remains in this state until re-authorization occurs.

If an EAPOL packet is detected on the interface during the lifetime of the link, the switch determines that the device connected to that interface is an IEEE 802.1x-capable supplicant and uses IEEE 802.1x authentication (not MAC authentication bypass) to authorize the interface.

Clients that were authorized with MAC authentication bypass can be re-authenticated.

For more information about how MAC authentication bypass and IEEE 802.1x authentication interact, see the “Understanding IEEE 802.1x Authentication with MAC Authentication Bypass” section and the “IEEE 802.1x Authentication Configuration Guidelines” section in the “Configuring IEEE 802.1x Port-Based Authentication” chapter of the software configuration guide.



---

**Examples**

This example shows how to enable MAC authentication bypass and to configure the switch to use EAP for authentication:

```
Switch(config-if)# dot1x mac-auth-bypass eap
```

You can verify your settings by entering the **show dot1x [interface interface-id]** privileged EXEC command.

---

**Related Commands**

Command	Description
<b>show dot1x [interface interface-id]</b>	Displays IEEE 802.1x status for the specified port.



# dot1x max-reauth-req

Use the **dot1x max-reauth-req** interface configuration command to set the maximum number of times that the switch restarts the authentication process before a port changes to the unauthorized state. Use the **no** form of this command to return to the default setting.

**dot1x max-reauth-req** *count*

**no dot1x max-reauth-req**

## Syntax Description

<i>count</i>	Number of times that the switch restarts the authentication process before the port changes to the unauthorized state. The range is 0 to 10.
--------------	--

## Defaults

The default is 2 times.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.
12.2(25)SED	The <i>count</i> range was changed.

## 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.

## Examples

This example shows how to set 4 as the number of times that the switch restarts the authentication process before the port changes to the unauthorized state:

```
Switch(config-if)# dot1x max-reauth-req 4
```

You can verify your settings by entering the **show dot1x [interface *interface-id*]** privileged EXEC command.

## Related Commands

Command	Description
<b>dot1x max-req</b>	Sets the maximum number of times that the switch forwards an EAP frame (assuming that no response is received) to the authentication server before restarting the authentication process.
<b>dot1x timeout tx-period</b>	Sets the number of seconds that the switch waits for a response to an EAP-request/identity frame from the client before resending the request.
<b>show dot1x [interface <i>interface-id</i>]</b>	Displays IEEE 802.1x status for the specified port.



# dot1x max-req

Use the **dot1x max-req** interface configuration command to set the maximum number of times that the switch sends an Extensible Authentication Protocol (EAP) frame from the authentication server (assuming that no response is received) to the client before restarting the authentication process. Use the **no** form of this command to return to the default setting.

**dot1x max-req** *count*

**no dot1x max-req**

Syntax Description	<i>count</i>	Number of times that the switch resends an EAP frame from the authentication server before restarting the authentication process. The range is 1 to 10.
--------------------	--------------	---

Defaults	The default is 2 times.
----------	-------------------------

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

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.
------------------	--

Examples	This example shows how to set 5 as the number of times that the switch sends an EAP frame from the authentication server to the client before restarting the authentication process:
----------	--

```
Switch(config-if)# dot1x max-req 5
```

You can verify your settings by entering the **show dot1x [interface interface-id]** privileged EXEC command.

Related Commands	Command	Description
	<b>dot1x timeout tx-period</b>	Sets the number of seconds that the switch waits for a response to an EAP-request/identity frame from the client before resending the request.
	<b>show dot1x [interface interface-id]</b>	Displays IEEE 802.1x status for the specified port.



# dot1x pae

Use the **dot1x pae** interface configuration command to configure the port as an IEEE 802.1x port access entity (PAE) authenticator. Use the **no** form of this command to disable IEEE 802.1x authentication on the port.

**dot1x pae authenticator**

**no dot1x pae**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The port is not an IEEE 802.1x PAE authenticator, and IEEE 802.1x authentication is disabled on the port.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(25)SEE	This command was introduced.

## Usage Guidelines

Use the **no dot1x pae** interface configuration command to disable IEEE 802.1x authentication on the port.

When you configure IEEE 802.1x authentication on a port, such as by entering the **dot1x port-control** interface configuration command, the switch automatically configures the port as an IEEE 802.1x authenticator. After the **no dot1x pae** interface configuration command is entered, the Authenticator PAE operation is disabled.

## Examples

This example shows how to disable IEEE 802.1x authentication on the port:

```
Switch(config-if)# no dot1x pae
```

You can verify your settings by entering the **show dot1x** or **show eap** privileged EXEC command.

## Related Commands

Command	Description
<a href="#">show dot1x</a>	Displays IEEE 802.1x statistics, administrative status, and operational status for the switch or for the specified port.
<a href="#">show eap</a>	Displays EAP registration and session information for the switch or for the specified port.



# dot1x port-control

Use the **dot1x port-control** interface configuration command to enable manual control of the authorization state of the port. Use the **no** form of this command to return to the default setting.

**dot1x port-control {auto | force-authorized | force-unauthorized}**

**no dot1x port-control**

Syntax Description		
<b>auto</b>		Enable IEEE 802.1x authentication on the port and cause the port to change to the authorized or unauthorized state based on the IEEE 802.1x authentication exchange between the switch and the client.
<b>force-authorized</b>		Disable IEEE 802.1x authentication on the port and cause the port to transition to the authorized state without an authentication exchange. The port sends and receives normal traffic without IEEE 802.1x-based authentication of the client.
<b>force-unauthorized</b>		Deny all access through this port by forcing the port to change to the unauthorized state, ignoring all attempts by the client to authenticate. The switch cannot provide authentication services to the client through the port.

**Defaults** The default is force-authorized.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines** You must globally enable IEEE 802.1x authentication on the switch by using the **dot1x system-auth-control** global configuration command before enabling IEEE 802.1x authentication on a specific port.

The IEEE 802.1x standard is supported on Layer 2 static-access ports and voice VLAN ports.

You can use the **auto** keyword only if the port is not configured as one of these:

- Trunk port—If you try to enable IEEE 802.1x authentication on a trunk port, an error message appears, and IEEE 802.1x is not enabled. If you try to change the mode of an IEEE 802.1x-enabled port to trunk, an error message appears, and 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 IEEE 802.1x authentication on a dynamic port, an error message appears, and IEEE 802.1x authentication is not enabled. If you try to change the mode of an IEEE 802.1x-enabled port to dynamic, an error message appears, and the port mode is not changed.
- Dynamic-access ports—If you try to enable IEEE 802.1x authentication on a dynamic-access (VLAN Query Protocol [VQP]) port, an error message appears, and IEEE 802.1x authentication is not enabled. If you try to change an IEEE 802.1x-enabled port to dynamic VLAN assignment, an error message appears, and the VLAN configuration is not changed.



- EtherChannel port—Do not configure a port that is an active or a not-yet-active member of an EtherChannel as an IEEE 802.1x port. If you try to enable IEEE 802.1x authentication on an EtherChannel port, an error message appears, and IEEE 802.1x authentication is not enabled.
- Switched Port Analyzer (SPAN) and Remote SPAN (RSPAN) destination ports—You can enable IEEE 802.1x authentication on a port that is a SPAN or RSPAN destination port. However, IEEE 802.1x authentication is disabled until the port is removed as a SPAN or RSPAN destination. You can enable IEEE 802.1x authentication on a SPAN or RSPAN source port.

To globally disable IEEE 802.1x authentication on the switch, use the **no dot1x system-auth-control** global configuration command. To disable IEEE 802.1x authentication on a specific port or to return to the default setting, use the **no dot1x port-control** interface configuration command.

### Examples

This example shows how to enable IEEE 802.1x authentication on a port:

```
Switch(config)# interface gigabitethernet0/21
Switch(config-if)# dot1x port-control auto
```

You can verify your settings by entering the **show dot1x [interface interface-id]** privileged EXEC command.

### Related Commands

Command	Description
<b>show dot1x [interface interface-id]</b>	Displays IEEE 802.1x status for the specified port.



# dot1x re-authenticate

Use the **dot1x re-authenticate** privileged EXEC command to manually initiate a re-authentication of the specified IEEE 802.1x-enabled port.

**dot1x re-authenticate** [**interface** *interface-id*]

Syntax Description	<b>interface</b> <i>interface-id</i> (Optional) Module and port number of the interface to re-authenticate.	
Defaults	There is no default setting.	
Command Modes	Privileged EXEC	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.
Usage Guidelines	You can use this command to re-authenticate a client without waiting for the configured number of seconds between re-authentication attempts (re-authperiod) and automatic re-authentication.	
Examples	This example shows how to manually re-authenticate the device connected to a port:	
	Switch# <b>dot1x re-authenticate interface gigabitethernet0/21</b>	
Related Commands	Command	Description
	<a href="#">dot1x reauthentication</a>	Enables periodic re-authentication of the client.
	<a href="#">dot1x timeout reauth-period</a>	Sets the number of seconds between re-authentication attempts.



# dot1x reauthentication

Use the **dot1x reauthentication** interface configuration command to enable periodic re-authentication of the client. Use the **no** form of this command to return to the default setting.

**dot1x reauthentication**

**no dot1x reauthentication**

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

<b>Defaults</b>	Periodic re-authentication is disabled.
-----------------	---

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

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	You configure the amount of time between periodic re-authentication attempts by using the <b>dot1x timeout reauth-period</b> interface configuration command.
-------------------------	---

<b>Examples</b>	This example shows how to disable periodic re-authentication of the client:
-----------------	---

```
Switch(config-if)# no dot1x reauthentication
```

This example shows how to enable periodic re-authentication and to set the number of seconds between re-authentication attempts to 4000 seconds:

```
Switch(config-if)# dot1x reauthentication
Switch(config-if)# dot1x timeout reauth-period 4000
```

You can verify your settings by entering the **show dot1x [interface interface-id]** privileged EXEC command.

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<b>dot1x re-authenticate</b>	Manually initiates a re-authentication of all IEEE 802.1x-enabled ports.
	<b>dot1x timeout reauth-period</b>	Sets the number of seconds between re-authentication attempts.
	<b>show dot1x [interface interface-id]</b>	Displays IEEE 802.1x status for the specified port.



# dot1x timeout

Use the **dot1x timeout** interface configuration command to set IEEE 802.1x timers. Use the **no** form of this command to return to the default setting.

**dot1x timeout** { **quiet-period** *seconds* | **ratelimit-period** *seconds* | **reauth-period** { *seconds* | **server** } | **server-timeout** *seconds* | **supp-timeout** *seconds* | **tx-period** *seconds* }

**no dot1x timeout** { **quiet-period** | **reauth-period** | **server-timeout** | **supp-timeout** | **tx-period** }

## Syntax Description

<b>quiet-period</b> <i>seconds</i>	Number of seconds that the switch remains in the quiet state following a failed authentication exchange with the client. The range is 1 to 65535.
<b>ratelimit-period</b> <i>seconds</i>	Number of seconds that the switch ignores Extensible Authentication Protocol over LAN (EAPOL) packets from clients that have been successfully authenticated during this duration. The range is 1 to 65535.
<b>reauth-period</b> { <i>seconds</i>   <b>server</b> }	Set the number of seconds between re-authentication attempts.  The keywords have these meanings: <ul style="list-style-type: none"> <li><i>seconds</i>—Sets the number of seconds from 1 to 65535; the default is 3600 seconds.</li> <li><b>server</b>—Sets the number of seconds as the value of the Session-Timeout RADIUS attribute (Attribute[27]).</li> </ul>
<b>server-timeout</b> <i>seconds</i>	Number of seconds that the switch waits for the retransmission of packets by the switch to the authentication server. The range is 30 to 65535.
<b>supp-timeout</b> <i>seconds</i>	Number of seconds that the switch waits for the retransmission of packets by the switch to the IEEE 802.1x client. The range is 30 to 65535.
<b>tx-period</b> <i>seconds</i>	Number of seconds that the switch waits for a response to an EAP-request/identity frame from the client before retransmitting the request. The range is 5 to 65535.

## Defaults

These are the default settings:

- reauth-period** is 3600 seconds.
- quiet-period** is 60 seconds.
- tx-period** is 5 seconds.
- supp-timeout** is 30 seconds.
- server-timeout** is 30 seconds.
- rate-limit** is 1 second.

## Command Modes

Interface configuration



Command History	Release	Modification
	12.2(25)FX	This command was introduced.
	12.2(25)SED	The range for <b>tx-period</b> keyword was changed, and the <b>reauth-period server</b> keywords were added.
	12.2(25)SEE	The <b>ratelimit-period</b> keyword was introduced.

### 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.

The **dot1x timeout reauth-period** interface configuration command affects the behavior of the switch only if you have enabled periodic re-authentication by using the **dot1x reauthentication** interface configuration command.

During the quiet period, the switch does not accept or initiate any authentication requests. If you want to provide a faster response time to the user, enter a number smaller than the default.

When the **ratelimit-period** is set to 0 (the default), the switch does not ignore EAPOL packets from clients that have been successfully authenticated and forwards them to the RADIUS server.

### Examples

This example shows how to enable periodic re-authentication and to set 4000 as the number of seconds between re-authentication attempts:

```
Switch(config-if) # dot1x reauthentication
Switch(config-if) # dot1x timeout reauth-period 4000
```

This example shows how to enable periodic re-authentication and to specify the value of the Session-Timeout RADIUS attribute as the number of seconds between re-authentication attempts:

```
Switch(config-if) # dot1x reauthentication
Switch(config-if) # dot1x timeout reauth-period server
```

This example shows how to set 30 seconds as the quiet time on the switch:

```
Switch(config-if) # dot1x timeout quiet-period 30
```

This example shows how to set 45 seconds as the switch-to-authentication server retransmission time:

```
Switch(config) # dot1x timeout server-timeout 45
```

This example shows how to set 45 seconds as the switch-to-client retransmission time for the EAP request frame:

```
Switch(config-if) # dot1x timeout supp-timeout 45
```

This example shows how to set 60 as the number of seconds to wait for a response to an EAP-request/identity frame from the client before re-transmitting the request:

```
Switch(config-if) # dot1x timeout tx-period 60
```

This example shows how to set 30 as the number of seconds that the switch ignores EAPOL packets from successfully authenticated clients:

```
Switch(config-if) # dot1x timeout ratelimit-period 30
```

You can verify your settings by entering the **show dot1x** privileged EXEC command.



## Related Commands

Command	Description
<a href="#">dot1x max-req</a>	Sets the maximum number of times that the switch sends an EAP-request/identity frame before restarting the authentication process.
<a href="#">dot1x reauthentication</a>	Enables periodic re-authentication of the client.
<a href="#">show dot1x</a>	Displays IEEE 802.1x status for all ports.



# duplex

Use the **duplex** interface configuration command to specify the duplex mode of operation for a port. Use the **no** form of this command to return the port to its default value.

**duplex** { **auto** | **full** | **half** }

**no duplex**

## Syntax Description

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

## Defaults

The default is **auto** for Fast Ethernet and Gigabit Ethernet ports.

The default is **full** for 100BASE-*x* (where *x* is -BX, -FX, -FX-FE, or -LX) SFP modules.

Duplex options are not supported on the 1000BASE-*x* (where *x* is -BX, -CWDM, -LX, -SX, or -ZX) SFP modules.

For information about which SFP modules are supported on your switch, see the product release notes.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

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

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



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

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

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



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

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

**Caution**

Changing the interface speed and duplex mode configuration might shut down and re-enable the interface during the reconfiguration.

For guidelines on setting the switch speed and duplex parameters, see the “Configuring Interface Characteristics” chapter in the software configuration guide for this release.

**Examples**

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

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# duplex full
```

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

**Related Commands**

Command	Description
<a href="#">show interfaces</a>	Displays the interface settings on the switch.
<a href="#">speed</a>	Sets the speed on a 10/100 or 10/100/1000 Mb/s interface.



# errdisable detect cause

Use the **errdisable detect cause** global configuration command to enable error-disable detection for a specific cause or all causes. Use the **no** form of this command to disable the error-disable detection feature.

**errdisable detect cause {all | bpduguard | dhcp-rate-limit | dtp-flap | gbic-invalid | inline-power | link-flap | loopback | pagp-flap | sfp-config-mismatch}**

**no errdisable detect cause {all | bpduguard | dhcp-rate-limit | dtp-flap | gbic-invalid | inline-power | link-flap | loopback | pagp-flap | sfp-config-mismatch}**

For the BPDU guard and port-security features, you can use this command to globally configure the switch to shut down just the offending VLAN on the port when a violation occurs, instead of shutting down the entire port.

When the per-VLAN error-disable feature is turned off and a BPDU guard violation occurs, the entire port is disabled. Use the **no** form of this command to disable the per-VLAN error-disable feature.

**errdisable detect cause bpduguard shutdown vlan**

**no errdisable detect cause bpduguard shutdown vlan**

Syntax Description	<b>all</b>	Enable error detection for all error-disabled causes.
	<b>bpduguard shutdown vlan</b>	Enable per-VLAN error-disable for BPDU guard.
	<b>dhcp-rate-limit</b>	Enable error detection for DHCP snooping.
	<b>dtp-flap</b>	Enable error detection for the Dynamic Trunking Protocol (DTP) flapping.
	<b>gbic-invalid</b>	Enable error detection for an invalid Gigabit Interface Converter (GBIC) module.
		<b>Note</b> On the Catalyst 2960 switch, this error refers to an invalid small form-factor pluggable (SFP) module.
	<b>inline-power</b>	Enable error detection for inline power.
	<b>link-flap</b>	Enable error detection for link-state flapping.
	<b>loopback</b>	Enable error detection for detected loopbacks.
	<b>pagp-flap</b>	Enable error detection for the Port Aggregation Protocol (PAgP) flap error-disabled cause.
	<b>sfp-config-mismatch</b>	Enable error detection on an SFP configuration mismatch.

**Command Default** Detection is enabled for all causes. All causes are configured to shut down the entire port.

**Command Modes** Global configuration



## Command History

Release	Modification
12.2(25)FX	This command was introduced.
12.2(37)SE	The Per-VLAN error-detection feature was added. The <b>inline-power</b> and <b>sfp-config-mismatch</b> keywords were added.

## Usage Guidelines

A cause (**link-flap**, **dhcp-rate-limit**, and so forth) is the reason why the error-disabled state occurred. When a cause is detected on a port, the port is placed in an error-disabled state, an operational state that is similar to a link-down state.

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

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

## Examples

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

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

This command shows how to globally configure BPDU guard for per-VLAN error disable:

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

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

## Related Commands

Command	Description
<b>show errdisable detect</b>	Displays error-disabled detection information.
<b>show interfaces status err-disabled</b>	Displays interface status or a list of interfaces in the error-disabled state.
<b>clear errdisable interface</b>	Clears the error-disabled state from a port or VLAN that was error disabled by the per-VLAN error disable feature.



# errdisable recovery

Use the **errdisable recovery** global configuration command to configure the recover mechanism variables. Use the **no** form of this command to return to the default setting.

**errdisable recovery** { **cause** { **all** | **bpduguard** | **channel-misconfig** | **dhcp-rate-limit** | **dtp-flap** | **gbic-invalid** | **inline-power** | **link-flap** | **loopback** | **pagp-flap** | **psecure-violation** | **security-violation** | **sfp-mismatch** | **udld** | **vmmps** } | { **interval** *interval* }

**no errdisable recovery** { **cause** { **all** | **bpduguard** | **channel-misconfig** | **dhcp-rate-limit** | **dtp-flap** | **gbic-invalid** | **inline-power** | **link-flap** | **loopback** | **pagp-flap** | **psecure-violation** | **security-violation** | **sfp-mismatch** | **udld** | **vmmps** } | { **interval** *interval* }

## Syntax Description

<b>cause</b>	Enable the error-disabled mechanism to recover from a specific cause.
<b>all</b>	Enable the timer to recover from all error-disabled causes.
<b>bpduguard</b>	Enable the timer to recover from the bridge protocol data unit (BPDU) guard error-disabled state.
<b>channel-misconfig</b>	Enable the timer to recover from the EtherChannel misconfiguration error-disabled state.
<b>dhcp-rate-limit</b>	Enable the timer to recover from the DHCP snooping error-disabled state.
<b>dtp-flap</b>	Enable the timer to recover from the Dynamic Trunking Protocol (DTP) flap error-disabled state.
<b>gbic-invalid</b>	Enable the timer to recover from an invalid Gigabit Interface Converter (GBIC) module error-disabled state.  <b>Note</b> On the Catalyst 2960 switch, this error refers to an invalid small form-factor pluggable (SFP) error-disabled state.
<b>inline-power</b>	Enable error detection for inline-power.
<b>link-flap</b>	Enable the timer to recover from the link-flap error-disabled state.
<b>loopback</b>	Enable the timer to recover from a loopback error-disabled state.
<b>pagp-flap</b>	Enable the timer to recover from the Port Aggregation Protocol (PAgP)-flap error-disabled state.
<b>psecure-violation</b>	Enable the timer to recover from a port security violation disable state.
<b>security-violation</b>	Enable the timer to recover from an IEEE 802.1x-violation disabled state.
<b>sfp-config-mismatch</b>	Enable error detection on an SFP configuration mismatch.
<b>udld</b>	Enable the timer to recover from the UniDirectional Link Detection (UDLD) error-disabled state.
<b>vmmps</b>	Enable the timer to recover from the VLAN Membership Policy Server (VMPS) error-disabled state.
<b>interval</b> <i>interval</i>	Specify the time to recover from the specified error-disabled state. The range is 30 to 86400 seconds. The same interval is applied to all causes. The default interval is 300 seconds.  <b>Note</b> The error-disabled recovery timer is initialized at a random differential from the configured interval value. The difference between the actual timeout value and the configured value can be up to 15 percent of the configured interval.



**Defaults**

Recovery is disabled for all causes.

The default recovery interval is 300 seconds.

**Command Modes**

Global configuration

**Command History**

Release	Modification
12.2(25)FX	This command was introduced.
12.2(37)SE	The per-VLAN error-detection feature was added. The <b>inline-power</b> and <b>sfp-mismatch</b> keywords were added.

**Usage Guidelines**

A cause (**link-flap**, **bpduguard**, and so forth) is defined as the reason that the error-disabled state occurred. When a cause is detected on a port, the port is placed in the error-disabled state, an operational state similar to the link-down state.

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

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

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

**Examples**

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

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

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

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

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

**Related Commands**

Command	Description
<b>show errdisable recovery</b>	Displays error-disabled recovery timer information.
<b>show interfaces status err-disabled</b>	Displays interface status or a list of interfaces in error-disabled state.
<b>clear errdisable interface</b>	Clears the error-disabled state from a port or VLAN that was error disabled by the per-VLAN error disable feature.



# exception crashinfo

Use the **exception crashinfo** global configuration command to configure the switch to create the extended crashinfo file when the Cisco IOS image fails. Use the **no** form of this command to disable this feature.

**exception crashinfo**

**no exception crashinfo**

---

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

---

**Defaults** The switch creates the extended crashinfo file.

---

**Command Modes** Global configuration

---

Release	Modification
12.2(25)SED	This command was introduced.

---



---

**Usage Guidelines** The basic crashinfo file includes the Cisco IOS image name and version that failed and a list of the processor registers. The extended crashinfo file includes additional information that can help determine the cause of the switch failure.

Use the **no exception crashinfo** global configuration command to configure the switch to not create the extended crashinfo file.

---

**Examples** This example shows how to configure the switch to not create the extended crashinfo file:

```
Switch(config)# no exception crashinfo
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

---

Command	Description
<b>show running-config</b>	Displays the operating configuration, including defined macros. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .

---



# fallback profile

Use the **fallback profile** global configuration command to create a fallback profile for web authentication. To return to the default setting, use the **no** form of this command.

**fallback profile** *profile*

**no fallback profile**

Syntax Description	<i>profile</i>	Specify the fallback profile for clients that do not support IEEE 802.1x authentication.
--------------------	----------------	--

Defaults	No fallback profile is configured.
----------	------------------------------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(35)SE	This command was introduced.

Usage Guidelines	The fallback profile is used to define the IEEE 802.1x fallback behavior for IEEE 802.1x ports that do not have supplicants. The only supported behavior is to fall back to web authentication.
------------------	---

After entering the **fallback profile** command, you enter profile configuration mode, and these configuration commands are available:

- **ip:** Create an IP configuration.
- **access-group:** Specify access control for packets sent by hosts that have not yet been authenticated.
- **admission:** Apply an IP admission rule.

Examples	This example shows how to create a fallback profile to be used with web authentication:
----------	---

```
Switch# configure terminal
Switch(config)# ip admission name rule1 proxy http
Switch(config)# fallback profile profile1
Switch(config-fallback-profile)# ip access-group default-policy in
Switch(config-fallback-profile)# ip admission rule1
Switch(config-fallback-profile)# exit
Switch(config)# interface gigabitethernet 1/0/1
Switch(config-if)# dot1x fallback profile1
Switch(config-if)# end
```

You can verify your settings by entering the **show running-configuration** [*interface interface-id*] privileged EXEC command.



Related Commands	Command	Description
	<b>dot1x fallback</b>	Configure a port to use web authentication as a fallback method for clients that do not support IEEE 802.1x authentication.
	<b>ip admission</b>	Enable web authentication on a switch port
	<b>ip admission name proxy http</b>	Enable web authentication globally on a switch
	<b>show dot1x</b> [ <b>interface</b> <i>interface-id</i> ]	Displays IEEE 802.1x status for the specified port.
	<b>show fallback profile</b>	Display the configured profiles on a switch.



# flowcontrol

Use the **flowcontrol** interface configuration command to set the receive flow-control state for an interface. When flow control **send** is operable and on for a device and it detects any congestion at its end, it notifies the link partner or the remote device of the congestion by sending a pause frame. When flow control **receive** is on for a device and it receives a pause frame, it stops sending any data packets. This prevents any loss of data packets during the congestion period.

Use the **receive off** keywords to disable flow control.

**flowcontrol receive {desired | off | on}**



Note

The Catalyst 2960 switch can receive, but not send, pause frames.

## Syntax Description

<b>receive</b>	Set whether the interface can receive flow-control packets from a remote device.
<b>desired</b>	Allow an interface to operate with an attached device that is required to send flow-control packets or with an attached device that is not required to but can send flow-control packets.
<b>off</b>	Turn off the ability of an attached device to send flow-control packets to an interface.
<b>on</b>	Allow an interface to operate with an attached device that is required to send flow-control packets or with an attached device that is not required to but can send flow-control packets.

## Defaults

The default is **flowcontrol receive off**.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

The switch does not support sending flow-control pause frames.

Note that the **on** and **desired** keywords have the same result.

When you use the **flowcontrol** command to set a port to control traffic rates during congestion, you are setting flow control on a port to one of these conditions:

- **receive on** or **desired**: The port cannot send pause frames, but can operate with an attached device that is required to or is able to send pause frames. The port can receive pause frames.
- **receive off**: Flow control does not operate in either direction. In case of congestion, no indication is given to the link partner, and no pause frames are sent or received by either device.



Table 2-5 shows the flow control results on local and remote ports for a combination of settings. The table assumes that **receive desired** has the same results as using the **receive on** keywords.

**Table 2-5** *Flow Control Settings and Local and Remote Port Flow Control Resolution*

Flow Control Settings		Flow Control Resolution	
Local Device	Remote Device	Local Device	Remote Device
<b>send off/receive on</b>	<b>send on/receive on</b>	Receives only	Sends and receives
	<b>send on/receive off</b>	Receives only	Sends only
	<b>send desired/receive on</b>	Receives only	Sends and receives
	<b>send desired/receive off</b>	Receives only	Sends only
	<b>send off/receive on</b>	Receives only	Receives only
	<b>send off/receive off</b>	Does not send or receive	Does not send or receive
<b>send off/receive off</b>	<b>send on/receive on</b>	Does not send or receive	Does not send or receive
	<b>send on/receive off</b>	Does not send or receive	Does not send or receive
	<b>send desired/receive on</b>	Does not send or receive	Does not send or receive
	<b>send desired/receive off</b>	Does not send or receive	Does not send or receive
	<b>send off/receive on</b>	Does not send or receive	Does not send or receive
	<b>send off/receive off</b>	Does not send or receive	Does not send or receive

### Examples

This example shows how to configure the local port to not support flow control by the remote port:

```
Switch(config)# interface gigabitethernet0/21
Switch(config-if)# flowcontrol receive off
```

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

### Related Commands

Command	Description
<a href="#">show interfaces</a>	Displays the interface settings on the switch, including input and output flow control.



# interface port-channel

Use the **interface port-channel** global configuration command to access or create the port-channel logical interface. Use the **no** form of this command to remove the port-channel.

**interface port-channel** *port-channel-number*

**no interface port-channel** *port-channel-number*

## Syntax Description

<i>port-channel-number</i>	Port-channel number. The range is 1 to 6.
----------------------------	---

## Defaults

No port-channel logical interfaces are defined.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

For Layer 2 EtherChannels, you do not have to create a port-channel interface first before assigning a physical port to a channel group. Instead, you can use the **channel-group** interface configuration command. It automatically creates the port-channel interface when the channel group gets its first physical port. If you create the port-channel interface first, the *channel-group-number* can be the same as the *port-channel-number*, or you can use a new number. If you use a new number, the **channel-group** command dynamically creates a new port channel.

Only one port channel in a channel group is allowed.

Follow these guidelines when you use the **interface port-channel** command:

- If you want to use the Cisco Discovery Protocol (CDP), you must configure it only on the physical port and not on the port-channel interface.
- Do not configure a port that is an active member of an EtherChannel as an IEEE 802.1x port. If IEEE 802.1x is enabled on a not-yet active port of an EtherChannel, the port does not join the EtherChannel.

For a complete list of configuration guidelines, see the “Configuring EtherChannels” chapter in the software configuration guide for this release.


## Examples

This example shows how to create a port-channel interface with a port channel number of 5:

```
Switch(config)# interface port-channel 5
```

You can verify your setting by entering the **show running-config** privileged EXEC or **show etherchannel channel-group-number detail** privileged EXEC command.



 interface port-channel

Related Commands	Command	Description
	<a href="#">channel-group</a>	Assigns an Ethernet port to an EtherChannel group.
	<a href="#">show etherchannel</a>	Displays EtherChannel information for a channel.
	<b>show running-config</b>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# interface range

Use the **interface range** global configuration command to enter interface range configuration mode and to execute a command on multiple ports at the same time. Use the **no** form of this command to remove an interface range.

