interface

To select an interface to configure and to enter interface configuration mode, use the **interface** command.

interface *type number*

Syntax Description

type	Type of interface to be configured; see Table 2-6 for valid values.
number	Module and port number.

Defaults

No interface types are configured.

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(25)EW	Extended to include the 10-Gigabit Ethernet interface.

Usage Guidelines

Table 2-6 lists the valid values for *type*.

Table 2-6 Valid type Values

Keyword	Definition
ethernet	Ethernet IEEE 802.3 interface.
fastethernet	100-Mbps Ethernet interface.
gigabitethernet	Gigabit Ethernet IEEE 802.3z interface.
tengigabitethernet	10-Gigabit Ethernet IEEE 802.3ae interface.
ge-wan	Gigabit Ethernet WAN IEEE 802.3z interface; supported on Catalyst 4500 series switches that are configured with a Supervisor Engine 2 only.
pos	Packet OC-3 interface on the Packet over SONET Interface Processor; supported on Catalyst 4500 series switches that are configured with a Supervisor Engine 2 only.
atm	ATM interface; supported on Catalyst 4500 series switches that are configured with a Supervisor Engine 2 only.
vlan	VLAN interface; see the **interface vlan** command.
port-channel	Port channel interface; see the **interface port-channel** command.
null	Null interface; the valid value is **0**.

Examples

This example shows how to enter the interface configuration mode on the Fast Ethernet interface 2/4:

```
Switch(config)# interface fastethernet2/4
Switch(config-if)#
```

Related Commands

Command	Description
show interfaces	Displays interface information.

interface port-channel

To access or create a port-channel interface, use the **interface port-channel** command.

interface port-channel *channel-group*

Syntax Description

channel-group	Port-channel group number; valid values are from 1 to 64.

Defaults

This command has no default settings.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

You do not have to create a port-channel interface before assigning a physical interface to a channel group. A port-channel interface is created automatically when the channel group gets its first physical interface, if it is not already created.

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

Only one port channel in a channel group is allowed.

Caution The Layer 3 port-channel interface is the routed interface. Do not enable Layer 3 addresses on the physical Fast Ethernet interfaces.

If you want to use CDP, you must configure it only on the physical Fast Ethernet interface and not on the port-channel interface.

Examples

This example creates a port-channel interface with a channel-group number of 64:

```
Switch(config)# interface port-channel 64
Switch(config)#
```

Related Commands

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

interface range

To run a command on multiple ports at the same time, use the **interface range** command.

interface range {**vlan** *vlan_id - vlan_id*} {*port-range* | **macro** *name*}

Syntax Description

vlan *vlan_id - vlan_id*	Specifies a VLAN range; valid values are from 1 to 4094.
port-range	Port range; for a list of valid values for *port-range*, see the "Usage Guidelines" section.
macro *name*	Specifies the name of a macro.

Defaults

This command has no default settings.

Command Modes

Global configuration mode

Interface configuration mode

Command History

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

Usage Guidelines

You can use the **interface range** command on the existing VLAN SVIs only. To display the VLAN SVIs, enter the **show running config** command. The VLANs that are not displayed cannot be used in the **interface range** command.

The values that are entered with the **interface range** command are applied to all the existing VLAN SVIs.

Before you can use a macro, you must define a range using the **define interface-range** command.

All configuration changes that are made to a port range are saved to NVRAM, but the port ranges that are created with the **interface range** command do not get saved to NVRAM.

You can enter the port range in two ways:

- Specifying up to five port ranges
- Specifying a previously defined macro

You can either specify the ports or the name of a port-range macro. A port range must consist of the same port type, and the ports within a range cannot span the modules.

You can define up to five port ranges on a single command; separate each range with a comma.

When you define a range, you must enter a space between the first port and the hyphen (-):

```
interface range gigabitethernet 5/1 -20, gigabitethernet4/5 -20.
```

Use these formats when entering the *port-range*:

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

Valid values for *interface-type* are as follows:

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

You cannot specify both a macro and an interface range in the same command. After creating a macro, you can enter additional ranges. If you have already entered an interface range, the CLI does not allow you to enter a macro.

You can specify a single interface in the *port-range* value. This makes the command similar to the **interface** *interface-number* command.

Examples

This example shows how to use the **interface range** command to interface to FE 5/18 - 20:

```
Switch(config)# interface range fastethernet 5/18 - 20
Switch(config-if)#
```

This command shows how to run a port-range macro:

```
Switch(config)# interface range macro macro1
Switch(config-if)#
```

Related Commands

Command	Description
define interface-range	Creates a macro of interfaces.
show running config (refer to Cisco IOS documentation)	Displays the running configuration for a switch.

interface vlan

To create or access a Layer 3 switch virtual interface (SVI), use the **interface vlan** command. To delete an SVI, use the **no** form of this command.

interface vlan *vlan_id*

no interface vlan *vlan_id*

Syntax Description

vlan_id	Number of the VLAN; valid values are from 1 to 4094.

Defaults

Fast EtherChannel is not specified.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

The SVIs are created the first time that you enter the **interface vlan** *vlan_id* command for a particular VLAN. The *vlan_id* value corresponds to the VLAN tag that is associated with the data frames on an ISL or 802.1Q-encapsulated trunk or the VLAN ID that is configured for an access port. A message is displayed whenever a VLAN interface is newly created, so you can check that you entered the correct VLAN number.

If you delete an SVI by entering the **no interface vlan** *vlan_id* command, the associated interface is forced into an administrative down state and marked as deleted. The deleted interface will no longer be visible in a **show interface** command.

You can reinstate a deleted SVI by entering the **interface vlan** *vlan_id* command for the deleted interface. The interface comes back up, but much of the previous configuration will be gone.

Examples

This example shows the output when you enter the **interface vlan** *vlan_id* command for a new VLAN number:

```
Switch(config)# interface vlan 23
% Creating new VLAN interface.
Switch(config)#
```

ip admission proxy http refresh-all

To ensure that you see a customized WebAuth login page with the same name in the switch system directory as a same-named prior login page, use the **ip admission proxy http refresh-all** command.

ip admission proxy http [success | failure | refresh-all | login [expired | page]]

Syntax Description

success	Successful authentication proxy.
failure	Failed authentication proxy.
refresh-all	Refresh all custom html pages.
login expired	Specify expired webpage
login page	Specify customized login webpage

Defaults

If you do not enter this command, if any of the customized web-based authentication page files with the file of same name have been changed, you see the old login page rather than the new file.

Command Modes

Global configuration mode

Command History

Release	Modification
15.0(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

You should enter this command whenever the customized web-based authentication page has been changed in the system directory.