**interface range** {*port-range* | **macro name**}

**no interface range** {*port-range* | **macro name**}

Syntax Description	<i>port-range</i>	Port range. For a list of valid values for <i>port-range</i> , see the “Usage Guidelines” section.
	<b>macro name</b>	Specify the name of a macro.

Defaults	This command has no default setting.
----------	--------------------------------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	When you enter interface range configuration mode, all interface parameters you enter are attributed to all interfaces within the range.
------------------	--

For VLANs, you can use the **interface range** command only on existing VLAN switch virtual interfaces (SVIs). To display VLAN SVIs, enter the **show running-config** privileged EXEC command. VLANs not displayed cannot be used in the **interface range** command. The commands entered under **interface range** command are applied to all existing VLAN SVIs in the range.

All configuration changes made to an interface range are saved to NVRAM, but the interface range itself is not saved to NVRAM.

You can enter the interface range in two ways:

- Specifying up to five interface ranges
- Specifying a previously defined interface-range macro

All interfaces in a range must be the same type; that is, all Fast Ethernet ports, all Gigabit Ethernet ports, all EtherChannel ports, or all VLANs. However, you can define up to five interface ranges with a single command, with each range separated by a comma.



Valid values for *port-range* type and interface:

- **vlan** *vlan-ID*, where VLAN ID is from 1 to 4094



**Note** Although the command-line interface (CLI) shows options to set multiple VLANs, these are not supported.

- **fastethernet** module/{*first port*} - {*last port*}, where module is always **0**
- **gigabitethernet** module/{*first port*} - {*last port*}, where module is always **0**

For physical interfaces:

- module is always **0**
- the range is type **0/number - number** (for example, **gigabitethernet0/1 - 2**)

- **port-channel** *port-channel-number - port-channel-number*, where *port-channel-number* is from 1 to 6



**Note** When you use the **interface range** command with port channels, the first and last port channel number in the range must be active port channels.

When you define a range, you must enter a space between the first entry and the hyphen (-):

```
interface range gigabitethernet0/1 -2
```

When you define multiple ranges, you must still enter a space after the first entry and before the comma (,):

```
interface range fastethernet0/1 - 2, gigabitethernet0/1 - 2
```

You cannot specify both a macro and an interface range in the same command.

You can also specify a single interface in *port-range*. The command is then similar to the **interface interface-id** global configuration command.

For more information about configuring interface ranges, see the software configuration guide for this release.

## Examples

This example shows how to use the **interface range** command to enter interface-range configuration mode to apply commands to two ports:

```
Switch(config)# interface range gigabitethernet0/1 - 2
Switch(config-if-range)#
```

This example shows how to use a port-range macro *macro1* for the same function. The advantage is that you can reuse *macro1* until you delete it.

```
Switch(config)# define interface-range macro1 gigabitethernet0/1 - 2
Switch(config)# interface range macro macro1
Switch(config-if-range)#
```



Related Commands	Command	Description
	<a href="#">define interface-range</a>	Creates an interface range macro.
	<b>show running-config</b>	Displays the configuration information currently running on the switch. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# interface vlan

Use the **interface vlan** global configuration command to create or access a VLAN and to enter interface configuration mode. Use the **no** form of this command to delete a VLAN.

**interface vlan** *vlan-id*

**no interface vlan** *vlan-id*

Syntax Description	<i>vlan-id</i> VLAN number. The range is 1 to 4094.
--------------------	---

Defaults	The default VLAN interface is VLAN 1.
----------	---------------------------------------

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines** VLANs are created the first time that you enter the **interface vlan** *vlan-id* command for a particular VLAN. The *vlan-id* corresponds to the VLAN-tag associated with data frames on an IEEE 802.1Q encapsulated trunk or the VLAN ID configured for an access port.

If you delete a VLAN by entering the **no interface vlan** *vlan-id* command, the deleted interface is no longer visible in the output from the **show interfaces** privileged EXEC command.



## Note

You cannot delete the VLAN 1 interface.

You can re-instate a deleted VLAN by entering the **interface vlan** *vlan-id* command for the deleted interface. The interface comes back up, but the previous configuration is gone.



---

**Examples**

This example shows how to create a new VLAN with VLAN ID 23 and to enter interface configuration mode:

```
Switch(config)# interface vlan 23
Switch(config-if)#
```

You can verify your setting by entering the **show interfaces** and **show interfaces vlan *vlan-id*** privileged EXEC commands.

---

**Related Commands**

Command	Description
<b>show interfaces vlan <i>vlan-id</i></b>	Displays the administrative and operational status of all interfaces or the specified VLAN.



# ip access-group

Use the **ip access-group** interface configuration command to control access to a Layer 2 interface. Use the **no** form of this command to remove all access groups or the specified access group from the interface.

**ip access-group** {*access-list-number* | *name*} {**in**}

**no ip access-group** [*access-list-number* | *name*] {**in**}

## Syntax Description

<i>access-list-number</i>	The number of the IP access control list (ACL). The range is 1 to 199 or 1300 to 2699.
<i>name</i>	The name of an IP ACL, specified in the <b>ip access-list</b> global configuration command.
<b>in</b>	Specify filtering on inbound packets.

## Defaults

No access list is applied to the interface.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

You can apply named or numbered standard or extended IP access lists to an interface. To define an access list by name, use the **ip access-list** global configuration command. To define a numbered access list, use the **access list** global configuration command. You can use numbered standard access lists ranging from 1 to 99 and 1300 to 1999 or extended access lists ranging from 100 to 199 and 2000 to 2699.

You can use this command to apply an access list to a Layer 2 interface. However, note these limitations for port ACLs:

- You can only apply ACLs in the inbound direction.
- You can only apply one IP ACL and one MAC ACL per interface.
- Port ACLs do not support logging; if the **log** keyword is specified in the IP ACL, it is ignored.
- An IP ACL applied to an interface only filters IP packets. To filter non-IP packets, use the **mac access-group** interface configuration command with MAC extended ACLs.

For standard inbound access lists, after the switch receives a packet, it checks the source address of the packet against the access list. IP extended access lists can optionally check other fields in the packet, such as the destination IP address, protocol type, or port numbers. If the access list permits the packet, the switch continues to process the packet. If the access list denies the packet, the switch discards the packet.

If the specified access list does not exist, all packets are passed.



## Examples

This example shows how to apply IP access list 101 to inbound packets on a port:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# ip access-group 101 in
```

You can verify your settings by entering the **show ip interface**, **show access-lists**, or **show ip access-lists** privileged EXEC command.

## Related Commands

Command	Description
<b>access list</b>	Configures a numbered ACL. For syntax information, select <b>Cisco IOS IP Command Reference, Volume 1 of 3:Addressing and Services, Release 12.2 &gt; IP Services Commands</b>
<b>ip access-list</b>	Configures a named ACL. For syntax information, select <b>Cisco IOS IP Command Reference, Volume 1 of 3:Addressing and Services, Release 12.2 &gt; IP Services Commands</b> .
<b>show access-lists</b>	Displays ACLs configured on the switch.
<b>show ip access-lists</b>	Displays IP ACLs configured on the switch. For syntax information, select <b>Cisco IOS IP Command Reference, Volume 1 of 3:Addressing and Services, Release 12.2 &gt; IP Services Commands</b> .
<b>show ip interface</b>	Displays information about interface status and configuration. For syntax information, select <b>Cisco IOS IP Command Reference, Volume 1 of 3:Addressing and Services, Release 12.2 &gt; IP Services Commands</b> .



# ip address

Use the **ip address** interface configuration command to set an IP address for the Layer 2 switch. Use the **no** form of this command to remove an IP address or to disable IP processing.

**ip address** *ip-address subnet-mask* [**secondary**]

**no ip address** [*ip-address subnet-mask*] [**secondary**]

Syntax Description	<i>ip-address</i>	IP address.
	<i>subnet-mask</i>	Mask for the associated IP subnet.
	<b>secondary</b>	(Optional) Specifies that the configured address is a secondary IP address. If this keyword is omitted, the configured address is the primary IP address.

**Defaults** No IP address is defined.

**Command Modes** Interface configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

If you remove the switch IP address through a Telnet session, your connection to the switch will be lost. Hosts can find subnet masks using the Internet Control Message Protocol (ICMP) Mask Request message. Routers respond to this request with an ICMP Mask Reply message.

You can disable IP processing on a particular interface by removing its IP address with the **no ip address** command. If the switch detects another host using one of its IP addresses, it will send an error message to the console.

You can use the optional keyword **secondary** to specify an unlimited number of secondary addresses. Secondary addresses are treated like primary addresses, except the system never generates datagrams other than routing updates with secondary source addresses. IP broadcasts and ARP requests are handled properly, as are interface routes in the IP routing table.



## Note

If any router on a network segment uses a secondary address, all other devices on that same segment must also use a secondary address from the same network or subnet. Inconsistent use of secondary addresses on a network segment can very quickly cause routing loops.

If your switch receives its IP address from a Bootstrap Protocol (BOOTP) or a DHCP server and you remove the switch IP address by using the **no ip address** command, IP processing is disabled, and the BOOTP or the DHCP server cannot reassign the address.



---

**Examples**

This example shows how to configure the IP address for the Layer 2 switch on a subnetted network:

```
Switch(config)# interface vlan 1
Switch(config-if)# ip address 172.20.128.2 255.255.255.0
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

---

**Related Commands**

Command	Description
<b>show running-config</b>	Displays the running configuration on the switch. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# ip admission

Use the **ip admission** interface configuration command to enable web authentication. You can also use this command in fallback-profile mode. Use the **no** form of this command to disable web authentication.

**ip admission** *rule*

**no ip admission**

Syntax Description	<i>rule</i> Apply an IP admission rule to the interface.
--------------------	--

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(35)SE	This command was introduced.

Usage Guidelines	The <b>ip admission</b> command applies a web authentication rule to a switch port.
------------------	---

**Examples** This example shows how to apply a web authentication rule to a switchport:

```
Switch# configure terminal
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# ip admission rule1
```

This example shows how to apply a web authentication rule to a fallback profile for use on an IEEE 802.1x enabled switch port.

```
Switch# configure terminal
Switch(config)# fallback profile profile1
Switch(config)# ip admission name rule1
Switch(config)# end
```

Related Commands	Command	Description
	<a href="#">dot1x fallback</a>	Configure a port to use web authentication as a fallback method for clients that do not support IEEE 802.1x authentication.
	<a href="#">fallback profile</a>	Enable web authentication on a port
	<a href="#">ip admission name</a> <a href="#">proxy http</a>	Enable web authentication globally on a switch
	<b>show ip admission</b>	Displays information about NAC cached entries or the NAC configuration. For more information, see the <i>Network Admission Control Software Configuration Guide</i> on Cisco.com.



# ip admission name proxy http

Use the **ip admission name proxy http** global configuration command to enable web authentication. Use the **no** form of this command to disable web authentication.

**ip admission name proxy http**

**no ip admission name proxy http**

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

<b>Defaults</b>	Web authentication is disabled.
-----------------	---------------------------------

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

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(35)SE	This command was introduced.

<b>Usage Guidelines</b>	<p>The <b>ip admission name proxy http</b> command globally enables web authentication on a switch.</p> <p>After you enable web authentication on a switch, use the <b>ip access-group in</b> and <b>ip admission web-rule</b> interface configuration commands to enable web authentication on a specific interface.</p>
-------------------------	---

<b>Examples</b>	This example shows how to configure only web authentication on a switchport:
-----------------	--

```
Switch# configure terminal
Switch(config)# ip admission name http-rule proxy http
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# ip access-group 101 in
Switch(config-if)# ip admission rule
Switch(config-if)# end
```

This example shows how to configure IEEE 802.1x authentication with web authentication as a fallback mechanism on a switchport.

```
Switch# configure terminal
Switch(config)# ip admission name rule2 proxy http
Switch(config)# fallback profile profile1
Switch(config)# ip access group 101 in
Switch(config)# ip admission name rule2
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# dot1x port-control auto
Switch(config-if)# dot1x fallback profile1
Switch(config-if)# end
```



Related Commands	Command	Description
	<b>dot1x fallback</b>	Configure a port to use web authentication as a fallback method for clients that do not support IEEE 802.1x authentication.
	<b>fallback profile</b>	Create a web authentication fallback profile.
	<b>ip admission</b>	Enable web authentication on a port
	<b>show ip admission</b>	Displays information about NAC cached entries or the NAC configuration. For more information, see the <i>Network Admission Control Software Configuration Guide</i> on Cisco.com.



# ip dhcp snooping

Use the **ip dhcp snooping** global configuration command to globally enable DHCP snooping. Use the **no** form of this command to return to the default setting.

**ip dhcp snooping**

**no ip dhcp snooping**

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

<b>Defaults</b>	DHCP snooping is disabled.
-----------------	----------------------------

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

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	<p>For any DHCP snooping configuration to take effect, you must globally enable DHCP snooping.</p> <p>DHCP snooping is not active until you enable snooping on a VLAN by using the <b>ip dhcp snooping vlan <i>vlan-id</i></b> global configuration command.</p>
-------------------------	--

<b>Examples</b>	<p>This example shows how to enable DHCP snooping:</p> <pre>Switch(config)# ip dhcp snooping</pre> <p>You can verify your settings by entering the <b>show ip dhcp snooping</b> user EXEC command.</p>
-----------------	--

<b>Related Commands</b>	<b>Command</b>	<b>Description</b>
	<a href="#">ip dhcp snooping vlan</a>	Enables DHCP snooping on a VLAN.
	<a href="#">show ip igmp snooping</a>	Displays the DHCP snooping configuration.
	<a href="#">show ip dhcp snooping binding</a>	Displays the DHCP snooping binding information.



# ip dhcp snooping binding

Use the **ip dhcp snooping binding** privileged EXEC command to configure the DHCP snooping binding database and to add binding entries to the database. Use the **no** form of this command to delete entries from the binding database.

**ip dhcp snooping binding** *mac-address* **vlan** *vlan-id* *ip-address* **interface** *interface-id* **expiry** *seconds*

**no ip dhcp snooping binding** *mac-address* **vlan** *vlan-id* *ip-address* **interface** *interface-id*

Syntax Description	<i>mac-address</i>	Specify a MAC address.
	<b>vlan</b> <i>vlan-id</i>	Specify a VLAN number. The range is 1 to 4094.
	<i>ip-address</i>	Specify an IP address.
	<b>interface</b> <i>interface-id</i>	Specify an interface on which to add or delete a binding entry.
	<b>expiry</b> <i>seconds</i>	Specify the interval (in seconds) after which the binding entry is no longer valid. The range is 1 to 4294967295.

**Defaults** No default database is defined.

**Command Modes** Privileged EXEC

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines** Use this command when you are testing or debugging the switch.

In the DHCP snooping binding database, each database entry, also referred to a binding, has an IP address, an associated MAC address, the lease time (in hexadecimal format), the interface to which the binding applies, and the VLAN to which the interface belongs. The database can have up to 8192 bindings.

Use the **show ip dhcp snooping binding** privileged EXEC command to display only the configured bindings.



---

**Examples**

This example shows how to generate a DHCP binding configuration with an expiration time of 1000 seconds on a port in VLAN 1:

```
Switch# ip dhcp snooping binding 0001.1234.1234 vlan 1 172.20.50.5 interface
gigabitethernet0/1 expiry 1000
```

You can verify your settings by entering the **show ip dhcp snooping binding** privileged EXEC command.

---

**Related Commands**

Command	Description
<a href="#">ip dhcp snooping</a>	Enables DHCP snooping on a VLAN.
<a href="#">show ip dhcp snooping binding</a>	Displays the dynamically configured bindings in the DHCP snooping binding database and the configuration information.



# ip dhcp snooping database

Use the **ip dhcp snooping database** global configuration command to configure the DHCP snooping binding database agent. Use the **no** form of this command to disable the agent, to reset the timeout value, or to reset the write-delay value.

```
ip dhcp snooping database { flash:/filename | ftp://user:password@host/filename |  
  http://[username:password]@{hostname | host-ip}/directory/image-name.tar |  
  rnp://user@host/filename | tftp://host/filename } | timeout seconds | write-delay seconds }
```

```
no ip dhcp snooping database [timeout | write-delay]
```

## Syntax Description

<b>flash:</b> / <i>filename</i>	Specify that the database agent or the binding file is in the flash memory.
<b>ftp:</b> // <i>user:password@host/filename</i>	Specify that the database agent or the binding file is on an FTP server.
<b>http:</b> //[ <i>username:password</i> ]@{ <i>hostname</i>   <i>host-ip</i> }/ <i>directory</i> / <i>image-name.tar</i>	Specify that the database agent or the binding file is on an FTP server.
<b>rnp:</b> // <i>user@host/filename</i>	Specify that the database agent or the binding file is on a Remote Control Protocol (RCP) server.
<b>tftp:</b> // <i>host/filename</i>	Specify that the database agent or the binding file is on a TFTP server.
<b>timeout</b> <i>seconds</i>	Specify (in seconds) how long to wait for the database transfer process to finish before stopping.  The default is 300 seconds. The range is 0 to 86400. Use 0 to define an infinite duration, which means to continue trying the transfer indefinitely.
<b>write-delay</b> <i>seconds</i>	Specify (in seconds) the duration for which the transfer should be delayed after the binding database changes. The default is 300 seconds. The range is 15 to 86400.

## Defaults

The URL for the database agent or binding file is not defined.

The timeout value is 300 seconds (5 minutes).

The write-delay value is 300 seconds (5 minutes).

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.



### Usage Guidelines

The DHCP snooping binding database can have up to 8192 bindings.

To ensure that the lease time in the database is accurate, we recommend that Network Time Protocol (NTP) is enabled and configured for these features:

- NTP authentication
- NTP peer and server associations
- NTP broadcast service
- NTP access restrictions
- NTP packet source IP address

If NTP is configured, the switch writes binding changes to the binding file only when the switch system clock is synchronized with NTP.

Because both NVRAM and the flash memory have limited storage capacities, we recommend that you store a binding file on a TFTP server. You must create an empty file at the configured URL on network-based URLs (such as TFTP and FTP) before the switch can first write bindings to the binding file at that URL.

Use the **ip dhcp snooping database flash:/filename** command to save the DHCP snooping binding database in the NVRAM. If you set the **ip dhcp snooping database timeout** command to 0 seconds and the database is being written to a TFTP file, if the TFTP server goes down, the database agent continues to try the transfer indefinitely. No other transfer can be initiated while this one is in progress. This might be inconsequential because if the server is down, no file can be written to it.

Use the **no ip dhcp snooping database** command to disable the agent.

Use the **no ip dhcp snooping database timeout** command to reset the timeout value.

Use the **no ip dhcp snooping database write-delay** command to reset the write-delay value.

### Examples

This example shows how to store a binding file at an IP address of 10.1.1.1 that is in a directory called *directory*. A file named *file* must be present on the TFTP server.

```
Switch(config)# ip dhcp snooping database tftp://10.1.1.1/directory/file
```

This example shows how to store a binding file called *file01.txt* in the NVRAM:

```
Switch(config)# ip dhcp snooping database flash:file01.txt
```

You can verify your settings by entering the **show ip dhcp snooping database** privileged EXEC command.

### Related Commands

Command	Description
<b>ip dhcp snooping</b>	Enables DHCP snooping on a VLAN.
<b>ip dhcp snooping binding</b>	Configures the DHCP snooping binding database.
<b>show ip dhcp snooping database</b>	Displays the status of DHCP snooping database agent.



# ip dhcp snooping information option

Use the **ip dhcp snooping information option** global configuration command to enable DHCP option-82 data insertion. Use the **no** form of this command to disable DHCP option-82 data insertion.

**ip dhcp snooping information option**

**no ip dhcp snooping information option**

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

**Defaults** DHCP option-82 data is inserted.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines** You must globally enable DHCP snooping by using the **ip dhcp snooping** global configuration command for any DHCP snooping configuration to take effect.

When the option-82 feature is enabled and a switch receives a DHCP request from a host, it adds the option-82 information in the packet. The option-82 information contains the switch MAC address (the remote ID suboption) and the port identifier, **vlan-mod-port**, from which the packet is received (circuit ID suboption). The switch forwards the DHCP request that includes the option-82 field to the DHCP server.

When the DHCP server receives the packet, it can use the remote ID, the circuit ID, or both to assign IP addresses and implement policies, such as restricting the number of IP addresses that can be assigned to a single remote ID or a circuit ID. Then the DHCP server echoes the option-82 field in the DHCP reply.

The DHCP server unicasts the reply to the switch if the request was relayed to the server by the switch. When the client and server are on the same subnet, the server broadcasts the reply. The switch inspects the remote ID and possibly the circuit ID fields to verify that it originally inserted the option-82 data. The switch removes the option-82 field and forwards the packet to the switch port that connects to the DHCP host that sent the DHCP request.

**Examples** This example shows how to enable DHCP option-82 data insertion:

```
Switch(config)# ip dhcp snooping information option
```

You can verify your settings by entering the **show ip dhcp snooping** user EXEC command.



## Related Commands

Command	Description
<a href="#">show ip dhcp snooping</a>	Displays the DHCP snooping configuration.
<a href="#">show ip dhcp snooping binding</a>	Displays the DHCP snooping binding information.



# ip dhcp snooping information option allow-untrusted

Use the **ip dhcp snooping information option allow-untrusted** global configuration command on an aggregation switch to configure it to accept DHCP packets with option-82 information that are received on untrusted ports that might be connected to an edge switch. Use the **no** form of this command to return to the default setting.

**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

The switch drops DHCP packets with option-82 information that are received on untrusted ports that might be connected to an edge switch.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

You might want an edge switch to which a host is connected to insert DHCP option-82 information at the edge of your network. You might also want to enable DHCP security features, such as DHCP snooping, on an aggregation switch. However, if DHCP snooping is enabled on the aggregation switch, the switch drops packets with option-82 information that are received on an untrusted port and does not learn DHCP snooping bindings for connected devices on a trusted interface.

If the edge switch to which a host is connected inserts option-82 information and you want to use DHCP snooping on an aggregation switch, enter the **ip dhcp snooping information option allow-untrusted** command on the aggregation switch. The aggregation switch can learn the bindings for a host even though the aggregation switch receives DHCP snooping packets on an untrusted port. You can also enable DHCP security features on the aggregation switch. The port on the edge switch to which the aggregation switch is connected must be configured as a trusted port.



### Note

Do not enter the **ip dhcp snooping information option allow-untrusted** command on an aggregation switch to which an untrusted device is connected. If you enter this command, an untrusted device might spoof the option-82 information.



---

**Examples**

This example shows how to configure an access switch to not check the option-82 information in untrusted packets from an edge switch and to accept the packets:

```
Switch(config)# ip dhcp snooping information option allow-untrusted
```

You can verify your settings by entering the **show ip dhcp snooping** user EXEC command.

---

**Related Commands**

Command	Description
<a href="#">show ip dhcp snooping</a>	Displays the DHCP snooping configuration.
<a href="#">show ip dhcp snooping binding</a>	Displays the DHCP snooping binding information.



# ip dhcp snooping limit rate

Use the **ip dhcp snooping limit rate** interface configuration command to configure the number of DHCP messages an interface can receive per second. Use the **no** form of this command to return to the default setting.

**ip dhcp snooping limit rate** *rate*

**no ip dhcp snooping limit rate**

Syntax Description	<i>rate</i>	Number of DHCP messages an interface can receive per second. The range is 1 to 2048.
--------------------	-------------	--

Defaults	DHCP snooping rate limiting is disabled.
----------	--

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	Normally, the rate limit applies to untrusted interfaces. If you want to configure rate limiting for trusted interfaces, keep in mind that trusted interfaces might aggregate DHCP traffic on multiple VLANs (some of which might not be snooped) in the switch, and you will need to adjust the interface rate limits to a higher value.
------------------	---

If the rate limit is exceeded, the interface is error-disabled. If you enabled error recovery by entering the **errdisable recovery dhcp-rate-limit** global configuration command, the interface retries the operation again when all the causes have timed out. If the error-recovery mechanism is not enabled, the interface stays in the error-disabled state until you enter the **shutdown** and **no shutdown** interface configuration commands.

Examples	This example shows how to set a message rate limit of 150 messages per second on an interface:
----------	--

```
Switch(config-if)# ip dhcp snooping limit rate 150
```

You can verify your settings by entering the **show ip dhcp snooping** user EXEC command.

Related Commands	Command	Description
	<a href="#">errdisable recovery</a>	Configures the recover mechanism.
	<a href="#">show ip dhcp snooping</a>	Displays the DHCP snooping configuration.
	<a href="#">show ip dhcp snooping binding</a>	Displays the DHCP snooping binding information.



# ip dhcp snooping trust

Use the **ip dhcp snooping trust** interface configuration command to configure a port as trusted for DHCP snooping purposes. Use the **no** form of this command to return to the default setting.

**ip dhcp snooping trust**

**no ip dhcp snooping trust**

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

<b>Defaults</b>	DHCP snooping trust is disabled.
-----------------	----------------------------------

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

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	Configure as trusted ports those that are connected to a DHCP server or to other switches or routers. Configure as untrusted ports those that are connected to DHCP clients.
-------------------------	--

<b>Examples</b>	This example shows how to enable DHCP snooping trust on a port:
-----------------	---

```
Switch(config-if)# ip dhcp snooping trust
```

You can verify your settings by entering the **show ip dhcp snooping** user EXEC command.

Related Commands	Command	Description
	<a href="#">show ip dhcp snooping</a>	Displays the DHCP snooping configuration.
	<a href="#">show ip dhcp snooping binding</a>	Displays the DHCP snooping binding information.



# ip dhcp snooping verify

Use the **ip dhcp snooping verify** global configuration command to configure the switch to verify on an untrusted port that the source MAC address in a DHCP packet matches the client hardware address. Use the **no** form of this command to configure the switch to not verify the MAC addresses.

**ip dhcp snooping verify mac-address**

**no ip dhcp snooping verify mac-address**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The switch verifies the source MAC address in a DHCP packet that is received on untrusted ports matches the client hardware address in the packet.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

In a service-provider network, when a switch receives a packet from a DHCP client on an untrusted port, it automatically verifies that the source MAC address and the DHCP client hardware address match. If the addresses match, the switch forwards the packet. If the addresses do not match, the switch drops the packet.

## Examples

This example shows how to disable the MAC address verification:

```
Switch(config)# no ip dhcp snooping verify mac-address
```

You can verify your settings by entering the **show ip dhcp snooping** user EXEC command.

## Related Commands

Command	Description
<a href="#">show ip dhcp snooping</a>	Displays the DHCP snooping configuration.



# ip dhcp snooping vlan

Use the **ip dhcp snooping vlan** global configuration command to enable DHCP snooping on a VLAN. Use the **no** form of this command to return to the default setting.

**ip dhcp snooping vlan** *vlan-range*

**no ip dhcp snooping vlan** *vlan-range*

Syntax Description	<p><b>vlan</b> <i>vlan-range</i> Specify a VLAN ID or a range of VLANs on which to enable DHCP snooping. The range is 1 to 4094.</p> <p>You can enter a single VLAN ID identified by VLAN ID number, a series of VLAN IDs separated by commas, a range of VLAN IDs separated by hyphens, or a range of VLAN IDs separated by entering the starting and ending VLAN IDs separated by a space.</p>	
Defaults	DHCP snooping is disabled on all VLANs.	
Command Modes	Global configuration	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.
Usage Guidelines	You must first globally enable DHCP snooping before enabling DHCP snooping on a VLAN.	
Examples	<p>This example shows how to enable DHCP snooping on VLAN 10:</p> <pre>Switch(config)# ip dhcp snooping vlan 10</pre> <p>You can verify your settings by entering the <b>show ip dhcp snooping</b> user EXEC command.</p>	
Related Commands	Command	Description
	<a href="#">show ip dhcp snooping</a>	Displays the DHCP snooping configuration.
	<a href="#">show ip dhcp snooping binding</a>	Displays the DHCP snooping binding information.



# ip igmp filter

Use the **ip igmp filter** interface configuration command to control whether or not all hosts on a Layer 2 interface can join one or more IP multicast groups by applying an Internet Group Management Protocol (IGMP) profile to the interface. Use the **no** form of this command to remove the specified profile from the interface.

**ip igmp filter** *profile number*

**no ip igmp filter**

Syntax Description	<i>profile number</i> The IGMP profile number to be applied. The range is 1 to 4294967295.	
Defaults	No IGMP filters are applied.	
Command Modes	Interface configuration	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.
Usage Guidelines	<p>You can apply IGMP filters only to Layer 2 physical interfaces; you cannot apply IGMP filters to ports that belong to an EtherChannel group.</p> <p>An IGMP profile can be applied to one or more switch port interfaces, but one port can have only one profile applied to it.</p>	
Examples	<p>This example shows how to apply IGMP profile 22 to a port:</p> <pre>Switch(config)# interface gigabitethernet0/2 Switch(config-if)# ip igmp filter 22</pre> <p>You can verify your setting by using the <b>show running-config</b> privileged EXEC command and by specifying an interface.</p>	



Related Commands	Command	Description
	<b>ip igmp profile</b>	Configures the specified IGMP profile number.
	<b>show ip dhcp snooping statistics</b>	Displays the characteristics of the specified IGMP profile.
	<b>show running-config interface</b> <i>interface-id</i>	Displays the running configuration on the switch interface, including the IGMP profile (if any) that is applied to an interface. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



## ip igmp max-groups

Use the **ip igmp max-groups** interface configuration command to set the maximum number of Internet Group Management Protocol (IGMP) groups that a Layer 2 interface can join or to configure the IGMP throttling action when the maximum number of entries is in the forwarding table. Use the **no** form of this command to set the maximum back to the default, which is to have no maximum limit, or to return to the default throttling action, which is to drop the report.

**ip igmp max-groups** {*number* | **action** {**deny** | **replace**}}

**no ip igmp max-groups** {*number* | **action**}

### Syntax Description

<i>number</i>	The maximum number of IGMP groups that an interface can join. The range is 0 to 4294967294. The default is no limit.
<b>action deny</b>	When the maximum number of entries is in the IGMP snooping forwarding table, drop the next IGMP join report. This is the default action.
<b>action replace</b>	When the maximum number of entries is in the IGMP snooping forwarding table, replace the existing group with the new group for which the IGMP report was received.

### Defaults

The default maximum number of groups is no limit.

After the switch learns the maximum number of IGMP group entries on an interface, the default throttling action is to drop the next IGMP report that the interface receives and to not add an entry for the IGMP group to the interface.

### Command Modes

Interface configuration

### Command History

Release	Modification
12.2(25)FX	This command was introduced.

### Usage Guidelines

You can use this command only on Layer 2 physical interfaces and on logical EtherChannel interfaces. You cannot set IGMP maximum groups for ports that belong to an EtherChannel group.

Follow these guidelines when configuring the IGMP throttling action:

- If you configure the throttling action as **deny** and set the maximum group limitation, the entries that were previously in the forwarding table are not removed but are aged out. After these entries are aged out, when the maximum number of entries is in the forwarding table, the switch drops the next IGMP report received on the interface.
- If you configure the throttling action as **replace** and set the maximum group limitation, the entries that were previously in the forwarding table are removed. When the maximum number of entries is in the forwarding table, the switch replaces a randomly selected multicast entry with the received IGMP report.
- When the maximum group limitation is set to the default (no maximum), entering the **ip igmp max-groups {deny | replace}** command has no effect.



---

**Examples**

This example shows how to limit to 25 the number of IGMP groups that a port can join:

```
Switch(config)# interface gigabitethernet0/2
Switch(config-if)# ip igmp max-groups 25
```

This example shows how to configure the switch to replace the existing group with the new group for which the IGMP report was received when the maximum number of entries is in the forwarding table:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# ip igmp max-groups action replace
```

You can verify your setting by using the **show running-config** privileged EXEC command and by specifying an interface.

---

**Related Commands**

Command	Description
<b>show running-config interface</b> <i>interface-id</i>	Displays the running configuration on the switch interface, including the maximum number of IGMP groups that an interface can join and the throttling action. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# ip igmp profile

Use the **ip igmp profile** global configuration command to create an Internet Group Management Protocol (IGMP) profile and enter IGMP profile configuration mode. From this mode, you can specify the configuration of the IGMP profile to be used for filtering IGMP membership reports from a switchport. Use the **no** form of this command to delete the IGMP profile.

**ip igmp profile** *profile number*

**no ip igmp profile** *profile number*

Syntax Description	<i>profile number</i> The IGMP profile number being configured. The range is 1 to 4294967295.				
Defaults	No IGMP profiles are defined. When configured, the default action for matching an IGMP profile is to deny matching addresses.				
Command Modes	Global configuration				
Command History	<table> <tr> <th>Release</th><th>Modification</th></tr> <tr> <td>12.2(25)FX</td><td>This command was introduced.</td></tr> </table>	Release	Modification	12.2(25)FX	This command was introduced.
Release	Modification				
12.2(25)FX	This command was introduced.				

**Usage Guidelines**

When you are in IGMP profile configuration mode, you can create the profile by using these commands:

- **deny**: specifies that matching addresses are denied; this is the default condition.
- **exit**: exits from igmp-profile configuration mode.
- **no**: negates a command or resets to its defaults.
- **permit**: specifies that matching addresses are permitted.
- **range**: specifies a range of IP addresses for the profile. This can be a single IP address or a range with a start and an end address.

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)# ip igmp profile 40
Switch(config-igmp-profile)# permit
Switch(config-igmp-profile)# range 233.1.1.1 233.255.255.255
```

You can verify your settings by using the **show ip igmp profile** privileged EXEC command.



Related Commands	Command	Description
	<a href="#">ip igmp filter</a>	Applies the IGMP profile to the specified interface.
	<a href="#">show ip dhcp snooping statistics</a>	Displays the characteristics of all IGMP profiles or the specified IGMP profile number.



# ip igmp snooping

Use the **ip igmp snooping** global configuration command to globally enable Internet Group Management Protocol (IGMP) snooping on the switch or to enable it on a per-VLAN basis. Use the **no** form of this command to return to the default setting.

**ip igmp snooping** [**vlan** *vlan-id*]

**no ip igmp snooping** [**vlan** *vlan-id*]

Syntax Description	<b>vlan</b> <i>vlan-id</i>	(Optional) Enable IGMP snooping on the specified VLAN. The range is 1 to 1001 and 1006 to 4094.
--------------------	----------------------------	---

Defaults	IGMP snooping is globally enabled on the switch. IGMP snooping is enabled on VLAN interfaces.
----------	--

Command Modes	Global configuration
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Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	When IGMP snooping is enabled globally, it is enabled in all the existing VLAN interfaces. When IGMP snooping is globally disabled, it is disabled on all the existing VLAN interfaces.  VLAN IDs 1002 to 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in IGMP snooping.
------------------	--

Examples	<p>This example shows how to globally enable IGMP snooping:</p> <pre>Switch(config)# ip igmp snooping</pre> <p>This example shows how to enable IGMP snooping on VLAN 1:</p> <pre>Switch(config)# ip igmp snooping vlan 1</pre> <p>You can verify your settings by entering the <b>show ip igmp snooping</b> privileged EXEC command.</p>
----------	---



Related Commands	Command	Description
	<b>ip igmp snooping report-suppression</b>	Enables IGMP report suppression.
	<b>show ip dhcp snooping statistics</b>	Displays the snooping configuration.
	<b>show ip igmp snooping groups</b>	Displays IGMP snooping multicast information.
	<b>show ip igmp snooping mrouter</b>	Displays the IGMP snooping router ports.
	<b>show ip igmp snooping querier</b>	Displays the configuration and operation information for the IGMP querier configured on a switch.



# ip igmp snooping last-member-query-interval

Use the **ip igmp snooping last-member-query-interval** global configuration command to enable the Internet Group Management Protocol (IGMP) configurable-leave timer globally or on a per-VLAN basis. Use the **no** form of this command to return to the default setting.

**ip igmp snooping [vlan *vlan-id*] last-member-query-interval *time***

**no ip igmp snooping [vlan *vlan-id*] last-member-query-interval**

Syntax Description	<b>vlan <i>vlan-id</i></b>	(Optional) Enable IGMP snooping and the leave timer on the specified VLAN. The range is 1 to 1001 and 1006 to 4094.
	<b><i>time</i></b>	Interval time out in seconds. The range is 100 to 5000 milliseconds.

**Defaults** The default timeout setting is 1000 milliseconds.

**Command Modes** Global configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

When IGMP snooping is globally enabled, IGMP snooping is enabled on all the existing VLAN interfaces. When IGMP snooping is globally disabled, IGMP snooping is disabled on all the existing VLAN interfaces.

VLAN IDs 1002 to 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in IGMP snooping.

Configuring the leave timer on a VLAN overrides the global setting.

The IGMP configurable leave time is only supported on devices running IGMP Version 2.

The configuration is saved in NVRAM.

**Examples**

This example shows how to globally enable the IGMP leave timer for 2000 milliseconds:

```
Switch(config)# ip igmp snooping last-member-query-interval 2000
```

This example shows how to configure the IGMP leave timer for 3000 milliseconds on VLAN 1:

```
Switch(config)# ip igmp snooping vlan 1 last-member-query-interval 3000
```

You can verify your settings by entering the **show ip igmp snooping** privileged EXEC command.



## Related Commands

Command	Description
<a href="#">ip igmp snooping</a>	Enables IGMP snooping on the switch or on a VLAN.
<a href="#">ip igmp snooping vlan immediate-leave</a>	Enables IGMP Immediate-Leave processing.
<a href="#">ip igmp snooping vlan mrouter</a>	Configures a Layer 2 port as a multicast router port.
<a href="#">ip igmp snooping vlan static</a>	Configures a Layer 2 port as a member of a group.
<a href="#">show ip igmp snooping</a>	Displays the IGMP snooping configuration.



# ip igmp snooping querier

Use the **ip igmp snooping querier** global configuration command to globally enable the Internet Group Management Protocol (IGMP) querier function in Layer 2 networks. Use the command with keywords to enable and configure the IGMP querier feature on a VLAN interface. Use the **no** form of this command to return to the default settings.

**ip igmp snooping querier** [**vlan** *vlan-id*] [**address** *ip-address* | **max-response-time** *response-time* | **query-interval** *interval-count* | **tcn query** [**count** *count* | **interval** *interval*] | **timer expiry** | **version** *version*]

**no ip igmp snooping querier** [**vlan** *vlan-id*] [**address** | **max-response-time** | **query-interval** | **tcn query** { **count** *count* | **interval** *interval* } | **timer expiry** | **version**]

## Syntax Description

<b>vlan</b> <i>vlan-id</i>	(Optional) Enable IGMP snooping and the IGMP querier function on the specified VLAN. The range is 1 to 1001 and 1006 to 4094.
<b>address</b> <i>ip-address</i>	(Optional) Specify a source IP address. If you do not specify an IP address, the querier tries to use the global IP address configured for the IGMP querier.
<b>max-response-time</b> <i>response-time</i>	(Optional) Set the maximum time to wait for an IGMP querier report. The range is 1 to 25 seconds.
<b>query-interval</b> <i>interval-count</i>	(Optional) Set the interval between IGMP queriers. The range is 1 to 18000 seconds.
<b>tcn query</b> [ <b>count</b> <i>count</i> / <b>interval</b> <i>interval</i> ]	(Optional) Set parameters related to Topology Change Notifications (TCNs). The keywords have these meanings: <ul style="list-style-type: none"> <li>• <b>count</b> <i>count</i>—Set the number of TCN queries to be executed during the TCN interval time. The range is 1 to 10.</li> <li>• <b>interval</b> <i>interval</i>—Set the TCN query interval time. The range is 1 to 255.</li> </ul>
<b>timer expiry</b>	(Optional) Set the length of time until the IGMP querier expires. The range is 60 to 300 seconds.
<b>version</b> <i>version</i>	(Optional) Select the IGMP version number that the querier feature uses. Select 1 or 2.

## Defaults

The IGMP snooping querier feature is globally disabled on the switch.

When enabled, the IGMP snooping querier disables itself if it detects IGMP traffic from a multicast-enabled device.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.



### Usage Guidelines

Use this command to enable IGMP snooping to detect the IGMP version and IP address of a device that sends IGMP query messages, which is also called a *querier*.

By default, the IGMP snooping querier is configured to detect devices that use IGMP *Version 2* (IGMPv2) but does not detect clients that are using IGMP *Version 1* (IGMPv1). You can manually configure the **max-response-time** value when devices use IGMPv2. You cannot configure the **max-response-time** when devices use IGMPv1. (The value cannot be configured and is set to zero).

Non-RFC compliant devices running IGMPv1 might reject IGMP general query messages that have a non-zero value as the **max-response-time** value. If you want the devices to accept the IGMP general query messages, configure the IGMP snooping querier to run IGMPv1.

VLAN IDs 1002 to 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in IGMP snooping.

### Examples

This example shows how to globally enable the IGMP snooping querier feature:

```
Switch(config)# ip igmp snooping querier
```

This example shows how to set the IGMP snooping querier maximum response time to 25 seconds:

```
Switch(config)# ip igmp snooping querier max-response-time 25
```

This example shows how to set the IGMP snooping querier interval time to 60 seconds:

```
Switch(config)# ip igmp snooping querier query-interval 60
```

This example shows how to set the IGMP snooping querier TCN query count to 25:

```
Switch(config)# ip igmp snooping querier tcn count 25
```

This example shows how to set the IGMP snooping querier timeout to 60 seconds:

```
Switch(config)# ip igmp snooping querier timeout expiry 60
```

This example shows how to set the IGMP snooping querier feature to version 2:

```
Switch(config)# ip igmp snooping querier version 2
```

You can verify your settings by entering the **show ip igmp snooping** privileged EXEC command.

### Related Commands

Command	Description
<a href="#">ip igmp snooping report-suppression</a>	Enables IGMP report suppression.
<a href="#">show ip igmp snooping</a>	Displays the IGMP snooping configuration.
<a href="#">show ip igmp snooping groups</a>	Displays IGMP snooping multicast information.
<a href="#">show ip igmp snooping mrouter</a>	Displays the IGMP snooping router ports.



# ip igmp snooping report-suppression

Use the **ip igmp snooping report-suppression** global configuration command to enable Internet Group Management Protocol (IGMP) report suppression. Use the **no** form of this command to disable IGMP report suppression and to forward all IGMP reports to multicast routers.

**ip igmp snooping report-suppression**

**no ip igmp snooping report-suppression**

Syntax Description	This command has no arguments or keywords.	
Defaults	IGMP report suppression is enabled.	
Command Modes	Global configuration	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

IGMP report suppression is supported only when the multicast query has IGMPv1 and IGMPv2 reports. This feature is not supported when the query includes IGMPv3 reports.

The switch uses IGMP report suppression to forward only one IGMP report per multicast router query to multicast devices. When IGMP router suppression is enabled (the default), the switch sends the first IGMP report from all hosts for a group to all the multicast routers. The switch does not send the remaining IGMP reports for the group to the multicast routers. This feature prevents duplicate reports from being sent to the multicast devices.

If the multicast router query includes requests only for IGMPv1 and IGMPv2 reports, the switch forwards only the first IGMPv1 or IGMPv2 report from all hosts for a group to all the multicast routers. If the multicast router query also includes requests for IGMPv3 reports, the switch forwards all IGMPv1, IGMPv2, and IGMPv3 reports for a group to the multicast devices.

If you disable IGMP report suppression by entering the **no ip igmp snooping report-suppression** command, all IGMP reports are forwarded to all the multicast routers.

**Examples**

This example shows how to disable report suppression:

```
Switch(config)# no ip igmp snooping report-suppression
```

You can verify your settings by entering the **show ip igmp snooping** privileged EXEC command.



Related Commands	Command	Description
	<a href="#">ip igmp snooping</a>	Enables IGMP snooping on the switch or on a VLAN.
	<a href="#">show ip igmp snooping</a>	Displays the IGMP snooping configuration of the switch or the VLAN.



# ip igmp snooping tcn

Use the **ip igmp snooping tcn** global configuration command to configure the Internet Group Management Protocol (IGMP) Topology Change Notification (TCN) behavior. Use the **no** form of this command to return to the default settings.

**ip igmp snooping tcn {flood query count *count* | query solicit}**

**no ip igmp snooping tcn {flood query count | query solicit}**

## Syntax Description

<b>flood query count</b> <i>count</i>	Specify the number of IGMP general queries for which the multicast traffic is flooded. The range is 1 to 10.
<b>query solicit</b>	Send an IGMP leave message (global leave) to speed the process of recovering from the flood mode caused during a TCN event.

## Defaults

The TCN flood query count is 2.  
The TCN query solicitation is disabled.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

Use **ip igmp snooping tcn flood query count** global configuration command to control the time that multicast traffic is flooded after a TCN event. If you set the TCN flood query count to 1 by using the **ip igmp snooping tcn flood query count** command, the flooding stops after receiving 1 general query. If you set the count to 7, the flooding of multicast traffic due to the TCN event lasts until 7 general queries are received. Groups are relearned based on the general queries received during the TCN event.

Use the **ip igmp snooping tcn query solicit** global configuration command to enable the switch to send the global leave message whether or not it is the spanning-tree root. This command also speeds the process of recovering from the flood mode caused during a TCN event.

## Examples

This example shows how to specify 7 as the number of IGMP general queries for which the multicast traffic is flooded:

```
Switch(config)# no ip igmp snooping tcn flood query count 7
```

You can verify your settings by entering the **show ip igmp snooping** privileged EXEC command.



Related Commands	Command	Description
	<b>ip igmp snooping</b>	Enables IGMP snooping on the switch or on a VLAN.
	<b>ip igmp snooping tcn flood</b>	Specifies flooding on an interface as the IGMP snooping spanning-tree TCN behavior.
	<b>show ip igmp snooping</b>	Displays the IGMP snooping configuration of the switch or the VLAN.



# ip igmp snooping tcn flood

Use the **ip igmp snooping tcn flood** interface configuration command to specify multicast flooding as the Internet Group Management Protocol (IGMP) snooping spanning-tree Topology Change Notification (TCN) behavior. Use the **no** form of this command to disable the multicast flooding.

**ip igmp snooping tcn flood**

**no ip igmp snooping tcn flood**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Multicast flooding is enabled on an interface during a spanning-tree TCN event.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

When the switch receives a TCN, multicast traffic is flooded to all the ports until two general queries are received. If the switch has many ports with attached hosts that are subscribed to different multicast groups, the flooding might exceed the capacity of the link and cause packet loss.

You can change the flooding query count by using the **ip igmp snooping tcn flood query count** *count* global configuration command.

## Examples

This example shows how to disable the multicast flooding on an interface:

```
Switch(config)# interface gigabitethernet0/2
Switch(config-if)# no ip igmp snooping tcn flood
```

You can verify your settings by entering the **show ip igmp snooping** privileged EXEC command.

## Related Commands

Command	Description
<b>ip igmp snooping</b>	Enables IGMP snooping on the switch or on a VLAN.
<b>ip igmp snooping tcn</b>	Configures the IGMP TCN behavior on the switch.
<b>show ip igmp snooping</b>	Displays the IGMP snooping configuration of the switch or the VLAN.



# ip igmp snooping vlan immediate-leave

Use the **ip igmp snooping immediate-leave** global configuration command to enable Internet Group Management Protocol (IGMP) snooping immediate-leave processing on a per-VLAN basis. Use the **no** form of this command to return to the default setting.

**ip igmp snooping vlan *vlan-id* immediate-leave**

**no ip igmp snooping vlan *vlan-id* immediate-leave**

Syntax Description	<i>vlan-id</i>	Enable IGMP snooping and the Immediate-Leave feature on the specified VLAN. The range is 1 to 1001 and 1006 to 4094.
--------------------	----------------	--

Defaults	IGMP immediate-leave processing is disabled.
----------	--

Command Modes	Global configuration
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Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	VLAN IDs 1002 to 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in IGMP snooping.
	You should configure the Immediate-Leave feature only when there is a maximum of one receiver on every port in the VLAN. The configuration is saved in NVRAM.
	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 1:
	<pre>Switch(config)# ip igmp snooping vlan 1 immediate-leave</pre>
	You can verify your settings by entering the <b>show ip igmp snooping</b> privileged EXEC command.

Related Commands	Command	Description
	<a href="#">ip igmp snooping report-suppression</a>	Enables IGMP report suppression.
	<a href="#">show ip igmp snooping</a>	Displays the snooping configuration.
	<a href="#">show ip igmp snooping groups</a>	Displays IGMP snooping multicast information.
	<a href="#">show ip igmp snooping mrouter</a>	Displays the IGMP snooping router ports.
	<a href="#">show ip igmp snooping querier</a>	Displays the configuration and operation information for the IGMP querier configured on a switch.



# ip igmp snooping vlan mrouter

Use the **ip igmp snooping mrouter** global configuration command to add a multicast router port or to configure the multicast learning method. Use the **no** form of this command to return to the default settings.

**ip igmp snooping vlan** *vlan-id* **mrouter** {**interface** *interface-id* | **learn** {**cgmp** | **pim-dvmrp**}}

**no ip igmp snooping vlan** *vlan-id* **mrouter** {**interface** *interface-id* | **learn** {**cgmp** | **pim-dvmrp**}}

## Syntax Description

<i>vlan-id</i>	Enable IGMP snooping, and add the port in the specified VLAN as the multicast router port. The range is 1 to 1001 and 1006 to 4094.
<b>interface</b> <i>interface-id</i>	Specify the next-hop interface to the multicast router. The keywords have these meanings: <ul style="list-style-type: none"> <li><b>fastethernet</b> <i>interface number</i>—a Fast Ethernet IEEE 802.3 interface.</li> <li><b>gigabitethernet</b> <i>interface number</i>—a Gigabit Ethernet IEEE 802.3z interface.</li> <li><b>port-channel</b> <i>interface number</i>—a channel interface. The range is 0 to 6.</li> </ul>
<b>learn</b> { <b>cgmp</b>   <b>pim-dvmrp</b> }	Specify the multicast router learning method. The keywords have these meanings: <ul style="list-style-type: none"> <li><b>cgmp</b>—Set the switch to learn multicast router ports by snooping on Cisco Group Management Protocol (CGMP) packets.</li> <li><b>pim-dvmrp</b>—Set the switch to learn multicast router ports by snooping on IGMP queries and Protocol-Independent Multicast-Distance Vector Multicast Routing Protocol (PIM-DVMRP) packets.</li> </ul>

## Defaults

By default, there are no multicast router ports.

The default learning method is **pim-dvmrp**—to snoop IGMP queries and PIM-DVMRP packets.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

VLAN IDs 1002 to 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in IGMP snooping.

The CGMP learn method is useful for reducing control traffic.

The configuration is saved in NVRAM.



## Examples

This example shows how to configure a port as a multicast router port:

```
Switch(config)# ip igmp snooping vlan 1 mrouter interface gigabitethernet0/22
```

This example shows how to specify the multicast router learning method as CGMP:

```
Switch(config)# ip igmp snooping vlan 1 mrouter learn cgmp
```

You can verify your settings by entering the **show ip igmp snooping** privileged EXEC command.

## Related Commands

Command	Description
<a href="#">ip igmp snooping report-suppression</a>	Enables IGMP report suppression.
<a href="#">show ip igmp snooping</a>	Displays the snooping configuration.
<a href="#">show ip igmp snooping groups</a>	Displays IGMP snooping multicast information.
<a href="#">show ip igmp snooping mrouter</a>	Displays the IGMP snooping router ports.
<a href="#">show ip igmp snooping querier</a>	Displays the configuration and operation information for the IGMP querier configured on a switch.



# ip igmp snooping vlan static

Use the **ip igmp snooping static** global configuration command to enable Internet Group Management Protocol (IGMP) snooping and to statically add a Layer 2 port as a member of a multicast group. Use the **no** form of this command to remove ports specified as members of a static multicast group.

**ip igmp snooping vlan** *vlan-id* **static** *ip-address* **interface** *interface-id*

**no ip igmp snooping vlan** *vlan-id* **static** *ip-address* **interface** *interface-id*

Syntax Description	<i>vlan-id</i>	Enable IGMP snooping on the specified VLAN. The range is 1 to 1001 and 1006 to 4094.
	<i>ip-address</i>	Add a Layer 2 port as a member of a multicast group with the specified group IP address.
	<b>interface</b> <i>interface-id</i>	Specify the interface of the member port. The keywords have these meanings: <ul style="list-style-type: none"> <li>• <b>fastethernet</b> <i>interface number</i>—a Fast Ethernet IEEE 802.3 interface.</li> <li>• <b>gigabitethernet</b> <i>interface number</i>—a Gigabit Ethernet IEEE 802.3z interface.</li> <li>• <b>port-channel</b> <i>interface number</i>—a channel interface. The range is 0 to 6.</li> </ul>

**Defaults** By default, there are no ports statically configured as members of a multicast group.

**Command Modes** Global configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines** VLAN IDs 1002 to 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in IGMP snooping.

The configuration is saved in NVRAM.

**Examples** This example shows how to statically configure a host on an interface:

```
Switch(config)# ip igmp snooping vlan 1 static 0100.5e02.0203 interface gigabitethernet0/1
Configuring port gigabitethernet0/1 on group 0100.5e02.0203
```

You can verify your settings by entering the **show ip igmp snooping** privileged EXEC command.



## Related Commands

Command	Description
<a href="#">ip igmp snooping report-suppression</a>	Enables IGMP report suppression.
<a href="#">show ip igmp snooping</a>	Displays the snooping configuration.
<a href="#">show ip igmp snooping groups</a>	Displays IGMP snooping multicast information.
<a href="#">show ip igmp snooping mrouter</a>	Displays the IGMP snooping router ports.
<a href="#">show ip igmp snooping querier</a>	Displays the configuration and operation information for the IGMP querier configured on a switch.



# ip ssh

Use the **ip ssh** global configuration command to configure the switch to run Secure Shell (SSH) Version 1 or SSH Version 2. This command is available only when your switch is running the cryptographic (encrypted) software image. Use the **no** form of this command to return to the default setting.

**ip ssh version [1 | 2]**

**no ip ssh version [1 | 2]**

Syntax Description	<b>1</b>	(Optional) Configure the switch to run SSH Version 1 (SSHv1).
	<b>2</b>	(Optional) Configure the switch to run SSH Version 2 (SSHv1).

Defaults	The default version is the latest SSH version supported by the SSH client.
----------	--

Command Modes	Global configuration
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Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

If you do not enter this command or if you do not specify a keyword, the SSH server selects the latest SSH version supported by the SSH client. For example, if the SSH client supports SSHv1 and SSHv2, the SSH server selects SSHv2.

The switch supports an SSHv1 or an SSHv2 server. It also supports an SSHv1 client. For more information about the SSH server and the SSH client, see the software configuration guide for this release.

A Rivest, Shamir, and Adelman (RSA) key pair generated by an SSHv1 server can be used by an SSHv2 server and the reverse.

**Examples**

This example shows how to configure the switch to run SSH Version 2:

```
Switch(config)# ip ssh version 2
```

You can verify your settings by entering the **show ip ssh** or **show ssh** privileged EXEC command.



Related Commands	Command	Description
	<b>show ip ssh</b>	Displays if the SSH server is enabled and displays the version and configuration information for the SSH server. For syntax information, select <b>Cisco IOS Release 12.2 Configuration Guides and Command References &gt; Cisco IOS Security Command Reference, Release 12.2 &gt; Other Security Features &gt; Secure Shell Commands</b> .
	<b>show ssh</b>	Displays the status of the SSH server. For syntax information, select <b>Cisco IOS Release 12.2 Configuration Guides and Command References &gt; Cisco IOS Security Command Reference, Release 12.2 &gt; Other Security Features &gt; Secure Shell Commands</b> .



# lacp port-priority

Use the **lacp port-priority** interface configuration command to configure the port priority for the Link Aggregation Control Protocol (LACP). Use the **no** form of this command to return to the default setting.

**lacp port-priority** *priority*

**no lacp port-priority**

## Syntax Description

*priority* Port priority for LACP. The range is 1 to 65535.

## Defaults

The default is 32768.

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

The **lacp port-priority** interface configuration command determines which ports are bundled and which ports are put in hot-standby mode when there are more than eight ports in an LACP channel group.

An LACP channel group can have up to 16 Ethernet ports of the same type. Up to eight ports can be active, and up to eight ports can be in standby mode.

In port-priority comparisons, a numerically *lower* value has a *higher* priority: When there are more than eight ports in an LACP channel-group, the eight ports with the numerically lowest values (highest priority values) for LACP port priority are bundled into the channel group, and the lower-priority ports are put in hot-standby mode. If two or more ports have the same LACP port priority (for example, they are configured with the default setting of 65535) an internal value for the port number determines the priority.



### Note

The LACP port priorities are only effective if the ports are on the switch that controls the LACP link. See the **lacp system-priority** global configuration command for determining which switch controls the link.

Use the **show lacp internal** privileged EXEC command to display LACP port priorities and internal port number values.

For information about configuring LACP on physical ports, see the “Configuring EtherChannels” chapter in the software configuration guide for this release.



## Examples

This example shows how to configure the LACP port priority on a port:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# lacp port-priority 1000
```

You can verify your settings by entering the **show lacp** *[channel-group-number]* **internal** privileged EXEC command.

## Related Commands

Command	Description
<b>channel-group</b>	Assigns an Ethernet port to an EtherChannel group.
<b>lacp system-priority</b>	Configures the LACP system priority.
<b>show lacp</b> <i>[channel-group-number]</i> <b>internal</b>	Displays internal information for all channel groups or for the specified channel group.



# lacp system-priority

Use the **lacp system-priority** global configuration command to configure the system priority for the Link Aggregation Control Protocol (LACP). Use the **no** form of this command to return to the default setting.

**lacp system-priority** *priority*

**no lacp system-priority**

Syntax Description	<i>priority</i>	System priority for LACP. The range is 1 to 65535.
Defaults	The default is 32768.	
Command Modes	Global configuration	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

The **lacp system-priority** command determines which switch in an LACP link controls port priorities. An LACP channel group can have up to 16 Ethernet ports of the same type. Up to eight ports can be active, and up to eight ports can be in standby mode. When there are more than eight ports in an LACP channel-group, the switch on the controlling end of the link uses port priorities to determine which ports are bundled into the channel and which ports are put in hot-standby mode. Port priorities on the other switch (the noncontrolling end of the link) are ignored.

In priority comparisons, numerically lower values have higher priority. Therefore, the system with the numerically lower value (higher priority value) for LACP system priority becomes the controlling system. If both switches have the same LACP system priority (for example, they are both configured with the default setting of 32768), the LACP system ID (the switch MAC address) determines which switch is in control.

The **lacp system-priority** command applies to all LACP EtherChannels on the switch.

Use the **show etherchannel summary** privileged EXEC command to see which ports are in the hot-standby mode (denoted with an H port-state flag in the output display).

For more information about configuring LACP on physical ports, see the “Configuring EtherChannels” chapter in the software configuration guide for this release.

**Examples**

This example shows how to set the LACP system priority:

```
Switch(config)# lacp system-priority 20000
```

You can verify your settings by entering the **show lacp sys-id** privileged EXEC command.



Related Commands	Command	Description
	<a href="#">channel-group</a>	Assigns an Ethernet port to an EtherChannel group.
	<a href="#">lacp port-priority</a>	Configures the LACP port priority.
	<a href="#">show lacp sys-id</a>	Displays the system identifier that is being used by LACP.



# link state group

Use the **link state group** interface configuration command to configure a port as a member of a link-state group. Use the **no** form of this command to remove the port from the link-state group.

**link state group** [*number*] {**upstream** | **downstream**}

**no link state group** [*number*] {**upstream** | **downstream**}

Syntax Description	<i>number</i>	(Optional) Specify the link-state group number. The group number can be 1 to 2. The default is 1.
	<b>upstream</b>	Configure a port as an upstream port for a specific link-state group.
	<b>downstream</b>	Configure a port as a downstream port for a specific link-state group.

**Defaults** The default group is group 1.

**Command Modes** Interface configuration

Command History	Release	Modification
	12.2(25)SEE	This command was introduced.

**Usage Guidelines** Use the **link state group** interface configuration command to configure a port as an upstream or downstream port for a specific link-state group. If the group number is omitted, the default group is assumed.

An interface can be an aggregation of ports (an EtherChannel), a single switch port in access or trunk mode, or a routed port. Each downstream interface can be associated with one or more upstream interfaces. Upstream interfaces can be bundled together, and each downstream interface can be associated with a single group consisting of multiple upstream interfaces, referred to as link-state groups.

The link state of the downstream interfaces are dependent on the link state of the upstream interfaces in the associated link-state group. If all of the upstream interfaces in a link-state group are in a link-down state, the associated downstream interfaces are forced into a link-down state. If any one of the upstream interfaces in the link-state group is in a link-up state, the associated downstream interfaces are allowed to change to, or remain in, a link-up state.

Follow these guidelines to avoid configuration problems:

- An interface that is defined as an upstream interface cannot also be defined as a downstream interface in the same or a different link-state group. The reverse is also true.
- An interface cannot be a member of more than one link-state group.
- You can configure only two link-state groups per switch.



## Examples

This example shows how to configure the interfaces as **upstream** in group 2:

```
Switch# configure terminal
Switch(config)# interface range gigabitethernet0/11 - 14
Switch(config-if-range)# link state group 2 downstream
Switch(config-if-range)# end
Switch(config-if)# end
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

## Related Commands

Command	Description
<a href="#">link state track</a>	Enables a link-state group.
<a href="#">show link state group</a>	Displays the link-state group information.
<a href="#">show running-config</a>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference for Release 12.2 &gt; Cisco IOS File Management Commands &gt; Configuration File Commands</b> .