Examples

This example shows how to enter this command:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip admission proxy http [success | failure | refresh-all | login]
Switch(config)# end
Switch#
```

<The new html page is observed.>

ip arp inspection filter vlan

To permit ARPs from hosts that are configured for static IP when DAI is enabled and to define an ARP access list and apply it to a VLAN, use the **ip arp inspection filter vlan** command. To disable this application, use the **no** form of this command.

ip arp inspection *filter arp-acl-name* **vlan** *vlan-range* [*static*]

no ip arp inspection *filter arp-acl-name* **vlan** *vlan-range* [*static*]

Syntax Description

arp-acl-name	Access control list name.
vlan-range	VLAN number or range; valid values are from 1 to 4094.
static	(Optional) Specifies that the access control list should be applied statically.

Defaults

No defined ARP ACLs are applied to any VLAN.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

When an ARP access control list is applied to a VLAN for dynamic ARP inspection, the ARP packets containing only the IP-to-Ethernet MAC bindings are compared against the ACLs. All other packet types are bridged in the incoming VLAN without validation.

This command specifies that the incoming ARP packets are compared against the ARP access control list, and the packets are permitted only if the access control list permits them.

If the access control lists deny the packets because of explicit denies, the packets are dropped. If the packets are denied because of an implicit deny, they are then matched against the list of DHCP bindings if the ACL is not applied statically.

Examples

This example shows how to apply the ARP ACL static hosts to VLAN 1 for DAI:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip arp inspection filter static-hosts vlan 1
Switch(config)# end
Switch#
Switch# show ip arp inspection vlan 1
Source Mac Validation      : Enabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled
```

```
 Vlan     Configuration    Operation   ACL Match          Static ACL
 ----     -------------    ---------   ---------          ----------
    1     Enabled          Active      static-hosts      No

 Vlan     ACL Logging      DHCP Logging
 ----     -----------      ------------
    1     Acl-Match        Deny
Switch#
```

Related Commands

Command	Description
arp access-list	Defines an ARP access list or adds clauses at the end of a predefined list.
show ip arp inspection	Displays the status of dynamic ARP inspection for a specific range of VLANs.

ip arp inspection limit (interface)

To limit the rate of incoming ARP requests and responses on an interface and prevent DAI from consuming all of the system's resources in the event of a DoS attack, use the **ip arp inspection limit** command. To release the limit, use the **no** form of this command.

ip arp inspection limit {**rate** *pps* | **none**} [**burst interval** *seconds*]

no ip arp inspection limit

Syntax Description

rate *pps*	Specifies an upper limit on the number of incoming packets processed per second. The rate can range from 1 to 10000.
none	Specifies no upper limit on the rate of the incoming ARP packets that can be processed.
burst interval *seconds*	(Optional) Specifies the consecutive interval in seconds over which the interface is monitored for the high rate of the ARP packets. The interval is configurable from 1 to 15 seconds.

Defaults

The rate is set to 15 packets per second on the untrusted interfaces, assuming that the network is a switched network with a host connecting to as many as 15 new hosts per second.

The rate is unlimited on all the trusted interfaces.

The burst interval is set to 1 second by default.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.1(19)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.1(20)EW	Added support for interface monitoring.

Usage Guidelines

The trunk ports should be configured with higher rates to reflect their aggregation. When the rate of the incoming packets exceeds the user-configured rate, the interface is placed into an error-disabled state. The error-disable timeout feature can be used to remove the port from the error-disabled state. The rate applies to both the trusted and nontrusted interfaces. Configure appropriate rates on trunks to handle the packets across multiple DAI-enabled VLANs or use the **none** keyword to make the rate unlimited.

The rate of the incoming ARP packets onthe channel ports is equal to the sum of the incoming rate of packets from all the channel members. Configure the rate limit for the channel ports only after examining the rate of the incoming ARP packets on the channel members.

After a switch receives more than the configured rate of packets every second consecutively over a period of burst seconds, the interface is placed into an error-disabled state.

Examples

This example shows how to limit the rate of the incoming ARP requests to 25 packets per second:

```
Switch# config terminal
Switch(config)# interface fa6/3
Switch(config-if)# ip arp inspection limit rate 25
Switch(config-if)# end
Switch# show ip arp inspection interfaces fastEthernet 6/3
Interface        Trust State     Rate (pps)
 ---------------  -----------     ----------
 Fa6/3            Trusted                25
Switch#
```

This example shows how to limit the rate of the incoming ARP requests to 20 packets per second and to set the interface monitoring interval to 5 consecutive seconds:

```
Switch# config terminal
Switch(config)# interface fa6/1
Switch(config-if)# ip arp inspection limit rate 20 burst interval 5
Switch(config-if)# end
```

Related Commands

Command	Description
show ip arp inspection	Displays the status of dynamic ARP inspection for a specific range of VLANs.

ip arp inspection log-buffer

To configure the parameters that are associated with the logging buffer, use the **ip arp inspection log-buffer** command. To disable the parameters, use the **no** form of this command.

ip arp inspection log-buffer {**entries** *number* | **logs** *number* **interval** *seconds*}

no ip arp inspection log-buffer {**entries** | **logs**}

Syntax Description

entries *number*	Number of entries from the logging buffer; the range is from 0 to 1024.
logs *number*	Number of entries to be logged in an interval; the range is from 0 to 1024. A 0 value indicates that entries should not be logged out of this buffer.
interval *seconds*	Logging rate; the range is from 0 to 86400 (1 day). A 0 value indicates an immediate log.

Defaults

When dynamic ARP inspection is enabled, denied, or dropped, the ARP packets are logged.

The number of entries is set to 32.

The number of logging entries is limited to 5 per second.

The interval is set to 1.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

The first dropped packet of a given flow is logged immediately. The subsequent packets for the same flow are registered but are not logged immediately. Registering these packets is done in a log buffer that is shared by all the VLANs. Entries from this buffer are logged on a rate-controlled basis.

Examples

This example shows how to configure the logging buffer to hold up to 45 entries:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip arp inspection log-buffer entries 45
Switch(config)# end
Switch# show ip arp inspection log
Total Log Buffer Size : 45
Syslog rate : 5 entries per 1 seconds.
No entries in log buffer.
Switch#
```

This example shows how to configure the logging rate to 10 logs per 3 seconds:

```
Switch(config)# ip arp inspection log-buffer logs 10 interval 3
Switch(config)# end
Switch# show ip arp inspection log
Total Log Buffer Size : 45
Syslog rate : 10 entries per 3 seconds.
No entries in log buffer.
Switch#
```

Related Commands

Command	Description
arp access-list	Defines an ARP access list or adds clauses at the end of a predefined list.
show ip arp inspection	Displays the status of dynamic ARP inspection for a specific range of VLANs.

ip arp inspection trust

To set a per-port configurable trust state that determines the set of interfaces where incoming ARP packets are inspected, use the **ip arp inspection trust** command. To make the interfaces untrusted, use the **no** form of this command.

ip arp inspection trust

no ip arp inspection trust

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default settings.

Command Modes

Interface configuration mode

Command History

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

Examples

This example shows how to configure an interface to be trusted:

```
Switch# config terminal
Switch(config)# interface fastEthernet 6/3
Switch(config-if)# ip arp inspection trust
Switch(config-if)# end
```

To verify the configuration, use the show form of this command:

```
Switch# show ip arp inspection interfaces fastEthernet 6/3

 Interface        Trust State     Rate (pps)     Burst Interval
 ---------------  -----------     ----------     --------------
 Fa6/3            Trusted              None                  1
Switch#
```

Related Commands

Command	Description
show ip arp inspection	Displays the status of dynamic ARP inspection for a specific range of VLANs.

ip arp inspection validate

To perform specific checks for ARP inspection, use the **ip arp inspection validate** command. To disable checks, use the **no** form of this command.

ip arp inspection validate [**src-mac**] [**dst-mac**] [**ip**]

no ip arp inspection validate [**src-mac**] [**dst-mac**] [**ip**]

Syntax Description

src-mac	(Optional) Checks the source MAC address in the Ethernet header against the sender's MAC address in the ARP body. This checking is done against both ARP requests and responses. **Note** When **src-mac** is enabled, packets with different MAC addresses are classified as invalid and are dropped.
dst-mac	(Optional) Checks the destination MAC address in the Ethernet header against the target MAC address in ARP body. This checking is done for ARP responses. **Note** When **dst-mac** is enabled, the packets with different MAC addresses are classified as invalid and are dropped.
ip	(Optional) Checks the ARP body for invalid and unexpected IP addresses. Addresses include 0.0.0.0, 255.255.255.255, and all IP multicast addresses. The sender IP addresses are checked in all ARP requests and responses and target IP addresses are checked only in ARP responses.

Defaults

Checks are disabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

When enabling the checks, specify at least one of the keywords (**src-mac**, **dst-mac**, and **ip**) on the command line. Each command overrides the configuration of the previous command. If a command enables **src** and **dst mac** validations, and a second command enables IP validation only, the **src** and **dst mac** validations are disabled as a result of the second command.

The **no** form of this command disables only the specified checks. If none of the check options are enabled, all the checks are disabled.

Examples

This example show how to enable the source MAC validation:

```
Switch(config)# ip arp inspection validate src-mac
Switch(config)# end
Switch# show ip arp inspection vlan 1
Source Mac Validation      : Enabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled

 Vlan     Configuration    Operation   ACL Match          Static ACL
 ----     -------------    ---------   ---------          ----------
    1     Enabled          Active

 Vlan     ACL Logging      DHCP Logging
 ----     -----------      ------------
    1     Deny             Deny
Switch#
```

Related Commands

Command	Description
arp access-list	Defines an ARP access list or adds clauses at the end of a predefined list.
show ip arp inspection	Displays the status of dynamic ARP inspection for a specific range of VLANs.

ip arp inspection vlan

To enable dynamic ARP inspection (DAI) on a per-VLAN basis, use the **ip arp inspection vlan** command. To disable DAI, use the **no** form of this command.

ip arp inspection vlan *vlan-range*

no ip arp inspection vlan *vlan-range*

Syntax Description

vlan-range	VLAN number or range; valid values are from 1 to 4094.

Defaults

ARP inspection is disabled on all VLANs.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

You must specify on which VLANs to enable DAI. DAI may not function on the configured VLANs if they have not been created or if they are private.

Examples

This example shows how to enable DAI on VLAN 1:

```
Switch# configure terminal
Switch(config)# ip arp inspection vlan 1
Switch(config)# end
Switch# show ip arp inspection vlan 1

Source Mac Validation      : Disabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled
Vlan     Configuration    Operation   ACL Match          Static ACL
 ----     -------------    ---------   ---------          ----------
    1     Enabled          Active
Vlan     ACL Logging      DHCP Logging
 ----     -----------      ------------
    1     Deny             Deny
Switch#
```

This example shows how to disable DAI on VLAN 1:

```
Switch# configure terminal
Switch(config)# no ip arp inspection vlan 1
Switch(config)#
```

Related Commands

Command	Description
arp access-list	Defines an ARP access list or adds clauses at the end of a predefined list.
show ip arp inspection	Displays the status of dynamic ARP inspection for a specific range of VLANs.

ip arp inspection vlan logging

To control the type of packets that are logged, use the **ip arp inspection vlan logging** command. To disable this logging control, use the **no** form of this command.

ip arp inspection vlan *vlan-range* **logging** {**acl-match** {**matchlog** | **none**} | **dhcp-bindings** {**permit** | **all** | **none**}}

no ip arp inspection vlan *vlan-range* **logging** {**acl-match** | **dhcp-bindings**}

Syntax Description

vlan-range	Number of the VLANs to be mapped to the specified instance. The number is entered as a single value or a range; valid values are from 1 to 4094.
acl-match	Specifies the logging criteria for packets that are dropped or permitted based on ACL matches.
matchlog	Specifies that logging of packets matched against ACLs is controlled by the **matchlog** keyword in the permit and deny access control entries of the ACL. **Note** By default, the **matchlog** keyword is not available on the ACEs. When the keyword is used, denied packets are not logged. Packets are logged only when they match against an ACE that has the **matchlog** keyword.
none	Specifies that ACL-matched packets are not logged.
dhcp-bindings	Specifies the logging criteria for packets dropped or permitted based on matches against the DHCP bindings.
permit	Specifies logging when permitted by DHCP bindings.
all	Specifies logging when permitted or denied by DHCP bindings.
none	Prevents all logging of packets permitted or denied by DHCP bindings.

Defaults

All denied or dropped packets are logged.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

The **acl-match** and **dhcp-bindings** keywords merge with each other. When you set an ACL match configuration, the DHCP bindings configuration is not disabled. You can use the **no** form of this command to reset some of the logging criteria to their defaults. If you do not specify either option, all the logging types are reset to log on when the ARP packets are denied. The two options that are available to you are as follows:

- **acl-match**—Logging on ACL matches is reset to log on deny
- **dhcp-bindings**—Logging on DHCP binding compared is reset to log on deny

Examples

This example shows how to configure an ARP inspection on VLAN 1 to add packets to a log on matching against the ACLs with the **logging** keyword:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip arp inspection vlan 1 logging acl-match matchlog
Switch(config)# end
Switch# show ip arp inspection vlan 1

Source Mac Validation      : Enabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled

 Vlan     Configuration    Operation   ACL Match          Static ACL
 ----     -------------    ---------   ---------          ----------
    1     Enabled          Active

 Vlan     ACL Logging      DHCP Logging
 ----     -----------      ------------
    1     Acl-Match        Deny
Switch#
```

Related Commands

Command	Description
arp access-list	Defines an ARP access list or adds clauses at the end of a predefined list.
show ip arp inspection	Displays the status of dynamic ARP inspection for a specific range of VLANs.

ip cef load-sharing algorithm

To configure the load-sharing hash function so that the source TCP/UDP port, the destination TCP/UDP port, or both ports can be included in the hash in addition to the source and destination IP addresses, use the **ip cef load-sharing algorithm** command. To revert back to the default, which does not include the ports, use the **no** form of this command.

ip cef load-sharing algorithm {**include-ports** {**source** *source* | **destination** *dest*} | **original** | **tunnel** | **universal**}

no ip cef load-sharing algorithm {**include-ports** {**source** *source* | **destination** *dest*} | **original** | **tunnel** | **universal**}

Syntax Description

include-ports	Specifies the algorithm that includes the Layer 4 ports.
source *source*	Specifies the source port in the load-balancing hash functions.
destination *dest*	Specifies the destination port in the load-balancing hash. Uses the source and destination in hash functions.
original	Specifies the original algorithm; not recommended.
tunnel	Specifies the algorithm for use in tunnel-only environments.
universal	Specifies the default Cisco IOS load-sharing algorithm.

Defaults

Default load-sharing algorithm is disabled.

Note This option does not include the source or destination port in the load-balancing hash.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

The original algorithm, tunnel algorithm, and universal algorithm are routed through the hardware. For software-routed packets, the algorithms are handled by the software. The **include-ports** option does not apply to the software-switched traffic.

Examples

This example shows how to configure the IP CEF load-sharing algorithm that includes Layer 4 ports:

```
Switch(config)# ip cef load-sharing algorithm include-ports
Switch(config)#
```

This example shows how to configure the IP CEF load-sharing algorithm that includes Layer 4 tunneling ports:

```
Switch(config)# ip cef load-sharing algorithm include-ports tunnel
Switch(config)#
```

Related Commands

Command	Description
show ip cef vlan	Displays the IP CEF VLAN interface status and configuration information.

ip device tracking maximum

To enable IP port security binding tracking on a Layer 2 port, use the **ip device tracking maximum** command. To disable IP port security on untrusted Layer 2 interfaces, use the **no** form of this command.

ip device tracking maximum {*number*}

no ip device tracking maximum {*number*}

Syntax Description

number	Specifies the number of bindings created in the IP device tracking table for a port, valid values are from 0 to 2048.