# link state track

Use the **link state track** user EXEC command to enable a link-state group. Use the **no** form of this command to disable a link-state group.

**link state track** [*number*]

**no link state track** [*number*]

Syntax Description	<i>number</i> (Optional) Specify the link-state group number. The group number can be 1 to 2. The default is 1.	
Defaults	Link-state tracking is disabled for all groups.	
Command Modes	Global configuration	
Command History	Release	Modification
	12.2(25)SEE	This command was introduced.
Usage Guidelines	Use the <b>link state track</b> global configuration command to enable a link-state group.	
Examples	<p>This example shows how enable link-state group 2:</p> <pre>Switch(config)# link state track 2</pre> <p>You can verify your settings by entering the <b>show running-config</b> privileged EXEC command.</p>	
Related Commands	Command	Description
	<a href="#">link state track</a>	Configures an interface as a member of a link-state group.
	<a href="#">show link state group</a>	Displays the link-state group information.
	<a href="#">show running-config</a>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference for Release 12.2 &gt; Cisco IOS File Management Commands &gt; Configuration File Commands</b> .



# logging event

Use the **logging event** interface configuration command to enable notification of interface link status changes. Use the **no** form of this command to disable notification.

**logging event** { **bundle-status** | **link-status** | **spanning-tree** | **status** | **trunk status** }

**no logging event** { **bundle-status** | **link-status** | **spanning-tree** | **status** | **trunk status** }

Syntax Description	<b>bundle-status</b>	Enable notification of BUNDLE and UNBUNDLE messages.
	<b>link-status</b>	Enable notification of interface data link status changes.
	<b>spanning-tree</b>	Enable notification of spanning-tree events.
	<b>status</b>	Enable notification of spanning-tree state change messages.
	<b>trunk-status</b>	Enable notification of trunk-status messages.

Defaults	Event logging is disabled.
----------	----------------------------

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Examples	This example shows how to enable spanning-tree logging:
----------	---

```
Switch(config-if)# logging event spanning-tree
```



# logging file

Use the **logging file** global configuration command to set logging file parameters. Use the **no** form of this command to return to the default setting.

**logging file** *filesystem:filename* [*max-file-size* / **nomax** [*min-file-size*]] [*severity-level-number* | *type*]

**no logging file** *filesystem:filename* [*severity-level-number* | *type*]

Syntax Description		
<i>filesystem:filename</i>	Alias for a flash file system. Contains the path and name of the file that contains the log messages.	
	The syntax for the local flash file system: <b>flash:</b>	
<i>max-file-size</i>	(Optional) Specify the maximum logging file size. The range is 4096 to 2147483647.	
<b>nomax</b>	(Optional) Specify the maximum file size of 2147483647.	
<i>min-file-size</i>	(Optional) Specify the minimum logging file size. The range is 1024 to 2147483647.	
<i>severity-level-number</i>	(Optional) Specify the logging severity level. The range is 0 to 7. See the <i>type</i> option for the meaning of each level.	
<i>type</i>	(Optional) Specify the logging type. These keywords are valid:	
	<ul style="list-style-type: none"> <li>• <b>emergencies</b>—System is unusable (severity 0).</li> <li>• <b>alerts</b>—Immediate action needed (severity 1).</li> <li>• <b>critical</b>—Critical conditions (severity 2).</li> <li>• <b>errors</b>—Error conditions (severity 3).</li> <li>• <b>warnings</b>—Warning conditions (severity 4).</li> <li>• <b>notifications</b>—Normal but significant messages (severity 5).</li> <li>• <b>informational</b>—Information messages (severity 6).</li> <li>• <b>debugging</b>—Debugging messages (severity 7).</li> </ul>	

## Defaults

The minimum file size is 2048 bytes; the maximum file size is 4096 bytes.

The default severity level is 7 (**debugging** messages and numerically lower levels).

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.



### Usage Guidelines

The log file is stored in ASCII text format in an internal buffer on the switch. You can access logged system messages by using the switch command-line interface (CLI) or by saving them to a properly configured syslog server. If the switch fails, the log is lost unless you had previously saved it to flash memory by using the **logging file flash:filename** global configuration command.

After saving the log to flash memory by using the **logging file flash:filename** global configuration command, you can use the **more flash:filename** privileged EXEC command to display its contents.

The command rejects the minimum file size if it is greater than the maximum file size minus 1024; the minimum file size then becomes the maximum file size minus 1024.

Specifying a *level* causes messages at that level and numerically lower levels to be displayed.

### Examples

This example shows how to save informational log messages to a file in flash memory:

```
Switch(config)# logging file flash:logfile informational
```

You can verify your setting by entering the **show running-config** privileged EXEC command.

### Related Commands

Command	Description
<b>show running-config</b>	Displays the running configuration on the switch. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# mac access-group

Use the **mac access-group** interface configuration command to apply a MAC access control list (ACL) to a Layer 2 interface. Use the **no** form of this command to remove all MAC ACLs or the specified MAC ACL from the interface. You create the MAC ACL by using the **mac access-list extended** global configuration command.

**mac access-group** {*name*} **in**

**no mac access-group** {*name*}

Syntax Description	<i>name</i>	Specify a named MAC access list.
	<b>in</b>	Specify that the ACL is applied in the ingress direction. Outbound ACLs are not supported on Layer 2 interfaces.

Defaults	No MAC ACL is applied to the interface.
----------	---

Command Modes	Interface configuration (Layer 2 interfaces only)
---------------	---

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

You can apply MAC ACLs only to ingress Layer 2 interfaces.

On Layer 2 interfaces, you can filter IP traffic by using IP access lists and non-IP traffic by using MAC access lists. You can filter both IP and non-IP traffic on the same Layer 2 interface by applying both an IP ACL and a MAC ACL to the interface. You can apply no more than one IP access list and one MAC access list to the same Layer 2 interface.

If a MAC ACL is already configured on a Layer 2 interface and you apply a new MAC ACL to the interface, the new ACL replaces the previously configured one.

When an inbound packet is received on an interface with a MAC ACL applied, the switch checks the match conditions in the ACL. If the conditions are matched, the switch forwards or drops the packet, according to the ACL.

If the specified ACL does not exist, the switch forwards all packets.

For more information about configuring MAC extended ACLs, see the “Configuring Network Security with ACLs” chapter in the software configuration guide for this release.



## Examples

This example shows how to apply a MAC extended ACL named *macacl2* to an interface:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# mac access-group macacl2 in
```

You can verify your settings by entering the **show mac access-group** privileged EXEC command. You can see configured ACLs on the switch by entering the **show access-lists** privileged EXEC command.

## Related Commands

Command	Description
<a href="#">show access-lists</a>	Displays the ACLs configured on the switch.
<a href="#">show link state group</a>	Displays the MAC ACLs configured on the switch.
<b>show running-config</b>	Displays the running configuration on the switch. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# mac access-list extended

Use the **mac access-list extended** global configuration command to create an access list based on MAC addresses for non-IP traffic. Using this command puts you in the extended MAC access-list configuration mode. Use the **no** form of this command to return to the default setting.

**mac access-list extended** *name*

**no mac access-list extended** *name*

Syntax Description	<i>name</i> Assign a name to the MAC extended access list.
--------------------	--

Defaults	By default, there are no MAC access lists created.
----------	--

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	MAC named extended lists are used with class maps.
	You can apply named MAC extended ACLs to Layer 2 interfaces.
	Entering the <b>mac access-list extended</b> command enables the MAC access-list configuration mode. These configuration commands are available:
	<ul style="list-style-type: none"> <li>• <b>default:</b> sets a command to its default.</li> <li>• <b>deny:</b> specifies packets to reject. For more information, see the <a href="#">deny (MAC access-list configuration)</a> MAC access-list configuration command.</li> <li>• <b>exit:</b> exits from MAC access-list configuration mode.</li> <li>• <b>no:</b> negates a command or sets its defaults.</li> <li>• <b>permit:</b> specifies packets to forward. For more information, see the <a href="#">permit (MAC access-list configuration)</a> command.</li> </ul>
	For more information about MAC extended access lists, see the software configuration guide for this release.



## Examples

This example shows how to create a MAC named extended access list named *mac1* and to enter extended MAC access-list configuration mode:

```
Switch(config)# mac access-list extended mac1
Switch(config-ext-macl)#
```

This example shows how to delete MAC named extended access list *mac1*:

```
Switch(config)# no mac access-list extended mac1
```

You can verify your settings by entering the **show access-lists** privileged EXEC command.

## Related Commands

Command	Description
<a href="#">deny (MAC access-list configuration)</a>	Configures the MAC ACL (in extended MAC-access list configuration mode).
<a href="#">permit (MAC access-list configuration)</a>	
<a href="#">show access-lists</a>	Displays the access lists configured on the switch.



# mac address-table aging-time

Use the **mac address-table aging-time** global configuration command to set the length of time that a dynamic entry remains in the MAC address table after the entry is used or updated. Use the **no** form of this command to return to the default setting. The aging time applies to all VLANs or a specified VLAN.

**mac address-table aging-time** {0 | 10-1000000} [vlan *vlan-id*]

**no mac address-table aging-time** {0 | 10-1000000} [vlan *vlan-id*]

Syntax Description	<b>0</b>	This value disables aging. Static address entries are never aged or removed from the table.
	<i>10-1000000</i>	Aging time in seconds. The range is 10 to 1000000 seconds.
	<b>vlan</b> <i>vlan-id</i>	(Optional) Specify the VLAN ID to which to apply the aging time. The range is 1 to 4094.

**Defaults** The default is 300 seconds.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines** If hosts do not send continuously, increase the aging time to record the dynamic entries for a longer time. Increasing the time can reduce the possibility of flooding when the hosts send again.

If you do not specify a specific VLAN, this command sets the aging time for all VLANs.

**Examples** This example shows how to set the aging time to 200 seconds for all VLANs:

```
Switch(config)# mac address-table aging-time 200
```

You can verify your setting by entering the **show mac address-table aging-time** privileged EXEC command.

Related Commands	Command	Description
	<a href="#">show mac address-table aging-time</a>	Displays the MAC address table aging time for all VLANs or the specified VLAN.



# mac address-table move update

Use the **mac address-table move update** global configuration command to enable the MAC address-table move update feature. Use the **no** form of this command to return to the default setting.

**mac address-table move update {receive | transmit}**

**no mac address-table move update {receive | transmit}**

Syntax Description	receive	Specify that the switch processes MAC address-table move update messages.
	transmit	Specify that the switch sends MAC address-table move update messages to other switches in the network if the primary link goes down and the standby link comes up.

Command Modes	Global configuration.
---------------	-----------------------

Defaults	By default, the MAC address-table move update feature is disabled.
----------	--

Command History	Release	Modification
	12.2(25)SED	This command was introduced.

Usage Guidelines	<p>The MAC address-table move update feature allows the switch to provide rapid bidirectional convergence if a primary (forwarding) link goes down and the standby link begins forwarding traffic. You can configure the access switch to send the MAC address-table move update messages if the primary link goes down and the standby link comes up. You can configure the uplink switches to receive and process the MAC address-table move update messages.</p>
------------------	---

Examples	<p>This example shows how to configure an access switch to send MAC address-table move update messages:</p>
----------	---

```
Switch# configure terminal
Switch(conf)# mac address-table move update transmit
Switch(conf)# end
```

This example shows how to configure an uplink switch to get and process MAC address-table move update messages:

```
Switch# configure terminal
Switch(conf)# mac address-table move update receive
Switch(conf)# end
```

You can verify your settings by entering the **show mac address-table move update** privileged EXEC command.



Related Commands	Command	Description
	<b>clear mac address-table move update</b>	Clears the MAC address-table move update global counters.
	<b>debug matm move update</b>	Debugs the MAC address-table move update message processing.
	<b>show mac address-table move update</b>	Displays the MAC address-table move update information on the switch.



# mac address-table notification

Use the **mac address-table notification** global configuration command to enable the MAC address notification feature on the switch. Use the **no** form of this command to return to the default setting.

**mac address-table notification** [**history-size** *value*] | [**interval** *value*]

**no mac address-table notification** [**history-size** | **interval**]

Syntax Description	<b>history-size</b> <i>value</i>	(Optional) Configure the maximum number of entries in the MAC notification history table. The range is 0 to 500 entries.
	<b>interval</b> <i>value</i>	(Optional) Set the notification trap interval. The switch sends the notification traps when this amount of time has elapsed. The range is 0 to 2147483647 seconds.

## Defaults

By default, the MAC address notification feature is disabled.  
The default trap interval value is 1 second.  
The default number of entries in the history table is 1.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

The MAC address notification feature sends Simple Network Management Protocol (SNMP) traps to the network management system (NMS) whenever a new MAC address is added or an old address is deleted from the forwarding tables. MAC notifications are generated only for dynamic and secure MAC addresses. Events are not generated for self addresses, multicast addresses, or other static addresses.

When you configure the **history-size** option, the existing MAC address history table is deleted, and a new table is created.

You enable the MAC address notification feature by using the **mac address-table notification** command. You must also enable MAC address notification traps on an interface by using the **snmp trap mac-notification** interface configuration command and configure the switch to send MAC address traps to the NMS by using the **snmp-server enable traps mac-notification** global configuration command.



## Examples

This example shows how to enable the MAC address-table notification feature, set the interval time to 60 seconds, and set the history-size to 100 entries:

```
Switch(config)# mac address-table notification
Switch(config)# mac address-table notification interval 60
Switch(config)# mac address-table notification history-size 100
```

You can verify your settings by entering the **show mac address-table notification** privileged EXEC command.

## Related Commands

Command	Description
<b>clear mac address-table notification</b>	Clears the MAC address notification global counters.
<b>show mac address-table notification</b>	Displays the MAC address notification settings on all interfaces or on the specified interface.
<b>snmp-server enable traps</b>	Sends the SNMP MAC notification traps when the <b>mac-notification</b> keyword is appended.
<b>snmp trap mac-notification</b>	Enables the SNMP MAC notification trap on a specific interface.



# mac address-table static

Use the **mac address-table static** global configuration command to add static addresses to the MAC address table. Use the **no** form of this command to remove static entries from the table.

**mac address-table static** *mac-addr* **vlan** *vlan-id* **interface** *interface-id*

**no mac address-table static** *mac-addr* **vlan** *vlan-id* [**interface** *interface-id*]

Syntax Description	<i>mac-addr</i>	Destination MAC address (unicast or multicast) to add to the address table. Packets with this destination address received in the specified VLAN are forwarded to the specified interface.
	<b>vlan</b> <i>vlan-id</i>	Specify the VLAN for which the packet with the specified MAC address is received. The range is 1 to 4094.
	<b>interface</b> <i>interface-id</i>	Interface to which the received packet is forwarded. Valid interfaces include physical ports and port channels.

**Defaults** No static addresses are configured.

**Command Modes** Global configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Examples** This example shows how to add the static address c2f3.220a.12f4 to the MAC address table. When a packet is received in VLAN 4 with this MAC address as its destination, the packet is forwarded to the specified interface:

```
Switch(config)# mac address-table static c2f3.220a.12f4 vlan 4 interface
gigabitethernet0/1
```

You can verify your setting by entering the **show mac address-table** privileged EXEC command.

Related Commands	<b>Command</b>	<b>Description</b>
	<b>show mac address-table static</b>	Displays static MAC address table entries only.



# mac address-table static drop

Use the **mac address-table static drop** global configuration command to enable unicast MAC address filtering and to configure the switch to drop traffic with a specific source or destination MAC address. Use the **no** form of this command to return to the default setting.

**mac address-table static** *mac-addr* **vlan** *vlan-id* **drop**

**no mac address-table static** *mac-addr* **vlan** *vlan-id*

Syntax Description	<i>mac-addr</i>	Unicast source or destination MAC address. Packets with this MAC address are dropped.
	<b>vlan</b> <i>vlan-id</i>	Specify the VLAN for which the packet with the specified MAC address is received. Valid VLAN IDs are 1 to 4094.

Defaults	Unicast MAC address filtering is disabled. The switch does not drop traffic for specific source or destination MAC addresses.
----------	---

Command Modes	Global configuration
---------------	----------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	Follow these guidelines when using this feature:
	<ul style="list-style-type: none"> <li>• Multicast MAC addresses, broadcast MAC addresses, and router MAC addresses are not supported. Packets that are forwarded to the CPU are also not supported.</li> <li>• If you add a unicast MAC address as a static address and configure unicast MAC address filtering, the switch either adds the MAC address as a static address or drops packets with that MAC address, depending on which command was entered last. The second command that you entered overrides the first command.</li> </ul> <p>For example, if you enter the <b>mac address-table static</b> <i>mac-addr</i> <b>vlan</b> <i>vlan-id</i> <b>interface</b> <i>interface-id</i> global configuration command followed by the <b>mac address-table static</b> <i>mac-addr</i> <b>vlan</b> <i>vlan-id</i> <b>drop</b> command, the switch drops packets with the specified MAC address as a source or destination.</p> <p>If you enter the <b>mac address-table static</b> <i>mac-addr</i> <b>vlan</b> <i>vlan-id</i> <b>drop</b> global configuration command followed by the <b>mac address-table static</b> <i>mac-addr</i> <b>vlan</b> <i>vlan-id</i> <b>interface</b> <i>interface-id</i> command, the switch adds the MAC address as a static address.</p>



---

**Examples**

This example shows how to enable unicast MAC address filtering and to configure the switch to drop packets that have a source or destination address of c2f3.220a.12f4. When a packet is received in VLAN 4 with this MAC address as its source or destination, the packet is dropped:

```
Switch(config)# mac address-table static c2f3.220a.12f4 vlan 4 drop
```

This example shows how to disable unicast MAC address filtering:

```
Switch(config)# no mac address-table static c2f3.220a.12f4 vlan 4
```

You can verify your setting by entering the **show mac address-table static** privileged EXEC command.

---

**Related Commands**

Command	Description
<a href="#">show mac address-table static</a>	Displays only static MAC address table entries.



# macro apply

Use the **macro apply** interface configuration command to apply a macro to an interface or to apply and trace a macro configuration on an interface.

```
macro {apply | trace} macro-name [parameter {value}] [parameter {value}]
[parameter {value}]
```

Syntax Description	<b>apply</b>	Apply a macro to the specified interface.
	<b>trace</b>	Use the <b>trace</b> keyword to apply a macro to an interface and to debug the macro.
	<i>macro-name</i>	Specify the name of the macro.
	<b>parameter</b> <i>value</i>	(Optional) Specify unique parameter values that are specific to the interface. You can enter up to three keyword-value pairs. Parameter keyword matching is case sensitive. All matching occurrences of the keyword are replaced with the corresponding value.

**Defaults** This command has no default setting.

**Command Modes** Interface configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

You can use the **macro trace** *macro-name* interface configuration command to apply and show the macros running on an interface or to debug the macro to find any syntax or configuration errors.

If a command fails because of a syntax error or a configuration error when you apply a macro, the macro continues to apply the remaining commands to the interface.

When creating a macro that requires the assignment of unique values, use the **parameter** *value* keywords to designate values specific to the interface.

Keyword matching is case sensitive. All matching occurrences of the keyword are replaced with the corresponding value. Any full match of a keyword, even if it is part of a larger string, is considered a match and is replaced by the corresponding value.

Some macros might contain keywords that require a parameter value. You can use the **macro apply** *macro-name* ? command to display a list of any required values in the macro. If you apply a macro without entering the keyword values, the commands are invalid and are not applied.

There are Cisco-default Smartports macros embedded in the switch software. You can display these macros and the commands they contain by using the **show parser macro** user EXEC command.



Follow these guidelines when you apply a Cisco-default Smartports macro on an interface:

- Display all macros on the switch by using the **show parser macro** user EXEC command. Display the contents of a specific macro by using the **show parser macro name** *macro-name* user EXEC command.
- Keywords that begin with \$ mean that a unique parameter value is required. Append the Cisco-default macro with the required values by using the **parameter** *value* keywords.

The Cisco-default macros use the \$ character to help identify required keywords. There is no restriction on using the \$ character to define keywords when you create a macro.

When you apply a macro to an interface, the macro name is automatically added to the interface. You can display the applied commands and macro names by using the **show running-configuration interface** *interface-id* user EXEC command.

A macro applied to an interface range behaves the same way as a macro applied to a single interface. When you use an interface range, the macro is applied sequentially to each interface within the range. If a macro command fails on one interface, it is still applied to the remaining interfaces.

You can delete a macro-applied configuration on an interface by entering the **default interface** *interface-id* interface configuration command.

## Examples

After you have created a macro by using the **macro name** global configuration command, you can apply it to an interface. This example shows how to apply a user-created macro called **duplex** to an interface:

```
Switch(config-if)# macro apply duplex
```

To debug a macro, use the **macro trace** interface configuration command to find any syntax or configuration errors in the macro as it is applied to an interface. This example shows how troubleshoot the user-created macro called **duplex** on an interface:

```
Switch(config-if)# macro trace duplex
Applying command...'duplex auto'
%Error Unknown error.
Applying command...'speed nonegotiate'
```

This example shows how to display the Cisco-default **cisco-desktop** macro and how to apply the macro and set the access VLAN ID to 25 on an interface:

```
Switch# show parser macro cisco-desktop
-----
Macro name : cisco-desktop
Macro type : default

# Basic interface - Enable data VLAN only
# Recommended value for access vlan (AVID) should not be 1
switchport access vlan $AVID
switchport mode access

# Enable port security limiting port to a single
# MAC address -- that of desktop
switchport port-security
switchport port-security maximum 1

# Ensure port-security age is greater than one minute
# and use inactivity timer
switchport port-security violation restrict
switchport port-security aging time 2
switchport port-security aging type inactivity
```



## macro apply

```
# Configure port as an edge network port
spanning-tree portfast
spanning-tree bpduguard enable
-----
Switch#
Switch# configure terminal
Switch(config)# interface gigabitethernet0/4
Switch(config-if)# macro apply cisco-desktop $AVID 25
```

### Related Commands

Command	Description
<a href="#">macro description</a>	Adds a description about the macros that are applied to an interface.
<a href="#">macro global</a>	Applies a macro on a switch or applies and traces a macro on a switch.
<a href="#">macro global description</a>	Adds a description about the macros that are applied to the switch.
<a href="#">macro name</a>	Creates a macro.
<a href="#">show parser macro</a>	Displays the macro definition for all macros or for the specified macro.



# macro description

Use the **macro description** interface configuration command to enter a description about which macros are applied to an interface. Use the **no** form of this command to remove the description.

**macro description** *text*

**no macro description** *text*

Syntax Description	<b>description</b> <i>text</i> Enter a description about the macros that are applied to the specified interface.
--------------------	--

Defaults	This command has no default setting.
----------	--------------------------------------

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	Use the <b>description</b> keyword to associate comment text, or the macro name, with an interface. When multiple macros are applied on a single interface, the description text will be from the last applied macro.
------------------	---

This example shows how to add a description to an interface:

```
Switch(config-if)# macro description duplex settings
```

You can verify your settings by entering the **show parser macro description** privileged EXEC command.

Related Commands	Command	Description
	<a href="#">macro apply</a>	Applies a macro on an interface or applies and traces a macro on an interface.
	<a href="#">macro global</a>	Applies a macro on a switch or applies and traces a macro on a switch
	<a href="#">macro global description</a>	Adds a description about the macros that are applied to the switch.
	<a href="#">macro name</a>	Creates a macro.
	<a href="#">show parser macro</a>	Displays the macro definition for all macros or for the specified macro.



# macro global

Use the **macro global** global configuration command to apply a macro to a switch or to apply and trace a macro configuration on a switch.

```
macro global { apply | trace } macro-name [parameter { value }] [parameter { value }]
               [parameter { value }]
```

Syntax Description	<b>apply</b>	Apply a macro to the switch.
	<b>trace</b>	Apply a macro to a switch and to debug the macro.
	<i>macro-name</i>	Specify the name of the macro.
	<b>parameter</b> <i>value</i>	(Optional) Specify unique parameter values that are specific to the switch. You can enter up to three keyword-value pairs. Parameter keyword matching is case sensitive. All matching occurrences of the keyword are replaced with the corresponding value.

**Defaults** This command has no default setting.

**Command Modes** Global configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

You can use the **macro trace** *macro-name* global configuration command to apply and to show the macros running on a switch or to debug the macro to find any syntax or configuration errors.

If a command fails because of a syntax error or a configuration error when you apply a macro, the macro continues to apply the remaining commands to the switch.

When creating a macro that requires the assignment of unique values, use the **parameter** *value* keywords to designate values specific to the switch.

Keyword matching is case sensitive. All matching occurrences of the keyword are replaced with the corresponding value. Any full match of a keyword, even if it is part of a larger string, is considered a match and is replaced by the corresponding value.

Some macros might contain keywords that require a parameter value. You can use the **macro global apply** *macro-name* ? command to display a list of any required values in the macro. If you apply a macro without entering the keyword values, the commands are invalid and are not applied.

There are Cisco-default Smartports macros embedded in the switch software. You can display these macros and the commands they contain by using the **show parser macro** user EXEC command.



Follow these guidelines when you apply a Cisco-default Smartports macro on a switch:

- Display all macros on the switch by using the **show parser macro** user EXEC command. Display the contents of a specific macro by using the **show parser macro name** *macro-name* user EXEC command.
- Keywords that begin with \$ mean that a unique parameter value is required. Append the Cisco-default macro with the required values by using the **parameter** *value* keywords.

The Cisco-default macros use the \$ character to help identify required keywords. There is no restriction on using the \$ character to define keywords when you create a macro.

When you apply a macro to a switch, the macro name is automatically added to the switch. You can display the applied commands and macro names by using the **show running-configuration** user EXEC command.

You can delete a global macro-applied configuration on a switch only by entering the **no** version of each command contained in the macro.

## Examples

After you have created a new macro by using the **macro name** global configuration command, you can apply it to a switch. This example shows how to see the **snmp** macro and how to apply the macro and set the hostname to test-server and set the IP precedence value to 7:

```
Switch# show parser macro name snmp
Macro name : snmp
Macro type : customizable

#enable port security, linkup, and linkdown traps
snmp-server enable traps port-security
snmp-server enable traps linkup
snmp-server enable traps linkdown
#set snmp-server host
snmp-server host ADDRESS
#set SNMP trap notifications precedence
snmp-server ip precedence VALUE

-----
Switch(config)# macro global apply snmp ADDRESS test-server VALUE 7
```

To debug a macro, use the **macro global trace** global configuration command to find any syntax or configuration errors in the macro when it is applied to a switch. In this example, the **ADDRESS** parameter value was not entered, causing the **snmp-server host** command to fail while the remainder of the macro is applied to the switch:

```
Switch(config)# macro global trace snmp VALUE 7
Applying command...'snmp-server enable traps port-security'
Applying command...'snmp-server enable traps linkup'
Applying command...'snmp-server enable traps linkdown'
Applying command...'snmp-server host'
%Error Unknown error.
Applying command...'snmp-server ip precedence 7'
```



Related Commands	Command	Description
	<b>macro apply</b>	Applies a macro on an interface or applies and traces a macro on an interface.
	<b>macro description</b>	Adds a description about the macros that are applied to an interface.
	<b>macro global description</b>	Adds a description about the macros that are applied to the switch.
	<b>macro name</b>	Creates a macro.
	<b>show parser macro</b>	Displays the macro definition for all macros or for the specified macro.



# macro global description

Use the **macro global description** global configuration command to enter a description about the macros that are applied to the 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

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## 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 uddld aggressive mode enabled
```

You can verify your settings by entering the **show parser macro description** privileged EXEC command.

## Related Commands

Command	Description
<a href="#">macro apply</a>	Applies a macro on an interface or applies and traces a macro on an interface.
<a href="#">macro description</a>	Adds a description about the macros that are applied to an interface.
<a href="#">macro global</a>	Applies a macro on a switch or applies and traces a macro on a switch.
<a href="#">macro name</a>	Creates a macro.
<a href="#">show parser macro</a>	Displays the macro definition for all macros or for the specified macro.



# macro name

Use the **macro name** global configuration command to create a configuration macro. Use the **no** form of this command to delete the macro definition.

**macro name** *macro-name*

**no macro name** *macro-name*

## Syntax Description

<i>macro-name</i>	Name of the macro.
-------------------	--------------------

## Defaults

This command has no default setting.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

A macro can contain up to 3000 characters. Enter one macro command per line. Use the @ character to end the macro. Use the # character at the beginning of a line to enter comment text within the macro.

You can define mandatory keywords within a macro by using a help string to specify the keywords. Enter **# macro keywords word** to define the keywords that are available for use with the macro. You can enter up to three help string keywords separated by a space. If you enter more than three macro keywords, only the first three are shown.

Macro names are case sensitive. For example, the commands **macro name Sample-Macro** and **macro name sample-macro** will result in two separate macros.

When creating a macro, do not use the **exit** or **end** commands or change the command mode by using **interface interface-id**. This could cause commands that follow **exit**, **end**, or **interface interface-id** to execute in a different command mode.

The **no** form of this command only deletes the macro definition. It does not affect the configuration of those interfaces on which the macro is already applied. You can delete a macro-applied configuration on an interface by entering the **default interface interface-id** interface configuration command.

Alternatively, you can create an *anti-macro* for an existing macro that contains the **no** form of all the corresponding commands in the original macro. Then apply the anti-macro to the interface.

You can modify a macro by creating a new macro with the same name as the existing macro. The newly created macro overwrites the existing macro but does not affect the configuration of those interfaces on which the original macro was applied.



## Examples

This example shows how to create a macro that defines the duplex mode and speed:

```
Switch(config)# macro name duplex
Enter macro commands one per line. End with the character '@'.
duplex full
speed auto
@
```

This example shows how create a macro with **# macro keywords**:

```
Switch(config)# macro name test
switchport access vlan $VLANID
switchport port-security maximum $MAX
#macro keywords $VLANID $MAX
@
```

This example shows how to display the mandatory keyword values before you apply the macro to an interface:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# macro apply test ?
WORD keyword to replace with a value e.g $VLANID,$MAX
<cr>
```

```
Switch(config-if)# macro apply test $VLANID ?
WORD Value of first keyword to replace
```

```
Switch(config-if)# macro apply test $VLANID 2
WORD keyword to replace with a value e.g $VLANID,$MAX
<cr>
```

```
Switch(config-if)# macro apply test $VLANID 2 $MAX ?
WORD Value of second keyword to replace
```

## Related Commands

Command	Description
<b>macro apply</b>	Applies a macro on an interface or applies and traces a macro on an interface.
<b>macro description</b>	Adds a description about the macros that are applied to an interface.
<b>macro global</b>	Applies a macro on a switch or applies and traces a macro on a switch
<b>macro global description</b>	Adds a description about the macros that are applied to the switch.
<b>show parser macro</b>	Displays the macro definition for all macros or for the specified macro.



# match (class-map configuration)

Use the **match** class-map configuration command to define the match criteria to classify traffic. Use the **no** form of this command to remove the match criteria.

**match** {**access-group** *acl-index-or-name* | **ip dscp** *dscp-list* | **ip precedence** *ip-precedence-list*}

**no match** {**access-group** *acl-index-or-name* | **ip dscp** *dscp-list* | **ip precedence** *ip-precedence-list*}

Syntax Description	<b>access-group</b> <i>acl-index-or-name</i>	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.
	<b>ip dscp</b> <i>dscp-list</i>	List of up to eight IP Differentiated Services Code Point (DSCP) values to match against incoming packets. Separate each value with a space. The range is 0 to 63. You also can enter a mnemonic name for a commonly-used value.
	<b>ip precedence</b> <i>ip-precedence-list</i>	List of up to eight IP-precedence values to match against incoming packets. Separate each value with a space. The range is 0 to 7. You also can enter a mnemonic name for a commonly-used value

**Defaults** No match criteria are defined.

**Command Modes** Class-map configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines** The **match** command is used to specify which fields in the incoming packets are examined to classify the packets. Only the IP access group or the MAC access group matching to the Ether Type/Len are supported.

To define packet classification on a physical-port basis, only one **match** command per class map is supported. In this situation, the **match-all** and **match-any** keywords are equivalent.

For the **match ip dscp** *dscp-list* or the **match ip precedence** *ip-precedence-list* command, you can enter a mnemonic name for a commonly used value. For example, you can enter the **match ip dscp af11** command, which is the same as entering the **match ip dscp 10** command. You can enter the **match ip precedence critical** command, which is the same as entering the **match ip precedence 5** command. For a list of supported mnemonics, enter the **match ip dscp ?** or the **match ip precedence ?** command to see the command-line help strings.



## Examples

This example shows how to create a class map called *class2*, which matches all the incoming traffic with DSCP values of 10, 11, and 12:

```
Switch(config)# class-map class2
Switch(config-cmap)# match ip dscp 10 11 12
Switch(config-cmap)# exit
```

This example shows how to create a class map called *class3*, which matches all the incoming traffic with IP-precedence values of 5, 6, and 7:

```
Switch(config)# class-map class3
Switch(config-cmap)# match ip precedence 5 6 7
Switch(config-cmap)# exit
```

This example shows how to delete the IP-precedence match criteria and to classify traffic using *acl1*:

```
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
```

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

## Related Commands

Command	Description
<a href="#">class-map</a>	Creates a class map to be used for matching packets to the class whose name you specify.
<a href="#">show class-map</a>	Displays quality of service (QoS) class maps.



# mdix auto

Use the **mdix auto** interface configuration command to enable the automatic medium-dependent interface crossover (auto-MDIX) feature on the interface. 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**

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

<b>Defaults</b>	Auto-MDIX is enabled.
-----------------	-----------------------

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

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	When you enable auto-MDIX on an interface, you must also set the interface speed and duplex to <b>auto</b> so that the feature operates correctly.
-------------------------	--

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

Auto-MDIX is supported on all 10/100 and 10/100/1000 Mb/s interfaces. It is not supported on 1000BASE-SX or -LX small form-factor pluggable (SFP) module interfaces.

<b>Examples</b>	This example shows how to enable auto-MDIX on a port:
-----------------	---

```
Switch# configure terminal
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# speed auto
Switch(config-if)# duplex auto
Switch(config-if)# mdix auto
Switch(config-if)# end
```

You can verify the operational state of auto-MDIX on the interface by entering the **show controllers ethernet-controller interface-id phy** privileged EXEC command.



Related Commands	Command	Description
	<code>show controllers ethernet-controller interface-id phy</code>	Displays general information about internal registers of an interface, including the operational state of auto-MDIX.



# media-type

Use the **media-type** interface configuration command to manually select the interface and type of a dual-purpose uplink port or to enable the switch to dynamically select the type that first links up. Use the **no** form of this command to return to the default setting.

**media-type { auto-select | rj45 | sfp }**

**no media-type**

Syntax Description	<b>auto-select</b>	Enable the switch to dynamically select the type based on which one first links up.
	<b>rj45</b>	Select the RJ-45 interface.
	<b>sfp</b>	Select the small form-factor pluggable (SFP) module interface.

**Defaults** The default is that the switch dynamically selects **auto-select**.

**Command Modes** Interface configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

You cannot use the dual-purpose uplinks as redundant links.

To configure the speed or duplex settings on a dual-purpose uplink, you must select the interface type. When you change the type, the speed and duplex configurations are removed. The switch configures both types with autonegotiation of both speed and duplex (the default).

When you select **auto-select**, the switch dynamically selects the type that first links up. When link up is achieved, the switch disables the other type until the active link goes down. When the active link goes down, the switch enables both types until one of them links up. In auto-select mode, the switch configures both types with autonegotiation of speed and duplex (the default).

When you select **rj45**, the switch disables the SFP module interface. If you connect a cable to this port, it cannot attain a link up even if the RJ-45 side is down or is not connected. In this mode, the dual-purpose port behaves like a 10/100/1000BASE-TX interface. You can configure the speed and duplex settings consistent with this interface type.

When you select **sfp**, the switch disables the RJ-45 interface. If you connect a cable to this port, it cannot attain a link up even if the SFP module side is down or if the SFP module is not present. Based on the type of installed SFP module, you can configure the speed and duplex settings consistent with this interface type.

When the switch powers on or when you enable a dual-purpose uplink port through the **shutdown** and the **no shutdown** interface configuration commands, the switch gives preference to the SFP module interface. In all other situations, the switch selects the active link based on which type first links up.



If you configure **auto-select**, you cannot configure the **speed** and **duplex** interface configuration commands.

The Catalyst 2960 switch operates with 100BASE-X (where -X is -BX, -FX, -FE, -LX) SFP modules as follows:

- When the 100BASE -X SFP module is inserted into the module slot and there is no link on the RJ-45 side, the switch disables the RJ-45 interface and selects the SFP module interface. This is the behavior even if there is no cable connected and if there is no link on the SFP side.
- When the 100BASE-X SFP module is inserted and there is a link on the RJ-45 side, the switch continues with that link. If the link goes down, the switch disables the RJ-45 side and selects the SFP module interface.
- When the 100BASE-X SFP module is removed, the switch again dynamically selects the type (**auto-select**) and re-enables the RJ-45 side.

The switch does not have this behavior with 100BASE-FX-GE SFP modules.

### Examples

This example shows how to select the SFP interface:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# media-type sfp
```

You can verify your setting by entering the **show interfaces interface-id capabilities** or the **show interfaces interface-id transceiver properties** privileged EXEC commands.

### Related Commands

Command	Description
<b>show interfaces capabilities</b>	Displays the capabilities of all interfaces or the specified interface.
<b>show interfaces transceiver properties</b>	Displays speed and duplex settings and media-type on an interface.



# mls qos

Use the **mls qos** global configuration command to enable quality of service (QoS) for the entire switch. When the **mls qos** command is entered, QoS is enabled with the default parameters on all ports in the system. Use the **no** form of this command to reset all the QoS-related statistics and to disable the QoS features for the entire switch.

**mls qos**

**no mls qos**

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

**Defaults** QoS is disabled. There is no concept of trusted or untrusted ports because the packets are not modified (the CoS, DSCP, and IP precedence values in the packet are not changed). Traffic is switched in pass-through mode (packets are switched without any rewrites and classified as best effort without any policing).

When QoS is enabled with the **mls qos** global configuration command and all other QoS settings are set to their defaults, traffic is classified as best effort (the DSCP and CoS value is set to 0) without any policing. No policy maps are configured. The default port trust state on all ports is untrusted. The default ingress and egress queue settings are in effect.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines** QoS must be globally enabled to use QoS classification, policing, mark down or drop, queueing, and traffic shaping features. You can create a policy-map and attach it to a port before entering the **mls qos** command. However, until you enter the **mls qos** command, QoS processing is disabled.

Policy-maps and class-maps used to configure QoS are not deleted from the configuration by the **no mls qos** command, but entries corresponding to policy maps are removed from the switch hardware to save system resources. To re-enable QoS with the previous configurations, use the **mls qos** command.

Toggling the QoS status of the switch with this command modifies (reallocates) the sizes of the queues. During the queue size modification, the queue is temporarily shut down during the hardware reconfiguration, and the switch drops newly arrived packets for this queue.

**Examples** This example shows how to enable QoS on the switch:

```
Switch(config)# mls qos
```

You can verify your settings by entering the **show mls qos** privileged EXEC command.



Related Commands	Command	Description
	<a href="#">show mls qos</a>	Displays QoS information.



# mls qos aggregate-policer

Use the **mls qos aggregate-policer** global configuration command to define policer parameters, which can be shared by multiple classes within the same policy map. A policer defines a maximum permissible rate of transmission, a maximum burst size for transmissions, and an action to take if either maximum is exceeded. Use the **no** form of this command to delete an aggregate policer.

**mls qos aggregate-policer** *aggregate-policer-name* *rate-bps* *burst-byte* **exceed-action** {**drop** | **policed-dscp-transmit**}

**no mls qos aggregate-policer** *aggregate-policer-name*

Syntax Description	<i>aggregate-policer-name</i>	Name of the aggregate policer referenced by the <b>police aggregate</b> policy-map class configuration command.
	<i>rate-bps</i>	Specify the average traffic rate in bits per second (b/s). The range is 1000000 to 1000000000.
	<i>burst-byte</i>	Specify the normal burst size in bytes. The range is 8000 to 1000000.
	<b>exceed-action drop</b>	When the specified rate is exceeded, specify that the switch drop the packet.
	<b>exceed-action policed-dscp-transmit</b>	When the specified rate is exceeded, specify that the switch change the Differentiated Services Code Point (DSCP) of the packet to that specified in the policed-DSCP map and then send the packet.

**Defaults** No aggregate policers are defined.

**Command Modes** Global configuration

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

Define an aggregate policer if the policer is shared with multiple classes.

Policers for a port cannot be shared with other policers for another port; traffic from two different ports cannot be aggregated for policing purposes.

The port ASIC device, which controls more than one physical port, supports 256 policers (255 user-configurable policers plus 1 policer reserved for internal use). The maximum number of user-configurable policers supported per port is 63. Policers are allocated on demand by the software and are constrained by the hardware and ASIC boundaries. You cannot reserve policers per port (there is no guarantee that a port will be assigned to any policer).

You apply an aggregate policer to multiple classes in the same policy map; you cannot use an aggregate policer across different policy maps.



You cannot delete an aggregate policer if it is being used in a policy map. You must first use the **no police aggregate aggregate-policer-name** policy-map class configuration command to delete the aggregate policer from all policy maps before using the **no mls qos aggregate-policer aggregate-policer-name** command.

Policing uses a token-bucket algorithm. You configure the bucket depth (the maximum burst that is tolerated before the bucket overflows) by using the *burst-byte* option of the **police** policy-map class configuration command or the **mls qos aggregate-policer** global configuration command. You configure how fast (the average rate) that the tokens are removed from the bucket by using the *rate-bps* option of the **police** policy-map class configuration command or the **mls qos aggregate-policer** global configuration command. For more information, see the software configuration guide for this release.

## Examples

This example shows how to define the aggregate policer parameters and how to apply the policer to multiple classes in a policy map:

```
Switch(config)# mls qos aggregate-policer agg_policer1 1000000 1000000 exceed-action drop
Switch(config)# policy-map policy2
Switch(config-pmap)# class class1
Switch(config-pmap-c)# police aggregate agg_policer1
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class2
Switch(config-pmap-c)# set dscp 10
Switch(config-pmap-c)# police aggregate agg_policer1
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class3
Switch(config-pmap-c)# trust dscp
Switch(config-pmap-c)# police aggregate agg_policer2
Switch(config-pmap-c)# exit
```

You can verify your settings by entering the **show mls qos aggregate-policer** privileged EXEC command.

## Related Commands

Command	Description
<b>police aggregate</b>	Creates a policer that is shared by different classes.
<b>show mls qos aggregate-policer</b>	Displays the quality of service (QoS) aggregate policer configuration.



# mls qos cos

Use the **mls qos cos** interface configuration command to define the default class of service (CoS) value of a port or to assign the default CoS to all incoming packets on the port. Use the **no** form of this command to return to the default setting.

**mls qos cos** { *default-cos* | **override** }

**no mls qos cos** { *default-cos* | **override** }

Syntax Description	<i>default-cos</i>	Assign a default CoS value to a port. If packets are untagged, the default CoS value becomes the packet CoS value. The CoS range is 0 to 7.
	<b>override</b>	Override the CoS of the incoming packets, and apply the default CoS value on the port to all incoming packets.

Defaults	The default CoS value for a port is 0. CoS override is disabled.
----------	---

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	<p>You can use the default value to assign a CoS and Differentiated Services Code Point (DSCP) value to all incoming packets that are untagged (if the incoming packet does not have a CoS value). You also can assign a default CoS and DSCP value to all incoming packets by using the <b>override</b> keyword.</p> <p>Use the <b>override</b> keyword when all incoming packets on certain ports deserve higher or lower priority than packets entering from other ports. Even if a port is previously set to trust DSCP, CoS, or IP precedence, this command overrides the previously configured trust state, and all the incoming CoS values are assigned the default CoS value configured with the <b>mls qos cos</b> command. If an incoming packet is tagged, the CoS value of the packet is modified with the default CoS of the port at the ingress port.</p>
------------------	---



---

**Examples**

This example shows how to configure the default port CoS to 4 on a port:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# mls qos trust cos
Switch(config-if)# mls qos cos 4
```

This example shows how to assign all the packets entering a port to the default port CoS value of 4 on a port:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# mls qos cos 4
Switch(config-if)# mls qos cos override
```

You can verify your settings by entering the **show mls qos interface** privileged EXEC command.

---

**Related Commands**

Command	Description
<a href="#">show mls qos interface</a>	Displays quality of service (QoS) information.



# mls qos dscp-mutation

Use the **mls qos dscp-mutation** interface configuration command to apply a Differentiated Services Code Point (DSCP)-to-DSCP-mutation map to a DSCP-trusted port. Use the **no** form of this command to return the map to the default settings (no DSCP mutation).

**mls qos dscp-mutation** *dscp-mutation-name*

**no mls qos dscp-mutation** *dscp-mutation-name*

Syntax Description	<i>dscp-mutation-name</i> Name of the DSCP-to-DSCP-mutation map. This map was previously defined with the <b>mls qos map dscp-mutation</b> global configuration command.					
Defaults	The default DSCP-to-DSCP-mutation map is a null map, which maps incoming DSCPs to the same DSCP values.					
Command Modes	Interface configuration					
Command History	<table><tr><th>Release</th><th>Modification</th></tr><tr><td>12.2(25)FX</td><td>This command was introduced.</td></tr></table>		Release	Modification	12.2(25)FX	This command was introduced.
Release	Modification					
12.2(25)FX	This command was introduced.					
Usage Guidelines	<p>If two quality of service (QoS) domains have different DSCP definitions, use the DSCP-to-DSCP-mutation map to translate one set of DSCP values to match the definition of another domain. You apply the DSCP-to-DSCP-mutation map to the receiving port (ingress mutation) at the boundary of a quality of service (QoS) administrative domain.</p> <p>With ingress mutation, the new DSCP value overwrites the one in the packet, and QoS handles the packet with this new value. The switch sends the packet out the port with the new DSCP value.</p> <p>You can configure multiple DSCP-to-DSCP-mutation maps on ingress ports.</p> <p>You apply the map only to DSCP-trusted ports. If you apply the DSCP mutation map to an untrusted port, to class of service (CoS) or IP-precedence trusted port, the command has no immediate effect until the port becomes DSCP-trusted.</p>					
Examples	<p>This example shows how to define the DSCP-to-DSCP-mutation map named <i>dscpmutation1</i> and to apply the map to a port:</p> <pre>Switch(config)# mls qos map dscp-mutation dscpmutation1 10 11 12 13 to 30 Switch(config)# interface gigabitethernet0/1 Switch(config-if)# mls qos trust dscp Switch(config-if)# mls qos dscp-mutation dscpmutation1</pre>					



This example show how to remove the DSCP-to-DSCP-mutation map name *dscpmutation1* from the port and to reset the map to the default:

```
Switch(config-if)# no mls qos dscp-mutation dscpmutation1
```

You can verify your settings by entering the **show mls qos maps** privileged EXEC command.

Related Commands	Command	Description
	<b>mls qos map dscp-mutation</b>	Defines the DSCP-to-DSCP-mutation map.
	<b>mls qos trust</b>	Configures the port trust state.
	<b>show mls qos maps</b>	Displays QoS mapping information.



## mls qos map

Use the **mls qos map** global configuration command to define the class of service (CoS)-to-Differentiated Services Code Point (DSCP) map, DSCP-to-CoS map, the DSCP-to-DSCP-mutation map, the IP-precedence-to-DSCP map, and the policed-DSCP map. Use the **no** form of this command to return to the default map.

```
mls qos map { cos-dscp dscp1...dscp8 / dscp-cos dscp-list to cos / dscp-mutation
dscp-mutation-name in-dscp to out-dscp / ip-prec-dscp dscp1...dscp8 / policed-dscp dscp-list
to mark-down-dscp }
```

```
no mls qos map { cos-dscp | dscp-cos | dscp-mutation dscp-mutation-name | ip-prec-dscp |
policed-dscp }
```

### Syntax Description

<b>cos-dscp</b> <i>dscp1...dscp8</i>	<p>Define the CoS-to-DSCP map.</p> <p>For <i>dscp1...dscp8</i>, enter eight DSCP values that correspond to CoS values 0 to 7. Separate each DSCP value with a space. The range is 0 to 63.</p>
<b>dscp-cos</b> <i>dscp-list</i> <b>to</b> <i>cos</i>	<p>Define the DSCP-to-CoS map.</p> <p>For <i>dscp-list</i>, enter up to eight DSCP values, with each value separated by a space. The range is 0 to 63. Then enter the <b>to</b> keyword.</p> <p>For <i>cos</i>, enter a single CoS value to which the DSCP values correspond. The range is 0 to 7.</p>
<b>dscp-mutation</b> <i>dscp-mutation-name in-dscp</i> <b>to</b> <i>out-dscp</i>	<p>Define the DSCP-to-DSCP-mutation map.</p> <p>For <i>dscp-mutation-name</i>, enter the mutation map name.</p> <p>For <i>in-dscp</i>, enter up to eight DSCP values, with each value separated by a space. Then enter the <b>to</b> keyword.</p> <p>For <i>out-dscp</i>, enter a single DSCP value.</p> <p>The range is 0 to 63.</p>
<b>ip-prec-dscp</b> <i>dscp1...dscp8</i>	<p>Define the IP-precedence-to-DSCP map.</p> <p>For <i>dscp1...dscp8</i>, enter eight DSCP values that correspond to the IP precedence values 0 to 7. Separate each DSCP value with a space. The range is 0 to 63.</p>
<b>policed-dscp</b> <i>dscp-list</i> <b>to</b> <i>mark-down-dscp</i>	<p>Define the policed-DSCP map.</p> <p>For <i>dscp-list</i>, enter up to eight DSCP values, with each value separated by a space. Then enter the <b>to</b> keyword.</p> <p>For <i>mark-down-dscp</i>, enter the corresponding policed (marked down) DSCP value.</p> <p>The range is 0 to 63.</p>



**Defaults**

[Table 2-6](#) shows the default CoS-to-DSCP map:

**Table 2-6 Default CoS-to-DSCP Map**

CoS Value	DSCP Value
0	0
1	8
2	16
3	24
4	32
5	40
6	48
7	56

[Table 2-7](#) shows the default DSCP-to-CoS map:

**Table 2-7 Default DSCP-to-CoS Map**

DSCP Value	CoS Value
0–7	0
8–15	1
16–23	2
24–31	3
32–39	4
40–47	5
48–55	6
56–63	7

[Table 2-8](#) shows the default IP-precedence-to-DSCP map:

**Table 2-8 Default IP-Precedence-to-DSCP Map**

IP Precedence Value	DSCP Value
0	0
1	8
2	16
3	24
4	32
5	40
6	48
7	56



The default DSCP-to-DSCP-mutation map is a null map, which maps an incoming DSCP value to the same DSCP value.

The default policed-DSCP map is a null map, which maps an incoming DSCP value to the same DSCP value.

---

**Command Modes** Global configuration

---

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

---



---

**Usage Guidelines** All the maps are globally defined. All the maps, except the DSCP-to-DSCP-mutation map, are applied to all ports. The DSCP-to-DSCP-mutation map is applied to a specific port.

---

**Examples** This example shows how to define the IP-precedence-to-DSCP map and to map IP-precedence values 0 to 7 to DSCP values of 0, 10, 20, 30, 40, 50, 55, and 60:

```
Switch# configure terminal
Switch(config)# mls qos map ip-prec-dscp 0 10 20 30 40 50 55 60
```

This example shows how to define the policed-DSCP map. DSCP values 1, 2, 3, 4, 5, and 6 are marked down to DSCP value 0. Marked DSCP values that not explicitly configured are not modified:

```
Switch# configure terminal
Switch(config)# mls qos map policed-dscp 1 2 3 4 5 6 to 0
```

This example shows how to define the DSCP-to-CoS map. DSCP values 20, 21, 22, 23, and 24 are mapped to CoS 1. DSCP values 10, 11, 12, 13, 14, 15, 16, and 17 are mapped to CoS 0:

```
Switch# configure terminal
Switch(config)# mls qos map dscp-cos 20 21 22 23 24 to 1
Switch(config)# mls qos map dscp-cos 10 11 12 13 14 15 16 17 to 0
```

This example shows how to define the CoS-to-DSCP map. CoS values 0 to 7 are mapped to DSCP values 0, 5, 10, 15, 20, 25, 30, and 35:

```
Switch# configure terminal
Switch(config)# mls qos map cos-dscp 0 5 10 15 20 25 30 35
```

This example shows how to define the DSCP-to-DSCP-mutation map. All the entries that are not explicitly configured are not modified (remain as specified in the null map):

```
Switch# configure terminal
Switch(config)# mls qos map dscp-mutation mutation1 1 2 3 4 5 6 7 to 10
Switch(config)# mls qos map dscp-mutation mutation1 8 9 10 11 12 13 to 10
Switch(config)# mls qos map dscp-mutation mutation1 20 21 22 to 20
Switch(config)# mls qos map dscp-mutation mutation1 0 31 32 33 34 to 30
```

You can verify your settings by entering the **show mls qos maps** privileged EXEC command.



Related Commands	Command	Description
	<a href="#">mls qos dscp-mutation</a>	Applies a DSCP-to-DSCP-mutation map to a DSCP-trusted port.
	<a href="#">show mls qos maps</a>	Displays quality of service (QoS) mapping information.




# mls qos queue-set output buffers

Use the **mls qos queue-set output buffers** global configuration command to allocate buffers to a queue-set (four egress queues per port). Use the **no** form of this command to return to the default setting.

**mls qos queue-set output** *qset-id* **buffers** *allocation1 ... allocation4*

**no mls qos queue-set output** *qset-id* **buffers**

Syntax Description	<table> <tr> <td><i>qset-id</i></td><td>ID of the queue-set. Each port belongs to a queue-set, which defines all the characteristics of the four egress queues per port. The range is 1 to 2.</td></tr> <tr> <td><i>allocation1 ... allocation4</i></td><td>Buffer space allocation (percentage) for each queue (four values for queues 1 to 4). For <i>allocation1</i>, <i>allocation3</i>, and <i>allocation4</i>, the range is 0 to 99. For <i>allocation2</i>, the range is 1 to 100 (including the CPU buffer). Separate each value with a space.</td></tr> </table>	<i>qset-id</i>	ID of the queue-set. Each port belongs to a queue-set, which defines all the characteristics of the four egress queues per port. The range is 1 to 2.	<i>allocation1 ... allocation4</i>	Buffer space allocation (percentage) for each queue (four values for queues 1 to 4). For <i>allocation1</i> , <i>allocation3</i> , and <i>allocation4</i> , the range is 0 to 99. For <i>allocation2</i> , the range is 1 to 100 (including the CPU buffer). Separate each value with a space.
<i>qset-id</i>	ID of the queue-set. Each port belongs to a queue-set, which defines all the characteristics of the four egress queues per port. The range is 1 to 2.				
<i>allocation1 ... allocation4</i>	Buffer space allocation (percentage) for each queue (four values for queues 1 to 4). For <i>allocation1</i> , <i>allocation3</i> , and <i>allocation4</i> , the range is 0 to 99. For <i>allocation2</i> , the range is 1 to 100 (including the CPU buffer). Separate each value with a space.				
Defaults	All allocation values are equally mapped among the four queues (25, 25, 25, 25). Each queue has 1/4 of the buffer space.				
Command Modes	Global configuration				
Command History	<table> <tr> <th>Release</th><th>Modification</th></tr> <tr> <td>12.2(25)FX</td><td>This command was introduced.</td></tr> </table>	Release	Modification	12.2(25)FX	This command was introduced.
Release	Modification				
12.2(25)FX	This command was introduced.				
Usage Guidelines	<p>Specify four allocation values, and separate each with a space.</p> <p>Allocate buffers according to the importance of the traffic; for example, give a large percentage of the buffer to the queue with the highest-priority traffic.</p> <p>To configure different classes of traffic with different characteristics, use this command with the <b>mls qos queue-set output</b> <i>qset-id</i> <b>threshold</b> global configuration command.</p>				
 Note	<p>The egress queue default settings are suitable for most situations. You should change them only when you have a thorough understanding of the egress queues and if these settings do not meet your QoS solution.</p>				



## Examples

This example shows how to map a port to queue-set 2. It allocates 40 percent of the buffer space to egress queue 1 and 20 percent to egress queues 2, 3, and 4:

```
Switch(config)# mls qos queue-set output 2 buffers 40 20 20 20
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# queue-set 2
```

You can verify your settings by entering the **show mls qos interface** *[interface-id]* **buffers** or the **show mls qos queue-set** privileged EXEC command.

## Related Commands

Command	Description
<b>mls qos queue-set output threshold</b>	Configures the weighted tail-drop (WTD) thresholds, guarantees the availability of buffers, and configures the maximum memory allocation to a queue-set.
<b>queue-set</b>	Maps a port to a queue-set.
<b>show mls qos interface buffers</b>	Displays quality of service (QoS) information.
<b>show mls qos queue-set</b>	Displays egress queue settings for the queue-set.



# mls qos queue-set output threshold

Use the **mls qos queue-set output threshold** global configuration command to configure the weighted tail-drop (WTD) thresholds, to guarantee the availability of buffers, and to configure the maximum memory allocation to a queue-set (four egress queues per port). Use the **no** form of this command to return to the default setting.

**mls qos queue-set output** *qset-id* **threshold** *queue-id* *drop-threshold1* *drop-threshold2* *reserved-threshold* *maximum-threshold*

**no mls qos queue-set output** *qset-id* **threshold** [*queue-id*]

## Syntax Description

<i>qset-id</i>	ID of the queue-set. Each port belongs to a queue-set, which defines all the characteristics of the four egress queues per port. The range is 1 to 2.
<i>queue-id</i>	Specific queue in the queue-set on which the command is performed. The range is 1 to 4.
<i>drop-threshold1</i> <i>drop-threshold2</i>	Two WTD thresholds expressed as a percentage of the queue's allocated memory. The range is 1 to 400 percent.
<i>reserved-threshold</i>	Amount of memory to be guaranteed (reserved) for the queue and expressed as a percentage of the allocated memory. The range is 1 to 100 percent.
<i>maximum-threshold</i>	Enable a queue in the full condition to get more buffers than are reserved for it. This is the maximum memory the queue can have before the packets are dropped. The range is 1 to 400 percent.

## Defaults

When quality of service (QoS) is enabled, WTD is enabled.

[Table 2-9](#) shows the default WTD threshold settings.

**Table 2-9 Default Egress Queue WTD Threshold Settings**

Feature	Queue 1	Queue 2	Queue 3	Queue 4
WTD Drop Threshold 1	100 percent	200 percent	100 percent	100 percent
WTD Drop Threshold 2	100 percent	200 percent	100 percent	100 percent
Reserved Threshold	50 percent	100 percent	50 percent	50 percent
Maximum Threshold	400 percent	400 percent	400 percent	400 percent

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.



**Usage Guidelines**

Use the **mls qos queue-set output *qset-id* buffers** global configuration command to allocate a fixed number of buffers to the four queues in a queue-set.

The drop-threshold percentages can exceed 100 percent and can be up to the maximum (if the maximum threshold exceeds 100 percent).

**Note**

The egress queue default settings are suitable for most situations. You should change them only when you have a thorough understanding of the egress queues and if these settings do not meet your QoS solution.

The switch uses a buffer allocation scheme to reserve a minimum amount of buffers for each egress queue, to prevent any queue or port from consuming all the buffers and depriving other queues, and to decide whether to grant buffer space to a requesting queue. The switch decides whether the target queue has not consumed more buffers than its reserved amount (under-limit), whether it has consumed all of its maximum buffers (over-limit), and whether the common pool is empty (no free buffers) or not empty (free buffers). If the queue is not over-limit, the switch can allocate buffer space from the reserved pool or from the common pool (if it is not empty). If there are no free buffers in the common pool or if the queue is over-limit, the switch drops the frame.