Defaults

This command has no default settings.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(37)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Examples

This example shows how to enable IP port security with IP-MAC filters on a Layer 2 access port:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip device tracking
Switch(config)# interface fastethernet 4/3
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 1
Switch(config-if)# ip device tracking maximum 5
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security maximum 5
Switch(config-if)# ip verify source tracking port-security
Switch(config-if)# end
```

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

Related Commands

Command	Description
ip verify source	Enables IP source guard on untrusted Layer 2 interfaces.
show ip verify source	Displays the IP source guard configuration and filters on a particular interface.

ip dhcp snooping

To enable DHCP snooping globally, use the **ip dhcp snooping** command. To disable DHCP snooping, use the **no** form of this command.

ip dhcp snooping

no ip dhcp snooping

Syntax Description

This command has no arguments or keywords.

Defaults

DHCP snooping is disabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

You must enable DHCP snooping globally before you can use DHCP snooping on a VLAN.

Examples

This example shows how to enable DHCP snooping:

```
Switch(config)# ip dhcp snooping
Switch(config)#
```

This example shows how to disable DHCP snooping:

```
Switch(config)# no ip dhcp snooping
Switch(config)#
```

Related Commands

Command	Description
ip dhcp snooping information option	Enables DHCP option 82 data insertion.
ip dhcp snooping limit rate	Configures the number of the DHCP messages that an interface can receive per second.
ip dhcp snooping trust	Enables DHCP snooping on a trusted VLAN.
ip dhcp snooping vlan	Enables DHCP snooping on a VLAN or a group of VLANs.
show ip dhcp snooping	Displays the DHCP snooping configuration.
show ip dhcp snooping binding	Displays the DHCP snooping binding entries.

ip dhcp snooping binding

To set up and generate a DHCP binding configuration to restore bindings across reboots, use the **ip dhcp snooping binding** command. To disable the binding configuration, use the **no** form of this command.

ip dhcp snooping binding *mac-address* **vlan** *vlan-# ip-address* **interface** *interface* **expiry** *seconds*

no ip dhcp snooping binding *mac-address* **vlan** *vlan-# ip-address* **interface** *interface*

Syntax Description

mac-address	Specifies a MAC address.
vlan *vlan-#*	Specifies a valid VLAN number.
ip-address	Specifies an IP address.
interface *interface*	Specifies an interface type and number.
expiry *seconds*	Specifies the interval (in seconds) after which binding is no longer valid.

Defaults

This command has no default settings.

Command Modes

Privileged EXEC mode

Command History

Release	Modification
12.1(19)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(25)EW	Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Whenever a binding is added or removed using this command, the binding database is marked as changed and a write is initiated.

Examples

This example shows how to generate a DHCP binding configuration on interface gigabitethernet1/1 in VLAN 1 with an expiration time of 1000 seconds:

```
Switch# ip dhcp snooping binding 0001.1234.1234 vlan 1 172.20.50.5 interface gi1/1 expiry 1000
Switch#
```

Related Commands

Command	Description
ip dhcp snooping	Globally enables DHCP snooping.
ip dhcp snooping information option	Enables DHCP option 82 data insertion.
ip dhcp snooping trust	Enables DHCP snooping on a trusted VLAN.
ip dhcp snooping vlan	Enables DHCP snooping on a VLAN or a group of VLANs.

Command	Description
show ip dhcp snooping	Displays the DHCP snooping configuration.
show ip dhcp snooping binding	Displays the DHCP snooping binding entries.

ip dhcp snooping database

To store the bindings that are generated by DHCP snooping, use the **ip dhcp snooping database** command. To either reset the timeout, reset the write-delay, or delete the agent specified by the URL, use the **no** form of this command.

ip dhcp snooping database {*url* | **timeout** *seconds* | **write-delay** *seconds*}

no ip dhcp snooping database {**timeout** | **write-delay**}

Syntax Description

url	Specifies the URL in one of the following forms: • tftp://<host>/<filename> • ftp://<user>:<password>@<host>/<filename> • rcp://<user>@<host>/<filename> • nvram:/<filename> • bootflash:/<filename>
timeout *seconds*	Specifies when to abort the database transfer process after a change to the binding database. The minimum value of the delay is 15 seconds. 0 is defined as an infinite duration.
write-delay *seconds*	Specifies the duration for which the transfer should be delayed after a change to the binding database.

Defaults

The timeout value is set to 300 seconds (5 minutes).

The write-delay value is set to 300 seconds.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

You need to create an empty file at the configured URL on network-based URLs (such as TFTP and FTP) before the switch can write the set of bindings for the first time at the URL.

Note Because both NVRAM and bootflash have limited storage capacity, using TFTP or network-based files is recommended . If you use flash to store the database file, new updates (by the agent) result in the creation of new files (flash fills quickly). In addition, due to the nature of the file system used on the flash, a large number of files causes access to be considerably slowed. When a file is stored in a remote location accessible through TFTP, an RPR/SSO standby supervisor engine can take over the binding list when a switchover occurs.

Examples

This example shows how to store a database file with the IP address 10.1.1.1 within a directory called directory. A file named file must be present on the TFTP server.

```
Switch# config terminal
Switch(config)# ip dhcp snooping database tftp://10.1.1.1/directory/file
Switch(config)# end
Switch# show ip dhcp snooping database
Agent URL : tftp://10.1.1.1/directory/file
Write delay Timer : 300 seconds
Abort Timer : 300 seconds

Agent Running : Yes
Delay Timer Expiry : Not Running
Abort Timer Expiry : Not Running

Last Succeded Time : None
Last Failed Time : None
Last Failed Reason : No failure recorded.

Total Attempts       :        1   Startup Failures :        0
Successful Transfers :        0   Failed Transfers :        0
Successful Reads     :        0   Failed Reads     :        0
Successful Writes    :        0   Failed Writes    :        0
Media Failures       :        0

Switch#
```

Related Commands

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

ip dhcp snooping information option

To enable DHCP option 82 data insertion, use the **ip dhcp snooping information option** command. To disable DHCP option 82 data insertion, use the **no** form of this command.

ip dhcp snooping information option format remote-id {**hostname** | **string** {*word*}}

no ip dhcp snooping information option format remote-id {**hostname** | **string** {*word*}}

Syntax Description

format	Specifies the option 82 information format.
remote-id	Specifies the remote ID for option 82.
hostname	Specifies the user-configured hostname for the remote ID.
string *word*	Specifies the user-defined string for the remote ID. The word string can be from 1 to 63 characters long with no spaces.

Defaults

DHCP option 82 data insertion is enabled.

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(12c)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(40)SG	Added **remote-id** keyword to support option 82 enhancement.

Usage Guidelines

If the hostname is longer than 63 characters it is truncated to 63 characters in the remote ID.

Examples

This example shows how to enable DHCP option 82 data insertion:

```
Switch(config)# ip dhcp snooping information option
Switch(config)#
```

This example shows how to disable DHCP option 82 data insertion:

```
Switch(config)# no ip dhcp snooping information option
Switch(config)#
```

This example shows how to configure the hostname as the remote ID:

```
Switch(config)# ip dhcp snooping information option format remote-id hostname
Switch(config)#
```

The following example shows how to enable DHCP Snooping on VLAN 500 through 555 and option 82 remote ID:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# ip dhcp snooping
```

```
Switch(config)# ip dhcp snooping vlan 500 555
Switch(config)# ip dhcp snooping information option format remote-id string switch123
Switch(config)# interface GigabitEthernet 5/1
Switch(config-if)# ip dhcp snooping trust
Switch(config-if)# ip dhcp snooping limit rate 100
Switch(config-if)# ip dhcp snooping vlan 555 information option format-type circuit-id
string customer-555
Switch(config-if)# interface FastEthernet 2/1
Switch(config-if)# ip dhcp snooping vlan 555 information option format-type circuit-id
string customer-500
Switch(config)# end
```

Related Commands

Command	Description
ip dhcp snooping	Globally enables DHCP snooping.
ip dhcp snooping binding	Sets up and generates a DHCP binding configuration to restore bindings across reboots.
ip dhcp snooping information option	Enables DHCP option 82 data insertion.
ip dhcp snooping limit rate	Configures the number of the DHCP messages that an interface can receive per second.
ip dhcp snooping trust	Enables DHCP snooping on a trusted VLAN.
ip dhcp snooping vlan	Enables DHCP snooping on a VLAN or a group of VLANs.
ip dhcp snooping vlan information option format-type circuit-id string	Enables circuit-id (a sub-option of DHCP snooping option-82) on a VLAN.
show ip dhcp snooping	Displays the DHCP snooping configuration.
show ip dhcp snooping binding	Displays the DHCP snooping binding entries.

ip dhcp snooping information option allow-untrusted

To allow DHCP packets with option 82 data inserted to be received from a snooping untrusted port, use the **ip dhcp snooping information option allow-untrusted** command. To disallow receipt of these DHCP packets, use the **no** form of this command.

ip dhcp snooping information option allow-untrusted

no ip dhcp snooping information option allow-untrusted

Syntax Description

This command has no arguments or keywords.

Defaults

DHCP packets with option 82 are not allowed on snooping untrusted ports.

Command Modes

Global configuration mode

Command History

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

Examples

This example shows how to allow DHCP packets with option 82 data inserted to be received from a snooping untrusted port:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# ip dhcp snooping information option allow-untrusted
Switch(config)# end
Switch#
```

Related Commands

Command	Description
ip dhcp snooping	Globally enables DHCP snooping.
ip dhcp snooping information option	Enables DHCP option 82 data insertion.
ip dhcp snooping limit rate	Configures the number of the DHCP messages that an interface can receive per second.
ip dhcp snooping trust	Enables DHCP snooping on a trusted VLAN.
ip dhcp snooping vlan	Enables DHCP snooping on a VLAN or a group of VLANs.
show ip dhcp snooping	Displays the DHCP snooping configuration.
show ip dhcp snooping binding	Displays the DHCP snooping binding entries.

ip dhcp snooping limit rate

To configure the number of the DHCP messages that an interface can receive per second, use the **ip dhcp snooping limit rate** command. To disable the DHCP snooping rate limiting, use the **no** form of this command.

ip dhcp snooping limit rate *rate*

no ip dhcp snooping limit rate

Syntax Description

rate	Number of DHCP messages a switch can receive per second.

Defaults

DHCP snooping rate limiting is disabled.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

Typically, the rate limit applies to the untrusted interfaces. If you want to set up rate limiting for the trusted interfaces, note that the trusted interfaces aggregate all DHCP traffic in the switch, and you will need to adjust the rate limit of the interfaces to a higher value.

Examples

This example shows how to enable the DHCP message rate limiting:

```
Switch(config-if)# ip dhcp snooping limit rate 150
Switch(config)#
```

This example shows how to disable the DHCP message rate limiting:

```
Switch(config-if)# no ip dhcp snooping limit rate
Switch(config)#
```

Related Commands

Command	Description
ip dhcp snooping	Globally enables DHCP snooping.
ip dhcp snooping information option	Enables DHCP option 82 data insertion.
ip dhcp snooping trust	Enables DHCP snooping on a trusted VLAN.
ip dhcp snooping vlan	Enables DHCP snooping on a VLAN or a group of VLANs.
show ip dhcp snooping	Displays the DHCP snooping configuration.
show ip dhcp snooping binding	Displays the DHCP snooping binding entries.

ip dhcp snooping trust

To configure an interface as trusted for DHCP snooping purposes, use the **ip dhcp snooping trust** command. To configure an interface as untrusted, use the **no** form of this command.

ip dhcp snooping trust

no ip dhcp snooping trust

Syntax Description

This command has no arguments or keywords.

Defaults

DHCP snooping trust is disabled.

Command Modes

Interface configuration mode

Command History

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

Examples

This example shows how to enable DHCP snooping trust on an interface:

```
Switch(config-if)# ip dhcp snooping trust
Switch(config)#
```

This example shows how to disable DHCP snooping trust on an interface:

```
Switch(config-if)# no ip dhcp snooping trust
Switch(config)#
```

Related Commands

Command	Description
ip dhcp snooping	Globally enables DHCP snooping.
ip dhcp snooping information option	Enables DHCP option 82 data insertion.
ip dhcp snooping limit rate	Configures the number of the DHCP messages that an interface can receive per second.
ip dhcp snooping vlan	Enables DHCP snooping on a VLAN or a group of VLANs.
show ip dhcp snooping	Displays the DHCP snooping configuration.
show ip dhcp snooping binding	Displays the DHCP snooping binding entries.

ip dhcp snooping vlan

Use the **ip dhcp snooping vlan** command to enable DHCP snooping on a VLAN. To disable DHCP snooping on a VLAN, use the **no** form of this command.

ip dhcp snooping [**vlan** *number*]

no ip dhcp snooping [**vlan** *number*]

Syntax Description

vlan *number*	(Optional) Single VLAN number or a range of VLANs; valid values are from 1 to 4094.

Defaults

DHCP snooping is disabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

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

Examples

This example shows how to enable DHCP snooping on a VLAN:

```
Switch(config)# ip dhcp snooping vlan 10
Switch(config)#
```

This example shows how to disable DHCP snooping on a VLAN:

```
Switch(config)# no ip dhcp snooping vlan 10
Switch(config)#
```

This example shows how to enable DHCP snooping on a group of VLANs:

```
Switch(config)# ip dhcp snooping vlan 10 55
Switch(config)#
```

This example shows how to disable DHCP snooping on a group of VLANs:

```
Switch(config)# no ip dhcp snooping vlan 10 55
Switch(config)#
```

Related Commands

Command	Description
ip dhcp snooping	Globally enables DHCP snooping.
ip dhcp snooping information option	Enables DHCP option 82 data insertion.
ip dhcp snooping limit rate	Configures the number of the DHCP messages that an interface can receive per second.
ip dhcp snooping trust	Enables DHCP snooping on a trusted VLAN.
ip dhcp snooping vlan information option format-type circuit-id string	Enables circuit-id (a suboption of DHCP snooping option-82) on a VLAN.
show ip dhcp snooping	Displays the DHCP snooping configuration.
show ip dhcp snooping binding	Displays the DHCP snooping binding entries.

ip dhcp snooping vlan information option format-type circuit-id string

To enable circuit-id (a suboption of DHCP snooping option 82) on a VLAN, use the **ip dhcp snooping vlan information option format-type circuit-id string** command. To disable circuit-id on a VLAN, use the **no** form of this command.

ip dhcp snooping vlan *number* **information option format-type circuit-id** [**override**] **string** *string*

no ip dhcp snooping vlan *number* **information option format-type circuit-id** [**override**] **string**

Syntax Description

number	Specifies single or range of VLANs; valid values are from 1 to 4094.
override	(Optional) Specifies an override string.
string *string*	Specifies a user-defined string for the circuit ID; range of 3 to 63 ASCII characters with no spaces.

Defaults

VLAN-mod-port, if DHCP snooping option-82 is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
12.2(40)SG	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(54)SG	Added the **override** option

Usage Guidelines

The circuit-id suboption of DHCP option 82 is supported only when DHCP snooping is globally enabled and on VLANs using DHCP option 82.

This command allows you to configure a string of ASCII characters to be the circuit ID. When you want to override the vlan-mod-port format type and instead use the circuit-ID to define subscriber information, use the **override** keyword.

Examples

The following example shows how to enable DHCP snooping on VLAN 500 through 555 and option 82 circuit-id:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# ip dhcp snooping
Switch(config)# ip dhcp snooping vlan 500 555
Switch(config)# ip dhcp snooping information option format remote-id string switch123
Switch(config)# interface GigabitEthernet 5/1
Switch(config-if)# ip dhcp snooping trust
Switch(config-if)# ip dhcp snooping limit rate 100
```

```
Switch(config-if)# ip dhcp snooping vlan 555 information option format-type circuit-id
string customer-555
Switch(config-if)# interface FastEthernet 2/1
Switch(config-if)# ip dhcp snooping vlan 555 information option format-type circuit-id
string customer-500
Switch(config)# end
```

This example shows how to configure the option-82 circuit-ID override suboption:

```
Switch(config-if)# ip dhcp snooping vlan 250 information option format-type circuit-id
override string testcustomer
```

You can verify your settings by entering the show ip dhcp snooping user EXEC command.