**Examples**

This example shows how to map a port to queue-set 2. It configures the drop thresholds for queue 2 to 40 and 60 percent of the allocated memory, guarantees (reserves) 100 percent of the allocated memory, and configures 200 percent as the maximum memory this queue can have before packets are dropped:

```
Switch(config)# mls qos queue-set output 2 threshold 2 40 60 100 200
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# queue-set 2
```

You can verify your settings by entering the **show mls qos interface *interface-id* buffers** or the **show mls qos queue-set** privileged EXEC command.

**Related Commands**

Command	Description
<b>mls qos queue-set output buffers</b>	Allocates buffers to a queue-set.
<b>queue-set</b>	Maps a port to a queue-set.
<b>show mls qos interface buffers</b>	Displays QoS information.
<b>show mls qos queue-set</b>	Displays egress queue settings for the queue-set.



# mls qos rewrite ip dscp

Use the **mls qos rewrite ip dscp** global configuration command to configure the switch to change (rewrite) the Differentiated Services Code Point (DSCP) field of an incoming IP packet. Use the **no** form of this command to configure the switch to not modify (rewrite) the DSCP field of the packet and to enable DSCP transparency.

**mls qos rewrite ip dscp**

**no mls qos rewrite ip dscp**

<b>Syntax Description</b>	This command has no arguments or keywords.
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<b>Defaults</b>	DSCP transparency is disabled. The switch changes the DSCP field of the incoming IP packet.
-----------------	---

<b>Command Modes</b>	Global configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	<p>DSCP transparency affects only the DSCP field of a packet at the egress. If DSCP transparency is enabled by using the <b>no mls qos rewrite ip dscp</b> command, the switch does not modify the DSCP field in the incoming packet, and the DSCP field in the outgoing packet is the same as that in the incoming packet.</p> <p>By default, DSCP transparency is disabled. The switch modifies the DSCP field in an incoming packet, and the DSCP field in the outgoing packet is based on the quality of service (QoS) configuration, including the port trust setting, policing and marking, and the DSCP-to-DSCP mutation map.</p> <p>Regardless of the DSCP transparency configuration, the switch modifies the internal DSCP value of the packet that the switch uses to generate a class of service (CoS) value representing the priority of the traffic. The switch also uses the internal DSCP value to select an egress queue and threshold.</p> <p>For example, if QoS is enabled and an incoming packet has a DSCP value of 32, the switch might modify the internal DSCP value based on the policy-map configuration and change the internal DSCP value to 16. If DSCP transparency is enabled, the outgoing DSCP value is 32 (same as the incoming value). If DSCP transparency is disabled, the outgoing DSCP value is 16 because it is based on the internal DSCP value.</p>
-------------------------	--



## Examples

This example shows how to enable DSCP transparency and configure the switch to not change the DSCP value of the incoming IP packet:

```
Switch(config)# mls qos
Switch(config)# no mls qos rewrite ip dscp
```

This example shows how to disable DSCP transparency and configure the switch to change the DSCP value of the incoming IP packet:

```
Switch(config)# mls qos
Switch(config)# mls qos rewrite ip dscp
```

You can verify your settings by entering the **show running config | include rewrite** privileged EXEC command.

## Related Commands

Command	Description
<a href="#">mls qos</a>	Enables QoS globally.
<a href="#">show mls qos</a>	Displays QoS information.
<b>show running-config   include rewrite</b>	Displays the DSCP transparency setting. For syntax information, select <b>Cisco IOS Release 12.2 Configuration Guides and Command References &gt; Cisco IOS Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# mls qos srr-queue input bandwidth

Use the **mls qos srr-queue input bandwidth** global configuration command to assign shaped round robin (SRR) weights to an ingress queue. The ratio of the weights is the ratio of the frequency in which the SRR scheduler dequeues packets from each queue. Use the **no** form of this command to return to the default setting.

**mls qos srr-queue input bandwidth** *weight1 weight2*

**no mls qos srr-queue input bandwidth**

Syntax Description	<i>weight1 weight2</i>	Ratio of <i>weight1</i> and <i>weight2</i> determines the ratio of the frequency in which the SRR scheduler dequeues packets from ingress queues 1 and 2. The range is 1 to 100. Separate each value with a space.
--------------------	------------------------	--

Defaults	Weight1 and weight2 are 4 (1/2 of the bandwidth is equally shared between the two queues).	
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Command Modes	Global configuration	
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Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	<p>SRR services the priority queue for its configured weight as specified by the <b>bandwidth</b> keyword in the <b>mls qos srr-queue input priority-queue <i>queue-id</i> bandwidth <i>weight</i></b> global configuration command. Then SRR shares the remaining bandwidth with both ingress queues and services them as specified by the weights configured with the <b>mls qos srr-queue input bandwidth <i>weight1 weight2</i></b> global configuration command.</p> <p>You specify which ingress queue is the priority queue by using the <b>mls qos srr-queue input priority-queue</b> global configuration command.</p>	
------------------	---	--

Examples	<p>This example shows how to assign the ingress bandwidth for the queues. Priority queueing is disabled, and the shared bandwidth ratio allocated to queue 1 is 25/(25+75) and to queue 2 is 75/(25+75):</p> <pre>Switch(config)# mls qos srr-queue input priority-queue 2 bandwidth 0 Switch(config)# mls qos srr-queue input bandwidth 25 75</pre> <p>In this example, queue 2 has three times the bandwidth of queue 1; queue 2 is serviced three times as often as queue 1.</p>	
----------	---	--



This example shows how to assign the ingress bandwidths for the queues. Queue 1 is the priority queue with 10 percent of the bandwidth allocated to it. The bandwidth ratio allocated to queues 1 and 2 is 4/(4+4). SRR services queue 1 (the priority queue) first for its configured 10 percent bandwidth. Then SRR equally shares the remaining 90 percent of the bandwidth between queues 1 and 2 by allocating 45 percent to each queue:

```
Switch(config)# mls qos srr-queue input priority-queue 1 bandwidth 10
Switch(config)# mls qos srr-queue input bandwidth 4 4
```

You can verify your settings by entering the **show mls qos interface** *[interface-id]* **queueing** or the **show mls qos input-queue** privileged EXEC command.

#### Related Commands

Command	Description
<a href="#">mls qos srr-queue input buffers</a>	Allocates the buffers between the ingress queues.
<a href="#">mls qos srr-queue input cos-map</a>	Maps class of service (CoS) values to an ingress queue or maps CoS values to a queue and to a threshold ID.
<a href="#">mls qos srr-queue input dscp-map</a>	Maps Differentiated Services Code Point (DSCP) values to an ingress queue or maps DSCP values to a queue and to a threshold ID.
<a href="#">mls qos srr-queue input priority-queue</a>	Configures the ingress priority queue and guarantees bandwidth.
<a href="#">mls qos srr-queue input threshold</a>	Assigns weighted tail-drop (WTD) threshold percentages to an ingress queue.
<a href="#">show mls qos input-queue</a>	Displays ingress queue settings.
<a href="#">show mls qos interface queueing</a>	Displays quality of service (QoS) information.



# mls qos srr-queue input buffers

Use the **mls qos srr-queue input buffers** global configuration command to allocate the buffers between the ingress queues. Use the **no** form of this command to return to the default setting.

**mls qos srr-queue input buffers** *percentage1 percentage2*

**no mls qos srr-queue input buffers**

Syntax Description	<i>percentage1</i> Percentage of buffers allocated to ingress queues 1 and 2. The range is 0 to <i>percentage2</i> 100. Separate each value with a space.													
Defaults	Ninety percent of the buffers is allocated to queue 1, and 10 percent of the buffers is allocated to queue 2.													
Command Modes	Global configuration													
Command History	<table><tr><th>Release</th><th>Modification</th></tr><tr><td>12.2(25)FX</td><td>This command was introduced.</td></tr></table>		Release	Modification	12.2(25)FX	This command was introduced.								
Release	Modification													
12.2(25)FX	This command was introduced.													
Usage Guidelines	You should allocate the buffers so that the queues can handle any incoming bursty traffic.													
Examples	<p>This example shows how to allocate 60 percent of the buffer space to ingress queue 1 and 40 percent of the buffer space to ingress queue 2:</p> <pre>Switch(config)# mls qos srr-queue input buffers 60 40</pre> <p>You can verify your settings by entering the <b>show mls qos interface</b> <i>[interface-id]</i> <b>buffers</b> or the <b>show mls qos input-queue</b> privileged EXEC command.</p>													
Related Commands	<table><tr><th>Command</th><th>Description</th></tr><tr><td><a href="#">mls qos srr-queue input bandwidth</a></td><td>Assigns shaped round robin (SRR) weights to an ingress queue.</td></tr><tr><td><a href="#">mls qos srr-queue input cos-map</a></td><td>Maps class of service (CoS) values to an ingress queue or maps CoS values to a queue and to a threshold ID.</td></tr><tr><td><a href="#">mls qos srr-queue input dscp-map</a></td><td>Maps Differentiated Services Code Point (DSCP) values to an ingress queue or maps DSCP values to a queue and to a threshold ID.</td></tr><tr><td><a href="#">mls qos srr-queue input priority-queue</a></td><td>Configures the ingress priority queue and guarantees bandwidth.</td></tr><tr><td><a href="#">mls qos srr-queue input threshold</a></td><td>Assigns weighted tail-drop (WTD) threshold percentages to an ingress queue.</td></tr></table>		Command	Description	<a href="#">mls qos srr-queue input bandwidth</a>	Assigns shaped round robin (SRR) weights to an ingress queue.	<a href="#">mls qos srr-queue input cos-map</a>	Maps class of service (CoS) values to an ingress queue or maps CoS values to a queue and to a threshold ID.	<a href="#">mls qos srr-queue input dscp-map</a>	Maps Differentiated Services Code Point (DSCP) values to an ingress queue or maps DSCP values to a queue and to a threshold ID.	<a href="#">mls qos srr-queue input priority-queue</a>	Configures the ingress priority queue and guarantees bandwidth.	<a href="#">mls qos srr-queue input threshold</a>	Assigns weighted tail-drop (WTD) threshold percentages to an ingress queue.
Command	Description													
<a href="#">mls qos srr-queue input bandwidth</a>	Assigns shaped round robin (SRR) weights to an ingress queue.													
<a href="#">mls qos srr-queue input cos-map</a>	Maps class of service (CoS) values to an ingress queue or maps CoS values to a queue and to a threshold ID.													
<a href="#">mls qos srr-queue input dscp-map</a>	Maps Differentiated Services Code Point (DSCP) values to an ingress queue or maps DSCP values to a queue and to a threshold ID.													
<a href="#">mls qos srr-queue input priority-queue</a>	Configures the ingress priority queue and guarantees bandwidth.													
<a href="#">mls qos srr-queue input threshold</a>	Assigns weighted tail-drop (WTD) threshold percentages to an ingress queue.													



Command	Description
<code>show mls qos input-queue</code>	Displays ingress queue settings.
<code>show mls qos interface buffers</code>	Displays quality of service (QoS) information.



# mls qos srr-queue input cos-map

Use the **mls qos srr-queue input cos-map** global configuration command to map class of service (CoS) values to an ingress queue or to map CoS values to a queue and to a threshold ID. Use the **no** form of this command to return to the default setting.

**mls qos srr-queue input cos-map** *queue queue-id* {*cos1...cos8* | **threshold** *threshold-id cos1...cos8*}

**no mls qos srr-queue input cos-map**

## Syntax Description

<b>queue</b> <i>queue-id</i>	Specify a queue number. For <i>queue-id</i> , the range is 1 to 2.
<i>cos1...cos8</i>	Map CoS values to an ingress queue. For <i>cos1...cos8</i> , enter up to eight values, and separate each value with a space. The range is 0 to 7.
<b>threshold</b> <i>threshold-id cos1...cos8</i>	Map CoS values to a queue threshold ID. For <i>threshold-id</i> , the range is 1 to 3. For <i>cos1...cos8</i> , enter up to eight values, and separate each value with a space. The range is 0 to 7.

## Defaults

Table 2-10 shows the default CoS input queue threshold map:

**Table 2-10 Default CoS Input Queue Threshold Map**

CoS Value	Queue ID - Threshold ID
0–4	1–1
5	2–1
6, 7	1–1

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.



**Usage Guidelines**

The CoS assigned at the ingress port selects an ingress or egress queue and threshold.

The drop-threshold percentage for threshold 3 is predefined. It is set to the queue-full state. You can assign two weighted tail-drop (WTD) threshold percentages to an ingress queue by using the **mls qos srr-queue input threshold** global configuration command.

You can map each CoS value to a different queue and threshold combination, allowing the frame to follow different behavior.

**Examples**

This example shows how to map CoS values 0 to 3 to ingress queue 1 and to threshold ID 1 with a drop threshold of 50 percent. It maps CoS values 4 and 5 to ingress queue 1 and to threshold ID 2 with a drop threshold of 70 percent:

```
Switch(config)# mls qos srr-queue input cos-map queue 1 threshold 1 0 1 2 3
Switch(config)# mls qos srr-queue input cos-map queue 1 threshold 2 4 5
Switch(config)# mls qos srr-queue input threshold 1 50 70
```

You can verify your settings by entering the **show mls qos maps** privileged EXEC command.

**Related Commands**

Command	Description
<a href="#">mls qos srr-queue input bandwidth</a>	Assigns shaped round robin (SRR) weights to an ingress queue.
<a href="#">mls qos srr-queue input buffers</a>	Allocates the buffers between the ingress queues.
<a href="#">mls qos srr-queue input dscp-map</a>	Maps Differentiated Services Code Point (DSCP) values to an ingress queue or maps DSCP values to a queue and to a threshold ID.
<a href="#">mls qos srr-queue input priority-queue</a>	Configures the ingress priority queue and guarantees bandwidth.
<a href="#">mls qos srr-queue input threshold</a>	Assigns WTD threshold percentages to an ingress queue.
<a href="#">show mls qos maps</a>	Displays QoS mapping information.



# mls qos srr-queue input dscp-map

Use the **mls qos srr-queue input dscp-map** global configuration command to map Differentiated Services Code Point (DSCP) values to an ingress queue or to map DSCP values to a queue and to a threshold ID. Use the **no** form of this command to return to the default setting.

**mls qos srr-queue input dscp-map queue** *queue-id* {*dscp1...dscp8* | **threshold** *threshold-id* *dscp1...dscp8*}

**no mls qos srr-queue input dscp-map**

Syntax Description	<b>queue</b> <i>queue-id</i>	Specify a queue number. For <i>queue-id</i> , the range is 1 to 2.
	<i>dscp1...dscp8</i>	Map DSCP values to an ingress queue. For <i>dscp1...dscp8</i> , enter up to eight values, and separate each value with a space. The range is 0 to 63.
	<b>threshold</b> <i>threshold-id</i> <i>dscp1...dscp8</i>	Map DSCP values to a queue threshold ID. For <i>threshold-id</i> , the range is 1 to 3. For <i>dscp1...dscp8</i> , enter up to eight values, and separate each value with a space. The range is 0 to 63.

## Defaults

Table 2-11 shows the default DSCP input queue threshold map:

**Table 2-11 Default DSCP Input Queue Threshold Map**

DSCP Value	Queue ID–Threshold ID
0–39	1–1
40–47	2–1
48–63	1–1

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.



**Usage Guidelines**

The DSCP assigned at the ingress port selects an ingress or egress queue and threshold.

The drop-threshold percentage for threshold 3 is predefined. It is set to the queue-full state. You can assign two weighted tail-drop (WTD) threshold percentages to an ingress queue by using the **mls qos srr-queue input threshold** global configuration command.

You can map each DSCP value to a different queue and threshold combination, allowing the frame to follow different behavior.

You can map up to eight DSCP values per command.

**Examples**

This example shows how to map DSCP values 0 to 6 to ingress queue 1 and to threshold 1 with a drop threshold of 50 percent. It maps DSCP values 20 to 26 to ingress queue 1 and to threshold 2 with a drop threshold of 70 percent:

```
Switch(config)# mls qos srr-queue input dscp-map queue 1 threshold 1 0 1 2 3 4 5 6
Switch(config)# mls qos srr-queue input dscp-map queue 1 threshold 2 20 21 22 23 24 25 26
Switch(config)# mls qos srr-queue input threshold 1 50 70
```

You can verify your settings by entering the **show mls qos maps** privileged EXEC command.

**Related Commands**

Command	Description
<b>mls qos srr-queue input bandwidth</b>	Assigns shaped round robin (SRR) weights to an ingress queue.
<b>mls qos srr-queue input buffers</b>	Allocates the buffers between the ingress queues.
<b>mls qos srr-queue input cos-map</b>	Maps class of service (CoS) values to an ingress queue or maps CoS values to a queue and to threshold ID.
<b>mls qos srr-queue input priority-queue</b>	Configures the ingress priority queue and guarantees bandwidth.
<b>mls qos srr-queue input threshold</b>	Assigns WTD threshold percentages to an ingress queue.
<b>show mls qos maps</b>	Displays QoS mapping information.



# mls qos srr-queue input priority-queue

Use the **mls qos srr-queue input priority-queue** global configuration command to configure the ingress priority queue and to guarantee bandwidth on the internal ring if the ring is congested. Use the **no** form of this command to return to the default setting.

**mls qos srr-queue input priority-queue** *queue-id* **bandwidth** *weight*

**no mls qos srr-queue input priority-queue** *queue-id*

Syntax Description	<i>queue-id</i>	Ingress queue ID. The range is 1 to 2.
	<b>bandwidth</b> <i>weight</i>	Bandwidth percentage of the internal ring. The range is 0 to 40.

Defaults	The priority queue is queue 2, and 10 percent of the bandwidth is allocated to it.
----------	--

Command Modes	Global configuration
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Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	You should use the priority queue only for traffic that needs to be expedited (for example, voice traffic, which needs minimum delay and jitter).
	The priority queue is guaranteed part of the bandwidth on the internal ring, which reduces the delay and jitter under heavy network traffic on an oversubscribed ring (when there is more traffic than the backplane can carry, and the queues are full and dropping frames).
	Shaped round robin (SRR) services the priority queue for its configured weight as specified by the <b>bandwidth</b> keyword in the <b>mls qos srr-queue input priority-queue</b> <i>queue-id</i> <b>bandwidth</b> <i>weight</i> global configuration command. Then SRR shares the remaining bandwidth with both ingress queues and services them as specified by the weights configured with the <b>mls qos srr-queue input bandwidth</b> <i>weight1 weight2</i> global configuration command.
	To disable priority queueing, set the bandwidth weight to 0, for example, <b>mls qos srr-queue input priority-queue</b> <i>queue-id</i> <b>bandwidth 0</b> .



## Examples

This example shows how to assign the ingress bandwidths for the queues. Queue 1 is the priority queue with 10 percent of the bandwidth allocated to it. The bandwidth ratio allocated to queues 1 and 2 is 4/(4+4). SRR services queue 1 (the priority queue) first for its configured 10 percent bandwidth. Then SRR equally shares the remaining 90 percent of the bandwidth between queues 1 and 2 by allocating 45 percent to each queue:

```
Switch(config)# mls qos srr-queue input priority-queue 1 bandwidth 10
Switch(config)# mls qos srr-queue input bandwidth 4 4
```

You can verify your settings by entering the **show mls qos interface [interface-id] queueing** or the **show mls qos input-queue** privileged EXEC command.

## Related Commands

Command	Description
<b>mls qos srr-queue input bandwidth</b>	Assigns shaped round robin (SRR) weights to an ingress queue.
<b>mls qos srr-queue input buffers</b>	Allocates the buffers between the ingress queues.
<b>mls qos srr-queue input cos-map</b>	Maps class of service (CoS) values to an ingress queue or maps CoS values to a queue and to a threshold ID.
<b>mls qos srr-queue input dscp-map</b>	Maps Differentiated Services Code Point (DSCP) values to an ingress queue or maps DSCP values to a queue and to a threshold ID.
<b>mls qos srr-queue input threshold</b>	Assigns weighted tail-drop (WTD) threshold percentages to an ingress queue.
<b>show mls qos input-queue</b>	Displays ingress queue settings.
<b>show mls qos interface queueing</b>	Displays quality of service (QoS) information.



# mls qos srr-queue input threshold

Use the **mls qos srr-queue input threshold** global configuration command to assign weighted tail-drop (WTD) threshold percentages to an ingress queue. Use the **no** form of this command to return to the default setting.

**mls qos srr-queue input threshold** *queue-id threshold-percentage1 threshold-percentage2*

**no mls qos srr-queue input threshold** *queue-id*

## Syntax Description

<i>queue-id</i>	ID of the ingress queue. The range is 1 to 2.
<i>threshold-percentage1</i> <i>threshold-percentage2</i>	Two WTD threshold percentage values. Each threshold value is a percentage of the total number of queue descriptors allocated for the queue. Separate each value with a space. The range is 1 to 100.

## Defaults

When quality of service (QoS) is enabled, WTD is enabled.  
The two WTD thresholds are set to 100 percent.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

QoS uses the CoS-to-threshold map or the DSCP-to-threshold map to decide which class of service (CoS) or Differentiated Services Code Points (DSCPs) values are mapped to threshold 1 and to threshold 2. If threshold 1 is exceeded, packets with CoS or DSCPs assigned to this threshold are dropped until the threshold is no longer exceeded. However, packets assigned to threshold 2 continue to be queued and sent as long as the second threshold is not exceeded.

Each queue has two configurable (explicit) drop threshold and one preset (implicit) drop threshold (full).

You configure the CoS-to-threshold map by using the **mls qos srr-queue input cos-map** global configuration command. You configure the DSCP-to-threshold map by using the **mls qos srr-queue input dscp-map** global configuration command.

## Examples

This example shows how to configure the tail-drop thresholds for the two queues. The queue 1 thresholds are 50 percent and 100 percent, and the queue 2 thresholds are 70 percent and 100 percent:

```
Switch(config)# mls qos srr-queue input threshold 1 50 100
Switch(config)# mls qos srr-queue input threshold 2 70 100
```

You can verify your settings by entering the **show mls qos interface** *[interface-id]* **buffers** or the **show mls qos input-queue** privileged EXEC command.



Related Commands	Command	Description
	<b>mls qos srr-queue input bandwidth</b>	Assigns shaped round robin (SRR) weights to an ingress queue.
	<b>mls qos srr-queue input buffers</b>	Allocates the buffers between the ingress queues.
	<b>mls qos srr-queue input cos-map</b>	Maps class of service (CoS) values to an ingress queue or maps CoS values to a queue and to a threshold ID.
	<b>mls qos srr-queue input dscp-map</b>	Maps Differentiated Services Code Point (DSCP) values to an ingress queue or maps DSCP values to a queue and to a threshold ID.
	<b>mls qos srr-queue input priority-queue</b>	Configures the ingress priority queue and guarantees bandwidth.
	<b>show mls qos input-queue</b>	Displays ingress queue settings.
	<b>show mls qos interface buffers</b>	Displays quality of service (QoS) information.



# mls qos srr-queue output cos-map

Use the **mls qos srr-queue output cos-map** global configuration command to map class of service (CoS) values to an egress queue or to map CoS values to a queue and to a threshold ID. Use the **no** form of this command to return to the default setting.

**mls qos srr-queue output cos-map queue** *queue-id* {*cos1...cos8* | **threshold** *threshold-id cos1...cos8*}

**no mls qos srr-queue output cos-map**

## Syntax Description

<b>queue</b> <i>queue-id</i>	Specify a queue number. For <i>queue-id</i> , the range is 1 to 4.
<i>cos1...cos8</i>	Map CoS values to an egress queue. For <i>cos1...cos8</i> , enter up to eight values, and separate each value with a space. The range is 0 to 7.
<b>threshold</b> <i>threshold-id cos1...cos8</i>	Map CoS values to a queue threshold ID. For <i>threshold-id</i> , the range is 1 to 3. For <i>cos1...cos8</i> , enter up to eight values, and separate each value with a space. The range is 0 to 7.

## Defaults

Table 2-12 shows the default CoS output queue threshold map:

**Table 2-12 Default Cos Output Queue Threshold Map**

CoS Value	Queue ID–Threshold ID
0, 1	2–1
2, 3	3–1
4	4–1
5	1–1
6, 7	4–1

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.



**Usage Guidelines**

The drop-threshold percentage for threshold 3 is predefined. It is set to the queue-full state.

**Note**

The egress queue default settings are suitable for most situations. You should change them only when you have a thorough understanding of the egress queues and if these settings do not meet your quality of service (QoS) solution.

You can assign two weighted tail-drop (WTD) threshold percentages to an egress queue by using the **mls qos queue-set output *qset-id* threshold** global configuration command.

You can map each CoS value to a different queue and threshold combination, allowing the frame to follow different behavior.

**Examples**

This example shows how to map a port to queue-set 1. It maps CoS values 0 to 3 to egress queue 1 and to threshold ID 1. It configures the drop thresholds for queue 1 to 50 and 70 percent of the allocated memory, guarantees (reserves) 100 percent of the allocated memory, and configures 200 percent as the maximum memory that this queue can have before packets are dropped.

```
Switch(config)# mls qos srr-queue output cos-map queue 1 threshold 1 0 1 2 3
Switch(config)# mls qos queue-set output 1 threshold 1 50 70 100 200
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# queue-set 1
```

You can verify your settings by entering the **show mls qos maps**, the **show mls qos interface *[interface-id]* buffers**, or the **show mls qos queue-set** privileged EXEC command.

**Related Commands**

Command	Description
<b>mls qos srr-queue output dscp-map</b>	Maps Differentiated Services Code Point (DSCP) values to an egress queue or maps DSCP values to a queue and to a threshold ID.
<b>mls qos queue-set output threshold</b>	Configures the WTD thresholds, guarantees the availability of buffers, and configures the maximum memory allocation to a queue-set.
<b>queue-set</b>	Maps a port to a queue-set.
<b>show mls qos interface buffers</b>	Displays QoS information.
<b>show mls qos maps</b>	Displays QoS mapping information.
<b>show mls qos queue-set</b>	Displays egress queue settings for the queue-set.



# mls qos srr-queue output dscp-map

Use the **mls qos srr-queue output dscp-map** global configuration command to map Differentiated Services Code Point (DSCP) values to an egress or to map DSCP values to a queue and to a threshold ID. Use the **no** form of this command to return to the default setting.

**mls qos srr-queue output dscp-map queue** *queue-id* {*dscp1...dscp8* | **threshold** *threshold-id* *dscp1...dscp8*}

**no mls qos srr-queue output dscp-map**

Syntax Description	<b>queue</b> <i>queue-id</i>	Specify a queue number. For <i>queue-id</i> , the range is 1 to 4.
	<i>dscp1...dscp8</i>	Map DSCP values to an egress queue. For <i>dscp1...dscp8</i> , enter up to eight values, and separate each value with a space. The range is 0 to 63.
	<b>threshold</b> <i>threshold-id</i> <i>dscp1...dscp8</i>	Map DSCP values to a queue threshold ID. For <i>threshold-id</i> , the range is 1 to 3. For <i>dscp1...dscp8</i> , enter up to eight values, and separate each value with a space. The range is 0 to 63.

## Defaults

Table 2-13 shows the default DSCP output queue threshold map:

**Table 2-13 Default DSCP Output Queue Threshold Map**

DSCP Value	Queue ID–Threshold ID
0–15	2–1
16–31	3–1
32–39	4–1
40–47	1–1
48–63	4–1

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.



**Usage Guidelines**

The drop-threshold percentage for threshold 3 is predefined. It is set to the queue-full state.

**Note**

The egress queue default settings are suitable for most situations. You should change them only when you have a thorough understanding of the egress queues and if these settings do not meet your QoS solution.

You can assign two weighted tail-drop (WTD) threshold percentages to an egress queue by using the **mls qos queue-set output *qset-id* threshold** global configuration command.

You can map each DSCP value to a different queue and threshold combination, allowing the frame to follow different behavior.

You can map up to eight DSCP values per command.

**Examples**

This example shows how to map a port to queue-set 1. It maps DSCP values 0 to 3 to egress queue 1 and to threshold ID 1. It configures the drop thresholds for queue 1 to 50 and 70 percent of the allocated memory, guarantees (reserves) 100 percent of the allocated memory, and configures 200 percent as the maximum memory that this queue can have before packets are dropped.

```
Switch(config)# mls qos srr-queue output dscp-map queue 1 threshold 1 0 1 2 3
Switch(config)# mls qos queue-set output 1 threshold 1 50 70 100 200
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# queue-set 1
```

You can verify your settings by entering the **show mls qos maps**, the **show mls qos interface *[interface-id]* buffers**, or the **show mls qos queue-set** privileged EXEC command.

**Related Commands**

Command	Description
<b>mls qos srr-queue output cos-map</b>	Maps class of service (CoS) values to an egress queue or maps CoS values to a queue and to a threshold ID.
<b>mls qos queue-set output threshold</b>	Configures the WTD thresholds, guarantees the availability of buffers, and configures the maximum memory allocation to a queue-set.
<b>queue-set</b>	Maps a port to a queue-set.
<b>show mls qos interface buffers</b>	Displays quality of service (QoS) information.
<b>show mls qos maps</b>	Displays QoS mapping information.
<b>show mls qos queue-set</b>	Displays egress queue settings for the queue-set.



# mls qos trust

Use the **mls qos trust** interface configuration command to configure the port trust state. Ingress traffic can be trusted, and classification is performed by examining the packet Differentiated Services Code Point (DSCP), class of service (CoS), or IP-precedence field. Use the **no** form of this command to return a port to its untrusted state.

**mls qos trust** [**cos** | **device cisco-phone** | **dscp** | **ip-precedence**]

**no mls qos trust** [**cos** | **device** | **dscp** | **ip-precedence**]

Syntax Description	<b>cos</b>	(Optional) Classify an ingress packet by using the packet CoS value. For an untagged packet, use the port default CoS value.
	<b>device cisco-phone</b>	(Optional) Classify an ingress packet by trusting the CoS or DSCP value sent from the Cisco IP Phone (trusted boundary), depending on the trust setting.
	<b>dscp</b>	(Optional) Classify an ingress packet by using the packet DSCP value (most significant 6 bits of 8-bit service-type field). For a non-IP packet, the packet CoS is used if the packet is tagged. For an untagged packet, the default port CoS value is used.
	<b>ip-precedence</b>	(Optional) Classify an ingress packet by using the packet IP-precedence value (most significant 3 bits of 8-bit service-type field). For a non-IP packet, the packet CoS is used if the packet is tagged. For an untagged packet, the port default CoS value is used.