Note The **show ip dhcp snooping** user EXEC command only displays the global command output, including a remote-ID configuration. It does not display any per-interface, per-VLAN string that you have configured for the circuit ID.

Related Commands

Command	Description
ip dhcp snooping	Globally enables DHCP snooping.
ip dhcp snooping information option	Enables DHCP option 82 data insertion.
ip dhcp snooping limit rate	Configures the number of the DHCP messages that an interface can receive per second.
ip dhcp snooping trust	Enables DHCP snooping on a trusted VLAN.
ip dhcp snooping vlan	Enables DHCP snooping on a VLAN or a group of VLANs.
show ip dhcp snooping	Displays the DHCP snooping configuration.
show ip dhcp snooping binding	Displays the DHCP snooping binding entries.

ip igmp filter

To control whether all hosts on a Layer 2 interface can join one or more IP multicast groups by applying an IGMP profile to the interface, use the **ip igmp filter** command. To remove a profile from the interface, use the **no** form of this command.

ip igmp filter *profile number*

no ip igmp filter

Syntax Description

profile number	IGMP profile number to be applied; valid values are from 1 to 429496795.

Defaults

Profiles are not applied.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.1(11b)EW	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

You can apply IGMP filters only to Layer 2 physical interfaces; you cannot apply IGMP filters to routed ports, switch virtual interfaces (SVIs), or ports that belong to an EtherChannel group.

An IGMP profile can be applied to one or more switch port interfaces, but one port can have only one profile applied to it.

Examples

This example shows how to apply IGMP profile 22 to an interface:

```
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# ip igmp filter 22
Switch(config-if)#
```

Related Commands

Command	Description
ip igmp profile	Creates an IGMP profile.
show ip igmp profile	Displays all configured IGMP profiles or a specified IGMP profile.

ip igmp max-groups

To set the maximum number of IGMP groups that a Layer 2 interface can join, use the **ip igmp max-groups** command. To set the maximum back to the default, use the **no** form of this command.

ip igmp max-groups *number*

no ip igmp max-groups

Syntax Description

number	Maximum number of IGMP groups that an interface can join; valid values are from 0 to 4294967294.

Defaults

No maximum limit.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.1(11b)EW	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

You can use the **ip igmp max-groups** command only on Layer 2 physical interfaces; you cannot set the IGMP maximum groups for the routed ports, the switch virtual interfaces (SVIs), or the ports that belong to an EtherChannel group.

Examples

This example shows how to limit the number of IGMP groups that an interface can join to 25:

```
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# ip igmp max-groups 25
Switch(config-if)
```

ip igmp profile

To create an IGMP profile, use the **ip igmp profile** command. To delete the IGMP profile, use the **no** form of this command.

ip igmp profile *profile number*

no ip igmp profile *profile number*

Syntax Description

profile number	IGMP profile number being configured; valid values are from 1 to 4294967295.

Defaults

No profile created.

Command Modes

Global configuration mode

IGMP profile configuration

Command History

Release	Modification
12.1(11b)EW	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

When entering a range, enter the low IP multicast address, a space, and the high IP multicast address.

You can apply an IGMP profile to one or more Layer 2 interfaces, but each interface can have only one profile applied to it.

Examples

This example shows how to configure IGMP profile 40 that permits the specified range of IP multicast addresses:

```
Switch # config terminal
Switch(config)# ip igmp profile 40
Switch(config-igmp-profile)# permit
Switch(config-igmp-profile)# range 233.1.1.1 233.255.255.255
Switch(config-igmp-profile)#
```

Related Commands

Command	Description
ip igmp filter	Controls whether all hosts on a Layer 2 interface can join one or more IP multicast groups by applying an IGMP profile to the interface.
show ip igmp profile	Displays all configured IGMP profiles or a specified IGMP profile.

ip igmp query-interval

To configure the frequency that the switch sends the IGMP host-query messages, use the **ip igmp query-interval** command. To return to the default frequency, use the **no** form of this command.

ip igmp query-interval *seconds*

no ip igmp query-interval

Syntax Description

seconds	Frequency, in seconds, at which the IGMP host-query messages are transmitted; valid values depend on the IGMP snooping mode. See the "Usage Guidelines" section for more information.

Defaults

The query interval is set to 60 seconds.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

If you use the default IGMP snooping configuration, the valid query interval values are from 1 to 65535 seconds. If you have changed the default configuration to support CGMP as the IGMP snooping learning method, the valid query interval values are from 1 to 300 seconds.

The designated switch for a LAN is the only switch that sends the IGMP host-query messages. For IGMP version 1, the designated switch is elected according to the multicast routing protocol that runs on the LAN. For IGMP version 2, the designated querier is the lowest IP-addressed multicast switch on the subnet.

If no queries are heard for the timeout period (controlled by the **ip igmp query-timeout** command), the switch becomes the querier.

Note Changing the timeout period may severely impact multicast forwarding.

Examples

This example shows how to change the frequency at which the designated switch sends the IGMP host-query messages:

```
Switch(config-if)# ip igmp query-interval 120
Switch(config-if)#
```

Related Commands

Command	Description
ip igmp querier-timeout (refer to Cisco IOS documentation)	Configures the timeout period before the router takes over as the querier for the interface after the previous querier has stopped querying.
ip pim query-interval (refer to Cisco IOS documentation)	Configures the frequency of Protocol Independent Multicast (PIM) router query messages.
show ip igmp groups (refer to Cisco IOS documentation)	Displays the multicast groups with receivers that are directly connected to the router and that were learned through Internet Group Management Protocol (IGMP), use the **show ip igmp groups** command in EXEC mode.

ip igmp snooping

To enable IGMP snooping, use the **ip igmp snooping** command. To disable IGMP snooping, use the **no** form of this command.

ip igmp snooping [**tcn** {**flood query count** *count* | **query solicit**}]

no ip igmp snooping [**tcn** {**flood query count** *count* | **query solicit**}]

Syntax Description

tcn	(Optional) Specifies the topology change configurations.
flood	(Optional) Specifies to flood the spanning tree table to the network when a topology change occurs.
query	(Optional) Specifies the TCN query configurations.
count *count*	(Optional) Specifies how often the spanning tree table is flooded; valid values are from 1 to 10.
solicit	(Optional) Specifies an IGMP general query.

Defaults

IGMP snooping is enabled.

Command Modes

Global configuration mode

Interface configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.1(11)EW	Support for flooding the spanning tree table was added.

Usage Guidelines

The **tcn flood** option applies only to Layer 2 switch ports and EtherChannels; it does not apply to routed ports, VLAN interfaces, or Layer 3 channels.

The **ip igmp snooping command** is disabled by default on multicast routers.

Note You can use the **tcn flood** option in interface configuration mode.