**Defaults** The port is not trusted. If no keyword is specified when the command is entered, the default is **dscp**.

**Command Modes** Interface configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines** Packets entering a quality of service (QoS) domain are classified at the edge of the domain. When the packets are classified at the edge, the switch port within the QoS domain can be configured to one of the trusted states because there is no need to classify the packets at every switch within the domain. Use this command to specify whether the port is trusted and which fields of the packet to use to classify traffic.

When a port is configured with trust DSCP or trust IP precedence and the incoming packet is a non-IP packet, the CoS-to-DSCP map is used to derive the corresponding DSCP value from the CoS value. The CoS can be the packet CoS for trunk ports or the port default CoS for nontrunk ports.

If the DSCP is trusted, the DSCP field of the IP packet is not modified. However, it is still possible that the CoS value of the packet is modified (according to DSCP-to-CoS map).

If the CoS is trusted, the CoS field of the packet is not modified, but the DSCP can be modified (according to CoS-to-DSCP map) if the packet is an IP packet.



The trusted boundary feature prevents security problems if users disconnect their PCs from networked Cisco IP Phones and connect them to the switch port to take advantage of trusted CoS or DSCP settings. You must globally enable the Cisco Discovery Protocol (CDP) on the switch and on the port connected to the IP phone. If the telephone is not detected, trusted boundary disables the trusted setting on the switch or routed port and prevents misuse of a high-priority queue.

If you configure the trust setting for DSCP or IP precedence, the DSCP or IP precedence values in the incoming packets are trusted. If you configure the **mls qos cos override** interface configuration command on the switch port connected to the IP phone, the switch overrides the CoS of the incoming voice and data packets and assigns the default CoS value to them.

For an inter-QoS domain boundary, you can configure the port to the DSCP-trusted state and apply the DSCP-to-DSCP-mutation map if the DSCP values are different between the QoS domains.

Classification using a port trust state (for example, **mls qos trust [cos | dscp | ip-precedence]** and a policy map (for example, **service-policy input policy-map-name**) are mutually exclusive. The last one configured overwrites the previous configuration.

### Examples

This example shows how to configure a port to trust the IP precedence field in the incoming packet:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# mls qos trust ip-precedence
```

This example shows how to specify that the Cisco IP Phone connected on a port is a trusted device:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# mls qos trust device cisco-phone
```

You can verify your settings by entering the **show mls qos interface** privileged EXEC command.

### Related Commands

Command	Description
<b>mls qos cos</b>	Defines the default CoS value of a port or assigns the default CoS to all incoming packets on the port.
<b>mls qos dscp-mutation</b>	Applies a DSCP-to DSCP-mutation map to a DSCP-trusted port.
<b>mls qos map</b>	Defines the CoS-to-DSCP map, DSCP-to-CoS map, the DSCP-to-DSCP-mutation map, the IP-precedence-to-DSCP map, and the policed-DSCP map.
<b>show mls qos interface</b>	Displays QoS information.



## monitor session

Use the **monitor session** global configuration command to start a new Switched Port Analyzer (SPAN) session or Remote SPAN (RSPAN) source or destination session, to enable ingress traffic on the destination port for a network security device (such as a Cisco IDS Sensor Appliance), to add or delete interfaces or VLANs to or from an existing SPAN or RSPAN session, and to limit (filter) SPAN source traffic to specific VLANs. Use the **no** form of this command to remove the SPAN or RSPAN session or to remove source or destination interfaces or filters from the SPAN or RSPAN session. For destination interfaces, the encapsulation options are ignored with the **no** form of the command.

**monitor session** *session\_number* **destination** {**interface** *interface-id* [, | -] [**encapsulation** {**dot1q** | **replicate**}] [**ingress** {**dot1q** **vlan** *vlan-id* | **untagged** **vlan** *vlan-id* | **vlan** *vlan-id*}] } | {**remote** **vlan** *vlan-id*}

**monitor session** *session\_number* **filter** **vlan** *vlan-id* [, | -]

**monitor session** *session\_number* **source** {**interface** *interface-id* [, | -] [**both** | **rx** | **tx**] } | {**vlan** *vlan-id* [, | -] [**both** | **rx** | **tx**] } | {**remote** **vlan** *vlan-id*}

**no monitor session** {*session\_number* | **all** | **local** | **remote**}

**no monitor session** *session\_number* **destination** {**interface** *interface-id* [, | -] [**encapsulation** {**dot1q** | **replicate**}] [**ingress** {**dot1q** **vlan** *vlan-id* | **untagged** **vlan** *vlan-id* | **vlan** *vlan-id*}] } | {**remote** **vlan** *vlan-id*}

**no monitor session** *session\_number* **filter** **vlan** *vlan-id* [, | -]

**no monitor session** *session\_number* **source** {**interface** *interface-id* [, | -] [**both** | **rx** | **tx**] } | {**vlan** *vlan-id* [, | -] [**both** | **rx** | **tx**] } | {**remote** **vlan** *vlan-id*}

### Syntax Description

<i>session_number</i>	Specify the session number identified with the SPAN or RSPAN session. The range is 1 to 66.
<b>destination</b>	Specify the SPAN or RSPAN destination. A destination must be a physical port.
<b>interface</b> <i>interface-id</i>	Specify the destination or source interface for a SPAN or RSPAN session. Valid interfaces are physical ports (including type and port number). For <b>source interface</b> , <b>port channel</b> is also a valid interface type, and the valid range is 1 to 6.
<b>encapsulation</b> <b>dot1q</b>	(Optional) Specify that the destination interface uses the IEEE 802.1Q encapsulation method.  These keywords are valid only for local SPAN. For RSPAN, the RSPAN VLAN ID overwrites the original VLAN ID; therefore packets are always sent untagged.
<b>encapsulation</b> <b>replicate</b>	(Optional) Specify that the destination interface replicates the source interface encapsulation method.  These keywords are valid only for local SPAN. For RSPAN, the RSPAN VLAN ID overwrites the original VLAN ID; therefore, packets are always sent untagged.
<b>ingress</b>	(Optional) Enable ingress traffic forwarding.



<b>dot1q vlan</b> <i>vlan-id</i>	Accept incoming packets with IEEE 802.1Q encapsulation with the specified VLAN as the default VLAN.
<b>untagged vlan</b> <i>vlan-id</i>	Accept incoming packets with untagged encapsulation with the specified VLAN as the default VLAN.
<b>vlan</b> <i>vlan-id</i>	When used with only the <b>ingress</b> keyword, set default VLAN for ingress traffic.
<b>remote vlan</b> <i>vlan-id</i>	Specify the remote VLAN for an RSPAN source or destination session. The range is 2 to 1001 and 1006 to 4094.  The RSPAN VLAN cannot be VLAN 1 (the default VLAN) or VLAN IDs 1002 to 1005 (reserved for Token Ring and FDDI VLANs).
,	(Optional) Specify a series of interfaces or VLANs, or separate a range of interfaces or VLANs from a previous range. Enter a space before and after the comma.
-	(Optional) Specify a range of interfaces or VLANs. Enter a space before and after the hyphen.
<b>filter vlan</b> <i>vlan-id</i>	Specify a list of VLANs as filters on trunk source ports to limit SPAN source traffic to specific VLANs. The <i>vlan-id</i> range is 1 to 4094.
<b>source</b>	Specify the SPAN or RSPAN source. A source can be a physical port, a port channel, or a VLAN.
<b>both, rx, tx</b>	(Optional) Specify the traffic direction to monitor. If you do not specify a traffic direction, the source interface sends both transmitted and received traffic.
<b>source vlan</b> <i>vlan-id</i>	Specify the SPAN source interface as a VLAN ID. The range is 1 to 4094.
<b>all, local, remote</b>	Specify <b>all</b> , <b>local</b> , or <b>remote</b> with the <b>no monitor session</b> command to clear all SPAN and RSPAN, all local SPAN, or all RSPAN sessions.

## Defaults

No monitor sessions are configured.

On a source interface, the default is to monitor both received and transmitted traffic.

On a trunk interface used as a source port, all VLANs are monitored.

If **encapsulation replicate** is not specified on a local SPAN destination port, packets are sent in native form with no encapsulation tag.

Ingress forwarding is disabled on destination ports.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.



**Usage Guidelines**

Traffic that enters or leaves source ports or source VLANs can be monitored by using SPAN or RSPAN. Traffic routed to source ports or source VLANs cannot be monitored.

You can set a combined maximum of two local SPAN sessions and RSPAN source sessions. You can have a total of 66 SPAN and RSPAN sessions on a switch.

You can have a maximum of 64 destination ports on a switch.

Each session can include multiple ingress or egress source ports or VLANs, but you cannot combine source ports and source VLANs in a single session. Each session can include multiple destination ports.

When you use VLAN-based SPAN (VSPAN) to analyze network traffic in a VLAN or set of VLANs, all active ports in the source VLANs become source ports for the SPAN or RSPAN session. Trunk ports are included as source ports for VSPAN, and only packets with the monitored VLAN ID are sent to the destination port.

You can monitor traffic on a single port or VLAN or on a series or range of ports or VLANs. You select a series or range of interfaces or VLANs by using the [, | -] options.

If you specify a series of VLANs or interfaces, you must enter a space before and after the comma. If you specify a range of VLANs or interfaces, you must enter a space before and after the hyphen (-).

EtherChannel ports cannot be configured as SPAN or RSPAN destination ports. A physical port that is a member of an EtherChannel group can be used as a destination port, but it cannot participate in the EtherChannel group while it is as a SPAN destination.

You can monitor individual ports while they participate in an EtherChannel, or you can monitor the entire EtherChannel bundle by specifying the **port-channel** number as the RSPAN source interface.

A port used as a destination port cannot be a SPAN or RSPAN source, nor can a port be a destination port for more than one session at a time.

You can enable IEEE 802.1x authentication on a port that is a SPAN or RSPAN destination port; however, IEEE 802.1x authentication is disabled until the port is removed as a SPAN destination. If IEEE 802.1x authentication is not available on the port, the switch returns an error message. You can enable IEEE 802.1x authentication on a SPAN or RSPAN source port.

VLAN filtering refers to analyzing network traffic on a selected set of VLANs on trunk source ports. By default, all VLANs are monitored on trunk source ports. You can use the **monitor session session\_number filter vlan vlan-id** command to limit SPAN traffic on trunk source ports to only the specified VLANs.

VLAN monitoring and VLAN filtering are mutually exclusive. If a VLAN is a source, VLAN filtering cannot be enabled. If VLAN filtering is configured, a VLAN cannot become a source.

If ingress traffic forwarding is enabled for a network security device, the destination port forwards traffic at Layer 2.

Destination ports can be configured to act in these ways:

- When you enter **monitor session session\_number destination interface interface-id** with no other keywords, egress encapsulation is untagged, and ingress forwarding is not enabled.
- When you enter **monitor session session\_number destination interface interface-id ingress**, egress encapsulation is untagged; ingress encapsulation depends on the keywords that follow—**dot1q** or **untagged**.
- When you enter **monitor session session\_number destination interface interface-id encapsulation dot1q** with no other keywords, egress encapsulation uses the IEEE 802.1Q encapsulation method. (This applies to local SPAN only; RSPAN does not support **encapsulation dot1q**.)



- When you enter **monitor session** *session\_number* **destination interface** *interface-id* **encapsulation dot1q ingress**, egress encapsulation uses the IEEE 802.1Q encapsulation method; ingress encapsulation depends on the keywords that follow—**dot1q** or **untagged**. (This applies to local SPAN only; RSPAN does not support **encapsulation dot1q**.)
- When you enter **monitor session** *session\_number* **destination interface** *interface-id* **encapsulation replicate** with no other keywords, egress encapsulation replicates the source interface encapsulation; ingress forwarding is not enabled. (This applies to local SPAN only; RSPAN does not support encapsulation replication.)
- When you enter **monitor session** *session\_number* **destination interface** *interface-id* **encapsulation replicate ingress**, egress encapsulation replicates the source interface encapsulation; ingress encapsulation depends on the keywords that follow—**dot1q** or **untagged**. (This applies to local SPAN only; RSPAN does not support encapsulation replication.)

## Examples

This example shows how to create a local SPAN session 1 to monitor both sent and received traffic on source port 1 to destination port 2:

```
Switch(config)# monitor session 1 source interface gigabitethernet0/1 both
Switch(config)# monitor session 1 destination interface gigabitethernet0/2
```

This example shows how to delete a destination port from an existing local SPAN session:

```
Switch(config)# no monitor session 2 destination gigabitethernet0/2
```

This example shows how to limit SPAN traffic in an existing session only to specific VLANs:

```
Switch(config)# monitor session 1 filter vlan 100 - 304
```

This example shows how to configure RSPAN source session 1 to monitor multiple source interfaces and to configure the destination RSPAN VLAN 900.

```
Switch(config)# monitor session 1 source interface gigabitethernet0/1
Switch(config)# monitor session 1 source interface port-channel 2 tx
Switch(config)# monitor session 1 destination remote vlan 900
Switch(config)# end
```

This example shows how to configure an RSPAN destination session 10 in the switch receiving the monitored traffic.

```
Switch(config)# monitor session 10 source remote vlan 900
Switch(config)# monitor session 10 destination interface gigabitethernet0/2
```

This example shows how to configure the destination port for ingress traffic on VLAN 5 by using a security device that supports IEEE 802.1Q encapsulation. Egress traffic replicates the source; ingress traffic uses IEEE 802.1Q encapsulation.

```
Switch(config)# monitor session 2 destination interface gigabitethernet0/2 encapsulation
replicate ingress dot1q vlan 5
```

This example shows how to configure the destination port for ingress traffic on VLAN 5 by using a security device that does not support encapsulation. Egress traffic replicates the source encapsulation; ingress traffic is untagged.

```
Switch(config)# monitor session 2 destination interface gigabitethernet0/2 encapsulation
replicate ingress untagged vlan 5
```

You can verify your settings by entering the **show monitor** privileged EXEC command. You can display SPAN and RSPAN configuration on the switch by entering the **show running-config** privileged EXEC command. SPAN information appears near the end of the output.



Related Commands	Command	Description
	<a href="#">remote-span</a>	Configures an RSPAN VLAN in vlan configuration mode.
	<a href="#">show monitor</a>	Displays SPAN and RSPAN session information.
	<b>show running-config</b>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



## mvr (global configuration)

Use the **mvr** global configuration command without keywords to enable the multicast VLAN registration (MVR) feature on the switch. Use the command with keywords to set the MVR mode for a switch, configure the MVR IP multicast address, set the maximum time to wait for a query reply before removing a port from group membership, and to specify the MVR multicast VLAN. Use the **no** form of this command to return to the default settings.

**mvr** [**group** *ip-address* [*count*]] | **mode** [**compatible** | **dynamic**] | **querytime** *value* | **vlan** *vlan-id*]

**no mvr** [**group** *ip-address* | **mode** [**compatible** | **dynamic**] | **querytime** *value* | **vlan** *vlan-id*]

Syntax Description	
<b>group</b> <i>ip-address</i>	Statically configure an MVR group IP multicast address on the switch. Use the <b>no</b> form of this command to remove a statically configured IP multicast address or contiguous addresses or, when no IP address is entered, to remove all statically configured MVR IP multicast addresses.
<i>count</i>	(Optional) Configure multiple contiguous MVR group addresses. The range is 1 to 256; the default is 1.
<b>mode</b>	(Optional) Specify the MVR mode of operation. The default is compatible mode.
<b>compatible</b>	Set MVR mode to provide compatibility with Catalyst 2900 XL and Catalyst 3500 XL switches. This mode does not allow dynamic membership joins on source ports.
<b>dynamic</b>	Set MVR mode to allow dynamic MVR membership on source ports.
<b>querytime</b> <i>value</i>	(Optional) Set the maximum time to wait for IGMP report memberships on a receiver port. This time applies only to receiver-port leave processing. When an IGMP query is sent from a receiver port, the switch waits for the default or configured MVR querytime for an IGMP group membership report before removing the port from multicast group membership. The value is the response time in units of tenths of a second. The range is 1 to 100; the default is 5 tenths or one-half second. Use the <b>no</b> form of the command to return to the default setting.
<b>vlan</b> <i>vlan-id</i>	(Optional) Specify the VLAN on which MVR multicast data is expected to be received. This is also the VLAN to which all the source ports belong. The range is 1 to 4094; the default is VLAN 1.

### Defaults

MVR is disabled by default.

The default MVR mode is compatible mode.

No IP multicast addresses are configured on the switch by default.

The default group ip address count is 0.

The default query response time is 5 tenths of or one-half second.

The default multicast VLAN for MVR is VLAN 1.



**Command Modes** Global configuration

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

A maximum of 256 MVR multicast groups can be configured on a switch.

Use the **mvr group** command to statically set up all the IP multicast addresses that will take part in MVR. Any multicast data sent to a configured multicast address is sent to all the source ports on the switch and to all receiver ports that have registered to receive data on that IP multicast address.

MVR supports aliased IP multicast addresses on the switch. However, if the switch is interoperating with Catalyst 3550 or Catalyst 3500 XL switches, you should not configure IP addresses that alias between themselves or with the reserved IP multicast addresses (in the range 224.0.0.xxx).

The **mvr querytime** command applies only to receiver ports.

If the switch MVR is interoperating with Catalyst 2900 XL or Catalyst 3500 XL switches, set the multicast mode to compatible.

When operating in compatible mode, MVR does not support IGMP dynamic joins on MVR source ports. MVR can coexist with IGMP snooping on a switch.

**Examples**

This example shows how to enable MVR:

```
Switch(config)# mvr
```

Use the **show mvr** privileged EXEC command to display the current setting for maximum multicast groups.

This example shows how to configure 228.1.23.4 as an IP multicast address:

```
Switch(config)# mvr group 228.1.23.4
```

This example shows how to configure ten contiguous IP multicast groups with multicast addresses from 228.1.23.1 to 228.1.23.10:

```
Switch(config)# mvr group 228.1.23.1 10
```

Use the **show mvr members** privileged EXEC command to display the IP multicast group addresses configured on the switch.

This example shows how to set the maximum query response time as one second (10 tenths):

```
Switch(config)# mvr querytime 10
```

This example shows how to set VLAN 2 as the multicast VLAN:

```
Switch(config)# mvr vlan 2
```

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



Related Commands	Command	Description
	<b>mvr (interface configuration)</b>	Configures MVR ports.
	<b>show mvr</b>	Displays MVR global parameters or port parameters.
	<b>show mvr interface</b>	Displays the configured MVR interfaces with their type, status, and Immediate Leave configuration. Also displays all MVR groups of which the interface is a member.
	<b>show mvr members</b>	Displays all ports that are members of an MVR multicast group; if the group has no members, its status is shown as Inactive.



## mvr (interface configuration)

Use the **mvr** interface configuration command to configure a Layer 2 port as a multicast VLAN registration (MVR) receiver or source port, to set the Immediate Leave feature, and to statically assign a port to an IP multicast VLAN and IP address. Use the **no** form of this command to return to the default settings.

**mvr** [**immediate** | **type** { **receiver** | **source** } | **vlan** *vlan-id* **group** [*ip-address*]]

**no mvr** [**immediate** | **type** { **source** | **receiver** } | **vlan** *vlan-id* **group** [*ip-address*]]

Syntax Description	<b>immediate</b>	(Optional) Enable the Immediate Leave feature of MVR on a port. Use the <b>no mvr immediate</b> command to disable the feature.
	<b>type</b>	(Optional) Configure the port as an MVR receiver port or a source port.  The default port type is neither an MVR source nor a receiver port. The <b>no mvr type</b> command resets the port as neither a source or a receiver port.
	<b>receiver</b>	Configure the port as a subscriber port that can only receive multicast data. Receiver ports cannot belong to the multicast VLAN.
	<b>source</b>	Configure the port as an uplink port that can send and receive multicast data for the configured multicast groups. All source ports on a switch belong to a single multicast VLAN.
	<b>vlan</b> <i>vlan-id</i> <b>group</b>	(Optional) Add the port as a static member of the multicast group with the specified VLAN ID.  The <b>no mvr vlan</b> <i>vlan-id</i> <b>group</b> command removes a port on a VLAN from membership in an IP multicast address group.
	<i>ip-address</i>	(Optional) Statically configure the specified MVR IP multicast group address for the specified multicast VLAN ID. This is the IP address of the multicast group that the port is joining.

### Defaults

A port is configured as neither a receiver nor a source.  
The Immediate Leave feature is disabled on all ports.  
No receiver port is a member of any configured multicast group.

### Command Modes

Interface configuration

### Command History

Release	Modification
12.2(25)FX	This command was introduced.



---

**Usage Guidelines**

Configure a port as a source port if that port should be able to both send and receive multicast data bound for the configured multicast groups. Multicast data is received on all ports configured as source ports.

Receiver ports cannot be trunk ports. Receiver ports on a switch can be in different VLANs, but should not belong to the multicast VLAN.

A port that is not taking part in MVR should not be configured as an MVR receiver port or a source port. A non-MVR port is a normal switch port, able to send and receive multicast data with normal switch behavior.

When Immediate Leave is enabled, a receiver port leaves a multicast group more quickly. Without Immediate Leave, when the switch receives an IGMP leave message from a group on a receiver port, it sends out an IGMP MAC-based query on that port and waits for IGMP group membership reports. If no reports are received in a configured time period, the receiver port is removed from multicast group membership. With Immediate Leave, an IGMP MAC-based query is not sent from the receiver port on which the IGMP leave was received. As soon as the leave message is received, the receiver port is removed from multicast group membership, which speeds up leave latency.

The Immediate Leave feature should be enabled only on receiver ports to which a single receiver device is connected.

The **mvr vlan group** command statically configures ports to receive multicast traffic sent to the IP multicast address. A port statically configured as a member of group remains a member of the group until statically removed. In compatible mode, this command applies only to receiver ports; in dynamic mode, it can also apply to source ports. Receiver ports can also dynamically join multicast groups by using IGMP join messages.

When operating in compatible mode, MVR does not support IGMP dynamic joins on MVR source ports.

---

**Examples**

This example shows how to configure a port as an MVR receiver port:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# mvr type receiver
```

Use the **show mvr interface** privileged EXEC command to display configured receiver ports and source ports.

This example shows how to enable Immediate Leave on a port:

```
Switch(config)# interface gigabitethernet0/1
Switch(config-if)# mvr immediate
```

This example shows how to add a port on VLAN 1 as a static member of IP multicast group 228.1.23.4:

```
Switch(config)# interface gigabitethernet0/2
Switch(config-if)# mvr vlan1 group 230.1.23.4
```

You can verify your settings by entering the **show mvr members** privileged EXEC command.



Related Commands	Command	Description
	<b>mvr (global configuration)</b>	Enables and configures multicast VLAN registration on the switch.
	<b>show mvr</b>	Displays MVR global parameters or port parameters.
	<b>show mvr interface</b>	Displays the configured MVR interfaces or displays the multicast groups to which a receiver port belongs. Also displays all MVR groups of which the interface is a member.
	<b>show mvr members</b>	Displays all receiver ports that are members of an MVR multicast group.



# pagp learn-method

Use the **pagp learn-method** interface configuration command to learn the source address of incoming packets received from an EtherChannel port. Use the **no** form of this command to return to the default setting.

**pagp learn-method { aggregation-port | physical-port }**

**no pagp learn-method**

## Syntax Description

<b>aggregation-port</b>	Specify address learning on the logical port-channel. The switch sends packets to the source using any of the ports in the EtherChannel. This setting is the default. With aggregate-port learning, it is not important on which physical port the packet arrives.
<b>physical-port</b>	Specify address learning on the physical port within the EtherChannel. The switch sends packets to the source using the same port in the EtherChannel from which it learned the source address. The other end of the channel uses the same port in the channel for a particular destination MAC or IP address.

## Defaults

The default is aggregation-port (logical port channel).

## Command Modes

Interface configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

The learn method must be configured the same at both ends of the link.



### Note

The Catalyst 2960 switch supports address learning only on aggregate ports even though the **physical-port** keyword is provided in the command-line interface (CLI). The **pagp learn-method** and the **pagp port-priority** interface configuration commands have no effect on the switch hardware, but they are required for PAgP interoperability with devices that only support address learning by physical ports, such as the Catalyst 1900 switch.

When the link partner to the Catalyst 2960 switch is a physical learner, we recommend that you configure the switch as a physical-port learner by using the **pagp learn-method physical-port** interface configuration command and to set the load-distribution method based on the source MAC address by using the **port-channel load-balance src-mac** global configuration command. Use the **pagp learn-method** interface configuration command only in this situation.



## Examples

This example shows how to set the learning method to learn the address on the physical port within the EtherChannel:

```
Switch(config-if)# pagp learn-method physical-port
```

This example shows how to set the learning method to learn the address on the port-channel within the EtherChannel:

```
Switch(config-if)# pagp learn-method aggregation-port
```

You can verify your settings by entering the **show running-config** privileged EXEC command or the **show pagp channel-group-number internal** privileged EXEC command.

## Related Commands

Command	Description
<a href="#">pagp port-priority</a>	Selects a port over which all traffic through the EtherChannel is sent.
<a href="#">show pagp</a>	Displays PAgP channel-group information.
<b>show running-config</b>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# pagp port-priority

Use the **pagp port-priority** interface configuration command to select a port over which all Port Aggregation Protocol (PAgP) traffic through the EtherChannel is sent. If all unused ports in the EtherChannel are in hot-standby mode, they can be placed into operation if the currently selected port and link fails. Use the **no** form of this command to return to the default setting.

**pagp port-priority** *priority*

**no pagp port-priority**

Syntax Description	<i>priority</i>	A priority number ranging from 0 to 255.
--------------------	-----------------	--

Defaults	The default is 128.
----------	---------------------

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	The physical port with the highest priority that is operational and has membership in the same EtherChannel is the one selected for PAgP transmission.
------------------	--



## Note

The Catalyst 2960 switch supports address learning only on aggregate ports even though the **physical-port** keyword is provided in the command-line interface (CLI). The **pagp learn-method** and the **pagp port-priority** interface configuration commands have no effect on the switch hardware, but they are required for PAgP interoperability with devices that only support address learning by physical ports, such as the Catalyst 1900 switch.

When the link partner to the Catalyst 2960 switch is a physical learner, we recommend that you configure the switch as a physical-port learner by using the **pagp learn-method physical-port** interface configuration command and to set the load-distribution method based on the source MAC address by using the **port-channel load-balance src-mac** global configuration command. Use the **pagp learn-method** interface configuration command only in this situation.

Examples	This example shows how to set the port priority to 200:
----------	---

```
Switch(config-if)# pagp port-priority 200
```

You can verify your setting by entering the **show running-config** privileged EXEC command or the **show pagp channel-group-number internal** privileged EXEC command.



Related Commands	Command	Description
	<a href="#">pagp learn-method</a>	Provides the ability to learn the source address of incoming packets.
	<a href="#">show pagp</a>	Displays PAgP channel-group information.
	<b>show running-config</b>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



## permit (MAC access-list configuration)

Use the **permit** MAC access-list configuration command to allow non-IP traffic to be forwarded if the conditions are matched. Use the **no** form of this command to remove a permit condition from the extended MAC access list.

```
{permit | deny} {any | host src-MAC-addr | src-MAC-addr mask} {any | host dst-MAC-addr | dst-MAC-addr mask} [type mask | cos cos | aarp | amber | dec-spanning | decnet-iv | diagnostic | dsm | etype-6000 | etype-8042 | lat | lavr-sca / lsap lsap mask | mop-console | mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp]
```

```
no {permit | deny} {any | host src-MAC-addr | src-MAC-addr mask} {any | host dst-MAC-addr | dst-MAC-addr mask} [type mask | cos cos | aarp | amber | dec-spanning | decnet-iv | diagnostic | dsm | etype-6000 | etype-8042 | lat | lavr-sca / lsap lsap mask | mop-console | mop-dump | msdos | mumps | netbios | vines-echo | vines-ip | xns-idp]
```



### Note

Though visible in the command-line help strings, **appletalk** is not supported as a matching condition.

### Syntax Description

<b>any</b>	Keyword to specify to deny any source or destination MAC address.
<b>host</b> <i>src-MAC-addr</i>   <i>src-MAC-addr mask</i>	Define a host MAC address and optional subnet mask. If the source address for a packet matches the defined address, non-IP traffic from that address is denied.
<b>host</b> <i>dst-MAC-addr</i>   <i>dst-MAC-addr mask</i>	Define a destination MAC address and optional subnet mask. If the destination address for a packet matches the defined address, non-IP traffic to that address is denied.
<i>type mask</i>	(Optional) Use the Ethertype number of a packet with Ethernet II or SNAP encapsulation to identify the protocol of the packet. <ul style="list-style-type: none"> <li><i>type</i> is 0 to 65535, specified in hexadecimal.</li> <li><i>mask</i> is a mask of <i>don't care</i> bits applied to the Ethertype before testing for a match.</li> </ul>
<b>aarp</b>	(Optional) Select Ethertype AppleTalk Address Resolution Protocol that maps a data-link address to a network address.
<b>amber</b>	(Optional) Select EtherType DEC-Amber.
<b>cos</b> <i>cos</i>	(Optional) Select an arbitrary class of service (CoS) number from 0 to 7 to set priority. Filtering on CoS can be performed only in hardware. A warning message appears if the <b>cos</b> option is configured.
<b>dec-spanning</b>	(Optional) Select EtherType Digital Equipment Corporation (DEC) spanning tree.
<b>decnet-iv</b>	(Optional) Select EtherType DECnet Phase IV protocol.
<b>diagnostic</b>	(Optional) Select EtherType DEC-Diagnostic.
<b>dsm</b>	(Optional) Select EtherType DEC-DSM.
<b>etype-6000</b>	(Optional) Select EtherType 0x6000.
<b>etype-8042</b>	(Optional) Select EtherType 0x8042.
<b>lat</b>	(Optional) Select EtherType DEC-LAT.
<b>lavr-sca</b>	(Optional) Select EtherType DEC-LAVC-SCA.



<b>lsap</b> <i>lsap-number mask</i>	(Optional) Use the LSAP number (0 to 65535) of a packet with 802.2 encapsulation to identify the protocol of the packet.  The <i>mask</i> is a mask of <i>don't care</i> bits applied to the LSAP number before testing for a match.
<b>mop-console</b>	(Optional) Select EtherType DEC-MOP Remote Console.
<b>mop-dump</b>	(Optional) Select EtherType DEC-MOP Dump.
<b>msdos</b>	(Optional) Select EtherType DEC-MSDOS.
<b>mumps</b>	(Optional) Select EtherType DEC-MUMPS.
<b>netbios</b>	(Optional) Select EtherType DEC- Network Basic Input/Output System (NETBIOS).
<b>vines-echo</b>	(Optional) Select EtherType Virtual Integrated Network Service (VINES) Echo from Banyan Systems.
<b>vines-ip</b>	(Optional) Select EtherType VINES IP.
<b>xns-idp</b>	(Optional) Select EtherType Xerox Network Systems (XNS) protocol suite.

To filter IPX traffic, you use the *type mask* or **lsap** *lsap mask* keywords, depending on the type of IPX encapsulation being used. Filter criteria for IPX encapsulation types as specified in Novell terminology and Cisco IOS terminology are listed in [Table 2-14](#).

**Table 2-14** IPX Filtering Criteria

IPX Encapsulation Type		Filter Criterion
Cisco IOS Name	Novell Name	
arpa	Ethernet II	Ethertype 0x8137
snap	Ethernet-snap	Ethertype 0x8137
sap	Ethernet 802.2	LSAP 0xE0E0
novell-ether	Ethernet 802.3	LSAP 0xFFFF

## Defaults

This command has no defaults. However, the default action for a MAC-named ACL is to deny.

## Command Modes

MAC access-list configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

You enter MAC access-list configuration mode by using the **mac access-list extended** global configuration command.

If you use the **host** keyword, you cannot enter an address mask; if you do not use the **any** or **host** keywords, you must enter an address mask.



After an access control entry (ACE) is added to an access control list, an implied **deny-any-any** condition exists at the end of the list. That is, if there are no matches, the packets are denied. However, before the first ACE is added, the list permits all packets.

For more information about MAC-named extended access lists, see the software configuration guide for this release.

---

### Examples

This example shows how to define the MAC-named extended access list to allow NETBIOS traffic from any source to MAC address 00c0.00a0.03fa. Traffic matching this list is allowed.