Examples

This example shows how to enable IGMP snooping:

```
Switch(config)# ip igmp snooping
Switch(config)#
```

This example shows how to disable IGMP snooping:

```
Switch(config)# no ip igmp snooping
Switch(config)#
```

This example shows how to enable the flooding of the spanning tree table to the network after nine topology changes have occurred:

```
Switch(config)# ip igmp snooping tcn flood query count 9
Switch(config)#
```

This example shows how to disable the flooding of the spanning tree table to the network:

```
Switch(config)# no ip igmp snooping tcn flood
Switch(config)#
```

This example shows how to enable an IGMP general query:

```
Switch(config)# ip igmp snooping tcn query solicit
Switch(config)#
```

This example shows how to disable an IGMP general query:

```
Switch(config)# no ip igmp snooping tcn query solicit
Switch(config)#
```

Related Commands

Command	Description
ip igmp snooping vlan immediate-leave	Enable IGMP immediate-leave processing.
ip igmp snooping vlan mrouter	Configures a Layer 2 interface as a multicast router interface for a VLAN.
ip igmp snooping vlan static	Configures a Layer 2 interface as a member of a group.

ip igmp snooping report-suppression

To enable report suppression, use the **ip igmp snooping report-suppression** command. To disable report suppression and forward the reports to the multicast devices, use the **no** form of this command.

ip igmp snooping report-suppression

no igmp snooping report-suppression

Syntax Description

This command has no arguments or keywords.

Defaults

IGMP snooping report-suppression is enabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

If the **ip igmp snooping report-suppression** command is disabled, all the IGMP reports are forwarded to the multicast devices.

If the command is enabled, report suppression is done by IGMP snooping.

Examples

This example shows how to enable report suppression:

```
Switch(config)# ip igmp snooping report-suppression
Switch(config)#
```

This example shows how to disable report suppression:

```
Switch(config)# no ip igmp snooping report-suppression
Switch(config)#
```

This example shows how to display the system status for report suppression:

```
Switch# show ip igmp snoop
vlan 1
----------
 IGMP snooping is globally enabled
 IGMP snooping TCN solicit query is globally disabled
 IGMP snooping global TCN flood query count is 2
 IGMP snooping is enabled on this Vlan
 IGMP snooping immediate-leave is disabled on this Vlan
 IGMP snooping mrouter learn mode is pim-dvmrp on this Vlan
 IGMP snooping is running in IGMP_ONLY mode on this Vlan
 IGMP snooping report suppression is enabled on this Vlan
Switch#
```

Related Commands

Command	Description
ip igmp snooping vlan immediate-leave	Enable IGMP immediate-leave processing.
ip igmp snooping vlan mrouter	Configures a Layer 2 interface as a multicast router interface for a VLAN.
ip igmp snooping vlan static	Configures a Layer 2 interface as a member of a group.

ip igmp snooping vlan

To enable IGMP snooping for a VLAN, use the **ip igmp snooping vlan** command. To disable IGMP snooping, use the **no** form of this command.

ip igmp snooping vlan *vlan-id*

no ip igmp snooping vlan *vlan-id*

Syntax Description

vlan-id	Number of the VLAN; valid values are from 1 to 1001 and from 1006 to 4094.

Defaults

IGMP snooping is disabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

This command is entered in VLAN interface configuration mode only.

The **ip igmp snooping vlan** command is disabled by default on multicast routers.

Examples

This example shows how to enable IGMP snooping on a VLAN:

```
Switch(config)# ip igmp snooping vlan 200
Switch(config)#
```

This example shows how to disable IGMP snooping on a VLAN:

```
Switch(config)# no ip igmp snooping vlan 200
Switch(config)#
```

Related Commands

Command	Description
ip igmp snooping vlan immediate-leave	Enable IGMP immediate-leave processing.
ip igmp snooping vlan mrouter	Configures a Layer 2 interface as a multicast router interface for a VLAN.
ip igmp snooping vlan static	Configures a Layer 2 interface as a member of a group.

ip igmp snooping vlan explicit-tracking

To enable per-VLAN explicit host tracking, use the **ip igmp snooping vlan explicit-tracking** command. To disable explicit host tracking, use the **no** form of this command.

ip igmp snooping vlan *vlan-id* **explicit-tracking**

no ip igmp snooping vlan *vlan-id* **explicit-tracking**

Syntax Description

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

Defaults

Explicit host tracking is enabled.

Command Modes

Global configuration mode

Command History

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

Examples

This example shows how to disable IGMP explicit host tracking on interface VLAN 200 and how to verify the configuration:

```
Switch(config)# no ip igmp snooping vlan 200 explicit-tracking
Switch(config)# end
Switch# show ip igmp snooping vlan 200 | include explicit tracking
Global IGMP Snooping configuration:
------------------------------------
IGMP snooping             : Enabled
IGMPv3 snooping           : Enabled
Report suppression        : Enabled
TCN solicit query         : Disabled
TCN flood query count     : 2

Vlan 2:
--------
IGMP snooping                  : Enabled
IGMPv2 immediate leave         : Disabled
Explicit host tracking         : Disabled
Multicast router learning mode : pim-dvmrp
CGMP interoperability mode     : IGMP_ONLY
Explicit host tracking         : Disabled
Switch#
```

Related Commands

Command	Description
ip igmp snooping vlan immediate-leave	Enables IGMP immediate-leave processing.
ip igmp snooping vlan mrouter	Configures a Layer 2 interface as a multicast router interface for a VLAN.

Command	Description
ip igmp snooping vlan static	Configures a Layer 2 interface as a member of a group.
show ip igmp snooping membership	Displays host membership information.

ip igmp snooping vlan immediate-leave

To enable IGMP immediate-leave processing, use the **ip igmp snooping vlan immediate-leave** command. To disable immediate-leave processing, use the **no** form of this command.

ip igmp snooping vlan *vlan_num* **immediate-leave**

no ip igmp snooping vlan *vlan_num* **immediate-leave**

Syntax Description

vlan_num	Number of the VLAN; valid values are from 1 to 4094.
immediate-leave	Enables immediate leave processing.

Defaults

Immediate leave processing is disabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

You enter this command in global configuration mode only.

Use the immediate-leave feature only when there is a single receiver for the MAC group for a specific VLAN.

The immediate-leave feature is supported only with IGMP version 2 hosts.

Examples

This example shows how to enable IGMP immediate-leave processing on VLAN 4:

```
Switch(config)# ip igmp snooping vlan 4 immediate-leave
Switch(config)#
```

This example shows how to disable IGMP immediate-leave processing on VLAN 4:

```
Switch(config)# no ip igmp snooping vlan 4 immediate-leave
Switch(config)#
```

Related Commands

Command	Description
ip igmp snooping	Enables IGMP snooping.
ip igmp snooping vlan mrouter	Configures a Layer 2 interface as a multicast router interface for a VLAN.
ip igmp snooping vlan static	Configures a Layer 2 interface as a member of a group.

Command	Description
show ip igmp interface	Displays the information about the IGMP-interface status and configuration.
show mac-address-table multicast	Displays information about the multicast MAC address table.

ip igmp snooping vlan mrouter

To statically configure an Layer 2 interface as a multicast router interface for a VLAN, use the **ip igmp snooping vlan mrouter** command. To remove the configuration, use the **no** form of this command.

ip igmp snooping vlan *vlan-id* **mrouter** {**interface** {{**fastethernet** *slot/port*} | {**gigabitethernet** *slot/port*} | {**tengigabitethernet** *slot/port*} | {**port-channel** *number*}} | {**learn** {**cgmp** | **pim-dvmrp**}}

no ip igmp snooping vlan *vlan-id* **mrouter** {**interface** {{**fastethernet** *slot/port*} | {**gigabitethernet** *slot/port*} | {**tengigabitethernet** *slot/port*} | {**port-channel** *number*}} | {**learn** {**cgmp** | **pim-dvmrp**}}

Syntax Description

vlan *vlan-id*	Specifies the VLAN ID number to use in the command; valid values are from 1 to 4094.
interface	Specifies the next-hop interface to a multicast switch.
fastethernet *slot/port*	Specifies the Fast Ethernet interface; number of the slot and port.
gigabitethernet *slot/port*	Specifies the Gigabit Ethernet interface; number of the slot and port.
tengigabitethernet *slot/port*	Specifies the 10-Gigabit Ethernet interface; number of the slot and port.
port-channel *number*	Port-channel number; valid values are from 1 to 64.
learn	Specifies the multicast switch learning method.
cgmp	Specifies the multicast switch snooping CGMP packets.
pim-dvmrp	Specifies the multicast switch snooping PIM-DVMRP packets.