```
Switch(config-ext-macl)# permit any host 00c0.00a0.03fa netbios
```

This example shows how to remove the permit condition from the MAC-named extended access list:

```
Switch(config-ext-macl)# no permit any 00c0.00a0.03fa 0000.0000.0000 netbios
```

This example permits all packets with Ethertype 0x4321:

```
Switch(config-ext-macl)# permit any any 0x4321 0
```

You can verify your settings by entering the **show access-lists** privileged EXEC command.

---

### Related Commands

Command	Description
<a href="#">deny (MAC access-list configuration)</a>	Denies non-IP traffic to be forwarded if conditions are matched.
<a href="#">mac access-list extended</a>	Creates an access list based on MAC addresses for non-IP traffic.
<a href="#">show access-lists</a>	Displays access control lists configured on a switch.



# police

Use the **police** policy-map class configuration command to define a policer for classified traffic. A policer defines a maximum permissible rate of transmission, a maximum burst size for transmissions, and an action to take if either maximum is exceeded. Use the **no** form of this command to remove an existing policer.

**police** *rate-bps burst-byte* [**exceed-action** {**drop** | **policed-dscp-transmit**}]

**no police** *rate-bps burst-byte* [**exceed-action** {**drop** | **policed-dscp-transmit**}]

Syntax Description	<i>rate-bps</i>	Specify the average traffic rate in bits per second (b/s). The range is 1000000 to 1000000000.
	<i>burst-byte</i>	Specify the normal burst size in bytes. The range is 8000 to 1000000.
	<b>exceed-action drop</b>	(Optional) When the specified rate is exceeded, specify that the switch drop the packet.
	<b>exceed-action policed-dscp-transmit</b>	(Optional) When the specified rate is exceeded, specify that the switch changes the Differentiated Services Code Point (DSCP) of the packet to that specified in the policed-DSCP map and then sends the packet.

**Defaults** No policers are defined.

**Command Modes** Policy-map class configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines**

When configuring hierarchical policy maps, you can only use the **police** policy-map command in a secondary interface-level policy map.

The port ASIC device, which controls more than one physical port, supports 256 policers (255 user-configurable policers plus 1 policer reserved for internal use). The maximum number of user-configurable policers supported per port is 63. Policers are allocated on demand by the software and are constrained by the hardware and ASIC boundaries. You cannot reserve policers per port. There is no guarantee that a port will be assigned to any policer.

To return to policy-map configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.



Policing uses a token-bucket algorithm. You configure the bucket depth (the maximum burst that is tolerated before the bucket overflows) by using the *burst-byte* option of the **police** policy-map class configuration command or the **mls qos aggregate-policer** global configuration command. You configure how quickly (the average rate) the tokens are removed from the bucket by using the *rate-bps* option of the **police** policy-map class configuration command or the **mls qos aggregate-policer** global configuration command. For more information, see the software configuration guide for this release.

### Examples

This example shows how to configure a policer that drops packets if traffic exceeds 1 Mb/s average rate with a burst size of 20 KB. The DSCPs of incoming packets are trusted, and there is no packet modification.

```
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 drop
Switch(config-pmap-c)# exit
```

This example shows how to configure a policer, which marks down the DSCP values with the values defined in policed-DSCP map and sends the packet:

```
Switch(config)# policy-map policy2
Switch(config-pmap)# class class2
Switch(config-pmap-c)# police 1000000 20000 exceed-action policed-dscp-transmit
Switch(config-pmap-c)# exit
```

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

### Related Commands

Command	Description
<b>class</b>	Defines a traffic classification match criteria (through the <b>police</b> , <b>set</b> , and <b>trust</b> policy-map class configuration commands) for the specified class-map name.
<b>mls qos map policed-dscp</b>	Applies a policed-DSCP map to a DSCP-trusted port.
<b>policy-map</b>	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy.
<b>set</b>	Classifies IP traffic by setting a DSCP or IP-precedence value in the packet.
<b>show policy-map</b>	Displays quality of service (QoS) policy maps.
<b>trust</b>	Defines a trust state for traffic classified through the <b>class</b> policy-map configuration or the <b>class-map</b> global configuration command.



# police aggregate

Use the **police aggregate** policy-map class configuration command to apply an aggregate policer to multiple classes in the same policy map. A policer defines a maximum permissible rate of transmission, a maximum burst size for transmissions, and an action to take if either maximum is exceeded. Use the **no** form of this command to remove the specified policer.

**police aggregate** *aggregate-policer-name*

**no police aggregate** *aggregate-policer-name*

Syntax Description	<i>aggregate-policer-name</i> Name of the aggregate policer.	
Defaults	No aggregate policers are defined.	
Command Modes	Policy-map class configuration	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.
Usage Guidelines	The port ASIC device, which controls more than one physical port, supports 256 policers (255 user-configurable policers plus 1 policer reserved for internal use). The maximum number of user-configurable policers supported per port is 63. Policers are allocated on demand by the software and are constrained by the hardware and ASIC boundaries. You cannot reserve policers per port. There is no guarantee that a port will be assigned to any policer.	
	You set aggregate policer parameters by using the <b>mls qos aggregate-policer</b> global configuration command. You apply an aggregate policer to multiple classes in the same policy map; you cannot use an aggregate policer across different policy maps.	
	To return to policy-map configuration mode, use the <b>exit</b> command. To return to privileged EXEC mode, use the <b>end</b> command.	
	You cannot configure aggregate policers in hierarchical policy maps.	



## Examples

This example shows how to define the aggregate policer parameters and to apply the policer to multiple classes in a policy map:

```
Switch(config)# mls qos aggregate-policer agg_policer1 1000000 8000 exceed-action drop
Switch(config)# policy-map policy2
Switch(config-pmap)# class class1
Switch(config-pmap-c)# police aggregate agg_policer1
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class2
Switch(config-pmap-c)# set dscp 10
Switch(config-pmap-c)# police aggregate agg_policer1
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class3
Switch(config-pmap-c)# trust dscp
Switch(config-pmap-c)# police aggregate agg_policer2
Switch(config-pmap-c)# exit
```

You can verify your settings by entering the **show mls qos aggregate-policer** privileged EXEC command.

## Related Commands

Command	Description
<b>mls qos aggregate-policer</b>	Defines policer parameters, which can be shared by multiple classes within a policy map.
<b>show mls qos aggregate-policer</b>	Displays the quality of service (QoS) aggregate policer configuration.



# policy-map

Use the **policy-map** global configuration command to create or modify a policy map that can be attached to multiple physical ports and to enter policy-map configuration mode. Use the **no** form of this command to delete an existing policy map and to return to global configuration mode.

**policy-map** *policy-map-name*

**no policy-map** *policy-map-name*

## Syntax Description

<i>policy-map-name</i>	Name of the policy map.
------------------------	-------------------------

## Defaults

No policy maps are defined.

The default behavior is to set the Differentiated Services Code Point (DSCP) to 0 if the packet is an IP packet and to set the class of service (CoS) to 0 if the packet is tagged. No policing is performed.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)FX	This command was introduced.

## Usage Guidelines

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

- **class**: defines the classification match criteria for the specified class map. 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.
- **rename**: renames the current policy map.

To return to global configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

Before configuring policies for classes whose match criteria are defined in a class map, use the **policy-map** command to specify the name of the policy map to be created, added to, or modified. Entering the **policy-map** command also enables the policy-map configuration mode in which you can configure or modify the class policies for that policy map.

You can configure class policies in a policy map only if the classes have match criteria defined for them. To configure the match criteria for a class, use the **class-map** global configuration and **match** class-map configuration commands. You define packet classification on a physical-port basis.

Only one policy map per ingress port is supported. You can apply the same policy map to multiple physical ports.



## Examples

This example shows how to create a policy map called *policy1*. When attached to the ingress port, it matches all the incoming traffic defined in *class1*, sets the IP DSCP to 10, and polices the traffic at an average rate of 1 Mb/s and bursts at 20 KB. Traffic exceeding the profile is marked down to a DSCP value gotten from the policed-DSCP map and then sent.

```
Switch(config)# policy-map policy1
Switch(config-pmap)# class class1
Switch(config-pmap-c)# set dscp 10
Switch(config-pmap-c)# police 1000000 20000 exceed-action policed-dscp-transmit
Switch(config-pmap-c)# exit
```

This example shows how to configure multiple classes in a policy map called *polycymap2*:

```
Switch(config)# policy-map polycymap2
Switch(config-pmap)# class class1
Switch(config-pmap-c)# set dscp 10
Switch(config-pmap-c)# police 1000000 20000 exceed-action policed-dscp-transmit
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class2
Switch(config-pmap-c)# trust dscp
Switch(config-pmap-c)# police 1000000 20000 exceed-action drop
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class3
Switch(config-pmap-c)# set dscp 0 (no policer)
Switch(config-pmap-c)# exit
```

This example shows how to delete *polycymap2*:

```
Switch(config)# no policy-map polycymap2
```

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

## Related Commands

Command	Description
<b>class</b>	Defines a traffic classification match criteria (through the <b>police</b> , <b>set</b> , and <b>trust</b> policy-map class configuration command) for the specified class-map name.
<b>class-map</b>	Creates a class map to be used for matching packets to the class whose name you specify.
<b>service-policy</b>	Applies a policy map to a port.
<b>show policy-map</b>	Displays QoS policy maps.



# port-channel load-balance

Use the **port-channel load-balance** global configuration command to set the load-distribution method among the ports in the EtherChannel. Use the **no** form of this command to return to the default setting.

**port-channel load-balance { dst-ip | dst-mac | src-dst-ip | src-dst-mac | src-ip | src-mac }**

**no port-channel load-balance**

Syntax Description	<b>dst-ip</b>	Load distribution is based on the destination host IP address.
	<b>dst-mac</b>	Load distribution is based on the destination host MAC address. Packets to the same destination are sent on the same port, but packets to different destinations are sent on different ports in the channel.
	<b>src-dst-ip</b>	Load distribution is based on the source and destination host IP address.
	<b>src-dst-mac</b>	Load distribution is based on the source and destination host MAC address.
	<b>src-ip</b>	Load distribution is based on the source host IP address.
	<b>src-mac</b>	Load distribution is based on the source MAC address. Packets from different hosts use different ports in the channel, but packets from the same host use the same port.

**Defaults** The default is **src-mac**.

**Command Modes** Global configuration

Command History	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

**Usage Guidelines** For information about when to use these forwarding methods, see the “Configuring EtherChannels” chapter in the software configuration guide for this release.

**Examples** This example shows how to set the load-distribution method to **dst-mac**:

```
Switch(config)# port-channel load-balance dst-mac
```

You can verify your setting by entering the **show running-config** privileged EXEC command or the **show etherchannel load-balance** privileged EXEC command.



Related Commands	Command	Description
	<a href="#">interface port-channel</a>	Accesses or creates the port channel.
	<a href="#">show etherchannel</a>	Displays EtherChannel information for a channel.
	<a href="#">show running-config</a>	Displays the current operating configuration. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# priority-queue

Use the **priority-queue** interface configuration command to enable the egress expedite queue on a port. Use the **no** form of this command to return to the default setting.

**priority-queue out**

**no priority-queue out**

Syntax Description	<b>out</b> Enable the egress expedite queue.
--------------------	--

Defaults	The egress expedite queue is disabled.
----------	--

Command Modes	Interface configuration
---------------	-------------------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

Usage Guidelines	<p>When you configure the <b>priority-queue out</b> command, the shaped round robin (SRR) weight ratios are affected because there is one fewer queue participating in SRR. This means that <i>weight1</i> in the <b>srr-queue bandwidth shape</b> or the <b>srr-queue bandwidth share</b> interface configuration command is ignored (not used in the ratio calculation). The expedite queue is a priority queue, and it is serviced until empty before the other queues are serviced.</p>
------------------	---

Follow these guidelines when the expedite queue is enabled or the egress queues are serviced based on their SRR weights:

- If the egress expedite queue is enabled, it overrides the SRR shaped and shared weights for queue 1.
- If the egress expedite queue is disabled and the SRR shaped and shared weights are configured, the shaped mode overrides the shared mode for queue 1, and SRR services this queue in shaped mode.
- If the egress expedite queue is disabled and the SRR shaped weights are not configured, SRR services the queue in shared mode.

Examples	<p>This example shows how to enable the egress expedite queue when the SRR weights are configured. The egress expedite queue overrides the configured SRR weights.</p>
----------	--

```
Switch(config)# interface gigabitethernet0/2
Switch(config-if)# srr-queue bandwidth shape 25 0 0 0
Switch(config-if)# srr-queue bandwidth share 30 20 25 25
Switch(config-if)# priority-queue out
```



This example shows how to disable the egress expedite queue after the SRR shaped and shared weights are configured. The shaped mode overrides the shared mode.

```
Switch(config)# interface gigabitethernet0/2
Switch(config-if)# srr-queue bandwidth shape 25 0 0 0
Switch(config-if)# srr-queue bandwidth share 30 20 25 25
Switch(config-if)# no priority-queue out
```

You can verify your settings by entering the **show mls qos interface *interface-id* queueing** or the **show running-config** privileged EXEC command.

Related Commands	Command	Description
	<b>show mls qos interface queueing</b>	Displays the queueing strategy (SRR, priority queueing), the weights corresponding to the queues, and the CoS-to-egress-queue map.
	<b>srr-queue bandwidth shape</b>	Assigns the shaped weights and enables bandwidth shaping on the four egress queues mapped to a port.
	<b>srr-queue bandwidth share</b>	Assigns the shared weights and enables bandwidth sharing on the four egress queues mapped to a port.



# queue-set

Use the **queue-set** interface configuration command to map a port to a queue-set. Use the **no** form of this command to return to the default setting.

**queue-set** *qset-id*

**no queue-set** *qset-id*

Syntax Description	<i>qset-id</i> ID of the queue-set. Each port belongs to a queue-set, which defines all the characteristics of the four egress queues per port. The range is 1 to 2.	
Defaults	The queue-set ID is 1.	
Command Modes	Interface configuration	
Command History	Release	Modification
	12.2(25)FX	This command was introduced.
Examples	<p>This example shows how to map a port to queue-set 2:</p> <pre>Switch(config)# interface gigabitethernet0/1 Switch(config-if)# queue-set 2</pre> <p>You can verify your settings by entering the <b>show mls qos interface</b> <i>[interface-id]</i> <b>buffers</b> privileged EXEC command.</p>	
Related Commands	Command	Description
	<b>mls qos queue-set output buffers</b>	Allocates buffers to a queue-set.
	<b>mls qos queue-set output threshold</b>	Configures the weighted tail-drop (WTD) thresholds, guarantees the availability of buffers, and configures the maximum memory allocation to a queue-set.
	<b>show mls qos interface buffers</b>	Displays quality of service (QoS) information.



# radius-server dead-criteria

Use the **radius-server dead-criteria** global configuration command to configure the conditions that determine when a RADIUS server is considered unavailable or *dead*. Use the **no** form of this command to return to the default settings.

**radius-server dead-criteria** [*time seconds* [*tries number*] | *tries number*]

**no radius-server dead-criteria** [*time seconds* [*tries number*] | *tries number*]

## Syntax Description

<b>time seconds</b>	(Optional) Set the time in seconds during which the switch does not need to get a valid response from the RADIUS server. The range is from 1 to 120 seconds.
<b>tries number</b>	(Optional) Set the number of times that the switch does not get a valid response from the RADIUS server before the server is considered unavailable. The range is from 1 to 100.

## Defaults

The switch dynamically determines the *seconds* value that is from 10 to 60 seconds.

The switch dynamically determines the *tries* value that is from 10 to 100.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)SEE	This command was introduced.

## Usage Guidelines

We recommend that you configure the *seconds* and *number* parameters as follows:

- Use the **radius-server timeout seconds** global configuration command to specify the time in seconds during which the switch waits for a RADIUS server to respond before the IEEE 802.1x authentication times out. The switch dynamically determines the default *seconds* value that is from 10 to 60 seconds.
- Use the **radius-server retransmit retries** global configuration command to specify the number of times the switch tries to reach the radius servers before considering the servers to be unavailable. The switch dynamically determines the default *tries* value that is from 10 to 100.
- The *seconds* parameter is less than or equal to the number of retransmission attempts times the time in seconds before the IEEE 802.1x authentication times out.
- The *tries* parameter should be the same as the number of retransmission attempts.

## Examples

This example shows how to configure 60 as the **time** and 10 as the number of **tries**, the conditions that determine when a RADIUS server is considered unavailable

```
Switch(config)# radius-server dead-criteria time 60 tries 10
```

You can verify your settings by entering the **show running-config** privileged EXEC command.



Related Commands	Command	Description
	<b>dot1x critical (global configuration)</b>	Configures the parameters for the inaccessible authentication bypass feature.
	<b>dot1x critical (interface configuration)</b>	Enables the inaccessible authentication bypass feature on an interface and configures the access VLAN to which the switch assigns the critical port when the port is in the critical-authentication state.
	<b>radius-server retransmit</b> <i>retries</i>	Specifies the number of times that the switch tries to reach the RADIUS servers before considering the servers to be unavailable. For syntax information, select <b>Cisco IOS Security Command Reference, Release 12.2 &gt; Server Security Protocols &gt; RADIUS Commands</b> .
	<b>radius-server timeout</b> <i>seconds</i>	Specifies the time in seconds during which the switch waits for a RADIUS server to respond before the IEEE 802.1x authentication times out. For syntax information, select <b>Cisco IOS Security Command Reference, Release 12.2 &gt; Server Security Protocols &gt; RADIUS Commands</b> .
	<b>show running-config</b>	Displays the running configuration on the switch. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# radius-server host

Use the **radius-server host** global configuration command to configure the RADIUS server parameters, including the RADIUS accounting and authentication. Use the **no** form of this command to return to the default settings.

**radius-server host** *ip-address* [**acct-port** *udp-port*] [**auth-port** *udp-port*] [**test username** *name* [**idle-time** *time*] [**ignore-acct-port**] [**ignore-auth-port**]] [**key** *string*]

**no radius-server host** *ip-address*

Syntax Description	
<i>ip-address</i>	Specify the IP address of the RADIUS server.
<b>acct-port</b> <i>udp-port</i>	(Optional) Specify the UDP port for the RADIUS accounting server. The range is from 0 to 65536.
<b>auth-port</b> <i>udp-port</i>	(Optional) Specify the UDP port for the RADIUS authentication server. The range is from 0 to 65536.
<b>test username</b> <i>name</i>	(Optional) Enable automatic server testing of the RADIUS server status, and specify the username to be used.
<b>idle-time</b> <i>time</i>	(Optional) Set the interval of time in minutes after which the switch sends test packets to the server. The range is from 1 to 35791 minutes.
<b>ignore-acct-port</b>	(Optional) Disables testing on the RADIUS-server accounting port.
<b>ignore-auth-port</b>	(Optional) Disables testing on the RADIUS-server authentication port.
<b>key</b> <i>string</i>	(Optional) Specify the authentication and encryption key for all RADIUS communication between the switch and the RADIUS daemon. The key is a text string that must match the encryption key used on the RADIUS server. Always configure the key as the last item in this command. Leading spaces are ignored, but spaces within and at the end of the key are used. If there are spaces in your key, do not enclose the key in quotation marks unless the quotation marks are part of the key.

## Defaults

The UDP port for the RADIUS accounting server is 1646.

The UDP port for the RADIUS authentication server is 1645.

Automatic server testing is disabled.

The idle time is 60 minutes (1 hour).

When the automatic testing is enabled, testing occurs on the accounting and authentication UDP ports.

The authentication and encryption key (*string*) is not configured.

## Command Modes

Global configuration

## Command History

Release	Modification
12.2(25)SEE	This command was introduced.



**Usage Guidelines**

We recommend that you configure the UDP port for the RADIUS accounting server and the UDP port for the RADIUS authentication server to nondefault values.

Use the **test username** *name* keywords to enable automatic server testing of the RADIUS server status and to specify the username to be used.

You can configure the authentication and encryption key by using the **radius-server host** *ip-address* **key** *string* or the **radius-server key** {**0** *string* | **7** *string* | *string*} global configuration command. Always configure the key as the last item in this command.

**Examples**

This example shows how to configure 1500 as the UDP port for the accounting server and 1510 as the UDP port for the authentication server:

```
Switch(config)# radius-server host 1.1.1.1 acct-port 1500 auth-port 1510
```

This example shows how to configure the UDP port for the accounting server and the authentication server, enable automated testing of the RADIUS server status, specify the username to be used, and configure a key string:

```
Switch(config)# radius-server host 1.1.1.2 acct-port 800 auth-port 900 test username  
aaafail idle-time 75 key abc123
```

You can verify your settings by entering the **show running-config** privileged EXEC command.

**Related Commands**

Command	Description
<a href="#">dot1x critical (global configuration)</a>	Configures the parameters for the inaccessible authentication bypass feature.
<a href="#">dot1x critical (interface configuration)</a>	Enables the inaccessible authentication bypass feature on an interface and configures the access VLAN to which the switch assigns the critical port when the port is in the critical-authentication state.
<b>radius-server key</b> { <b>0</b> <i>string</i>   <b>7</b> <i>string</i>   <i>string</i> }	Sets the authentication and encryption key for all RADIUS communications between the router and the RADIUS daemon. For syntax information, select <b>Cisco IOS Security Command Reference, Release 12.2 &gt; Server Security Protocols &gt; RADIUS Commands</b> .
<b>show running-config</b>	Displays the running configuration on the switch. For syntax information, select <b>Cisco IOS Configuration Fundamentals Command Reference, Release 12.2 &gt; File Management Commands &gt; Configuration File Management Commands</b> .



# rcommand

Use the **rcommand** user EXEC command to start a Telnet session and to execute commands on a cluster member switch from the cluster command switch. To end the session, enter the **exit** command.

**rcommand** { *n* | **commander** | **mac-address** *hw-addr* }

Syntax Description	<i>n</i>	Provide the number that identifies a cluster member. The range is 0 to 15.
	<b>commander</b>	Provide access to the cluster command switch from a cluster member switch.
	<b>mac-address</b> <i>hw-addr</i>	MAC address of the cluster member switch.

Command Modes	User EXEC
---------------	-----------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.

**Usage Guidelines** This command is available only on the cluster command switch.

If the switch is the cluster command switch but the cluster member switch *n* does not exist, an error message appears. To get the switch number, enter the **show cluster members** privileged EXEC command on the cluster command switch.

You can use this command to access a cluster member switch from the cluster command-switch prompt or to access a cluster command switch from the member-switch prompt.

For Catalyst 2900 XL, 3500 XL, 2950, 2960, 2970, 3550, 3560, and 3750 switches, the Telnet session accesses the member-switch command-line interface (CLI) at the same privilege level as on the cluster command switch. For example, if you execute this command at user level on the cluster command switch, the cluster member switch is accessed at user level. If you use this command on the cluster command switch at privileged level, the command accesses the remote device at privileged level. If you use an intermediate enable-level lower than *privileged*, access to the cluster member switch is at user level.

For Catalyst 1900 and 2820 switches running standard edition software, the Telnet session accesses the menu console (the menu-driven interface) if the cluster command switch is at privilege level 15. If the cluster command switch is at privilege level 1, you are prompted for the password before being able to access the menu console. Cluster command switch privilege levels map to the cluster member switches running standard edition software as follows:

- If the cluster command switch privilege level is from 1 to 14, the cluster member switch is accessed at privilege level 1.
- If the cluster command switch privilege level is 15, the cluster member switch is accessed at privilege level 15.

The Catalyst 1900 and 2820 CLI is available only on switches running Enterprise Edition Software.



This command will not work if the vty lines of the cluster command switch have access-class configurations.

You are not prompted for a password because the cluster member switches inherited the password of the cluster command switch when they joined the cluster.

---

### Examples

This example shows how to start a session with member 3. All subsequent commands are directed to member 3 until you enter the **exit** command or close the session.

```
Switch# rcommand 3
Switch-3# show version
Cisco Internet Operating System Software ...
...
Switch-3# exit
Switch#
```

---

### Related Commands

Command	Description
<a href="#">show cluster members</a>	Displays information about the cluster members.



# remote-span

Use the **remote-span** VLAN configuration command to configure a VLAN as a Remote Switched Port Analyzer (RSPAN) VLAN. Use the **no** form of this command to remove the RSPAN designation from the VLAN.

**remote-span**

**no remote-span**

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

<b>Defaults</b>	No RSPAN VLANs are defined.
-----------------	-----------------------------

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

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.2(25)FX	This command was introduced.

<b>Usage Guidelines</b>	You can configure RSPAN VLANs only in config-VLAN mode (entered by using the <b>vlan</b> global configuration command), not the VLAN configuration mode entered by using the <b>vlan database</b> privileged EXEC command.
	If VLAN Trunking Protocol (VTP) is enabled, the RSPAN feature is propagated by VTP for VLAN-IDs that are lower than 1005. If the RSPAN VLAN ID is in the extended range, you must manually configure intermediate switches (those in the RSPAN VLAN between the source switch and the destination switch).
	Before you configure the RSPAN <b>remote-span</b> command, use the <b>vlan</b> (global configuration) command to create the VLAN.
	The RSPAN VLAN has these characteristics: <ul style="list-style-type: none"><li>• No MAC address learning occurs on it.</li><li>• RSPAN VLAN traffic flows only on trunk ports.</li><li>• Spanning Tree Protocol (STP) can run in the RSPAN VLAN, but it does not run on RSPAN destination ports.</li></ul>
When an existing VLAN is configured as an RSPAN VLAN, the VLAN is first deleted and then recreated as an RSPAN VLAN. Any access ports are made inactive until the RSPAN feature is disabled.	



## Examples

This example shows how to configure a VLAN as an RSPAN VLAN.

```
Switch(config)# vlan 901  
Switch(config-vlan)# remote-span
```

This example shows how to remove the RSPAN feature from a VLAN.

```
Switch(config)# vlan 901  
Switch(config-vlan)# no remote-span
```

You can verify your settings by entering the **show vlan remote-span** user EXEC command.

## Related Commands

Command	Description
<a href="#">monitor session</a>	Enables Switched Port Analyzer (SPAN) and RSPAN monitoring on a port and configures a port as a source or destination port.
<a href="#">vlan (global configuration)</a>	Changes to config-vlan mode where you can configure VLANs 1 to 4094.



# renew ip dhcp snooping database

Use the **renew ip dhcp snooping database** privileged EXEC command to renew the DHCP snooping binding database.

```
renew ip dhcp snooping database [{ flash:/filename | ftp://user:password@host/filename |  
nvramp:/filename | rnp://user@host/filename | tftp://host/filename }] [validation none]
```

Syntax Description		
	<b>flash:/filename</b>	(Optional) Specify that the database agent or the binding file is in the flash memory.
	<b>ftp://user:password@host/filename</b>	(Optional) Specify that the database agent or the binding file is on an FTP server.
	<b>nvramp:/filename</b>	(Optional) Specify that the database agent or the binding file is in the NVRAM.
	<b>rnp://user@host/filename</b>	(Optional) Specify that the database agent or the binding file is on a Remote Control Protocol (RCP) server.
	<b>tftp://host/filename</b>	(Optional) Specify that the database agent or the binding file is on a TFTP server.
	<b>validation none</b>	(Optional) Specify that the switch does not verify the cyclic redundancy check (CRC) for the entries in the binding file specified by the URL.

Defaults	No default is defined.
----------	------------------------

Command Modes	Privileged EXEC
---------------	-----------------

Command History	Release	Modification
	12.2(25)FX	This command was introduced.


Usage Guidelines	If you do not specify a URL, the switch tries to read the file from the configured URL.
------------------	---

Examples	This example shows how to renew the DHCP snooping binding database without checking CRC values in the file:
----------	---

```
Switch# renew ip dhcp snooping database validation none
```

You can verify your settings by entering the **show ip dhcp snooping database** privileged EXEC command.



 renew ip dhcp snooping database

Related Commands	Command	Description
	<a href="#">ip dhcp snooping</a>	Enables DHCP snooping on a VLAN.
	<a href="#">ip dhcp snooping binding</a>	Configures the DHCP snooping binding database.
	<a href="#">show ip dhcp snooping database</a>	Displays the status of the DHCP snooping database agent.