Defaults

Multicast switch snooping PIM-DVMRP packets are specified.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.1(12c)EW	Support for extended addressing was added.
12.2(25)EW	Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch.

Usage Guidelines

You enter this command in VLAN interface configuration mode only.

The interface to the switch must be in the VLAN where you are entering the command. It must be both administratively up and line protocol up.

The CGMP learning method can decrease control traffic.

The learning method that you configure is saved in NVRAM.

The static connections to multicast interfaces are supported only on switch interfaces.

Examples

This example shows how to specify the next-hop interface to a multicast switch:

```
Switch(config-if)# ip igmp snooping 400 mrouter interface fastethernet 5/6
Switch(config-if)#
```

This example shows how to specify the multicast switch learning method:

```
Switch(config-if)# ip igmp snooping 400 mrouter learn cgmp
Switch(config-if)#
```

Related Commands

Command	Description
ip igmp snooping	Enable IGMP snooping.
ip igmp snooping vlan immediate-leave	Enable IGMP immediate-leave processing.
ip igmp snooping vlan static	Configures a Layer 2 interface as a member of a group.
show ip igmp snooping	Displays information on dynamically learned and manually configured VLAN switch interfaces.
show ip igmp snooping mrouter	Displays information on the dynamically learned and manually configured multicast switch interfaces.

ip igmp snooping vlan static

To configure a Layer 2 interface as a member of a group, use the **ip igmp snooping vlan static** command. To remove the configuration, use the **no** form of this command.

ip igmp snooping vlan *vlan_num* **static** *mac-address* {**interface** {**fastethernet** *slot/port*} | {**gigabitethernet** *slot/port*} | {**tengigabitethernet** *slot/port*} | {**port-channel** *number*}}

no ip igmp snooping vlan *vlan_num* **static** *mac-address* {**interface** {**fastethernet** *slot/port*} | {**gigabitethernet** *slot/port*} | {**tengigabitethernet** *mod/interface-number*} | {**port-channel** *number*}}

Syntax Description

vlan_num	Number of the VLAN.
mac-address	Group MAC address.
interface	Specifies the next-hop interface to multicast switch.
fastethernet *slot/port*	Specifies the Fast Ethernet interface; number of the slot and port.
gigabitethernet *slot/port*	Specifies the Gigabit Ethernet interface; number of the slot and port.
tengigabitethernet *slot/port*	Specifies the 10-Gigabit Ethernet interface; number of the slot and port.
port-channel *number*	Port-channel number; valid values are from 1 through 64.

Defaults

This command has no default settings.

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(25)EW	Support for the 10-Gigabit Ethernet interface was introduced on the Catalyst 4500 series switch.

Examples

This example shows how to configure a host statically on an interface:

```
Switch(config)# ip igmp snooping vlan 4 static 0100.5e02.0203 interface fastethernet 5/11
Configuring port FastEthernet5/11 on group 0100.5e02.0203 vlan 4
Switch(config)#
```

Related Commands

Command	Description
ip igmp snooping	Enable IGMP snooping.
ip igmp snooping vlan immediate-leave	Enable IGMP immediate-leave processing.

Command	Description
ip igmp snooping vlan mrouter	Configures a Layer 2 interface as a multicast router interface for a VLAN.
show mac-address-table multicast	Displays information about the multicast MAC address table.

ip local-proxy-arp

To enable the local proxy ARP feature, use the **ip local-proxy-arp** command. To disable the local proxy ARP feature, use the **no** form of this command.

ip local-proxy-arp

no ip local-proxy-arp

Syntax Description

This command has no arguments or keywords.

Defaults

Local proxy ARP is disabled.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

Use this feature only on subnets where hosts are intentionally prevented from communicating directly to the switch on which they are connected.

ICMP redirect is disabled on interfaces where the local proxy ARP feature is enabled.

Examples

This example shows how to enable the local proxy ARP feature:

```
Switch(config-if)# ip local-proxy-arp
Switch(config-if)#
```

ip mfib fastdrop

To enable MFIB fast drop, use the **ip mfib fastdrop** command. To disable MFIB fast drop, use the **no** form of this command.

ip mfib fastdrop

no ip mfib fastdrop

Syntax Description

This command has no arguments or keywords.

Defaults

MFIB fast drop is enabled.

Command Modes

Privileged EXEC mode

Command History

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

Examples

This example shows how to enable MFIB fast drops:

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

Related Commands

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

ip multicast multipath

To enable load splitting of IP multicast traffic over Equal Cost Multipath (ECMP), use the **ip multicast multipath** command in global configuration mode. To disable this functionality, use the **no** form of this command.

ip multicast [**vrf** *vrf-name*] **multipath** [**s-g-hash** {**basic** | **next-hop-based**}]

no ip multicast [**vrf** *vrf-name*] **multipath** [**s-g-hash** {**basic** | **next-hop-based**}]

Syntax Description

vrf *vrf-name*	(Optional) Enables ECMP multicast load splitting for IP multicast traffic associated with the Multicast Virtual Private Network (MVPN) routing and forwarding (MVRF) instance specified for the *vrf-name* argument.
s-g-hash basic | **next-hop-based**	(Optional) Enables ECMP multicast load splitting based on source and group address or on source, group, and next-hop address. The **basic** keyword enables a simple hash based on source and group address. This algorithm is referred to as the basic S-G-hash algorithm. The **next-hop-based** keyword enables a more complex hash based on source, group, and next-hop address. This algorithm is referred to as the next-hop-based S-G-hash algorithm.

Command Default

If multiple equal-cost paths exist, multicast traffic will not be load-split across those paths.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(53)SG	The **s-g-hash** keyword was introduced on the Catalyst 4500 switch.

Usage Guidelines

The **ip multicast multipath** command does not work with bidirectional Protocol Independent Multicast (PIM).

Use the **ip multicast multipath** command to enable load splitting of IP multicast traffic across multiple equal-cost paths.

If two or more equal-cost paths from a source are available, unicast traffic will be load-split across those paths. However, by default, multicast traffic is not load-split across multiple equal-cost paths. In general, multicast traffic flows down from the reverse path forwarding (RPF) neighbor. According to the PIM specifications, this neighbor must have the highest IP address if more than one neighbor has the same metric.

When you configue load splitting with the **ip multicast multipath** command, the system splits multicast traffic across multiple equal-cost paths based on source address using the S-hash algorithm. When the **ip multicast multipath** command is configured and multiple equal-cost paths exist, the path in which

multicast traffic will travel is selected based on the source IP address. Multicast traffic from different sources will be load-split across the different equal-cost paths. Load splitting will not occur across equal-cost paths for multicast traffic from the same source sent to different multicast groups.

Note The **ip multicast multipath** command load splits the traffic but does not load balance the traffic. Traffic from a source will use only one path, even if the traffic greatly exceeds traffic from other sources.

If the **ip multicast multipath** command is configured with the **s-g-hash** keyword and multiple equal-cost paths exist, load splitting will occur across equal-cost paths based on source and group address or on source, group, and next-hop address. If you specify the optional **s-g-hash** keyword for load splitting IP multicast traffic, you must select the algorithm used to calculate the equal-cost paths by specifying one of the following keywords:

- **basic**—The basic S-G-hash algorithm is predictable because no randomization is used in calculating the hash value. The basic S-G-hash algorithm, however, is subject to polarization because for a given source and group the same hash is always chosen irrespective of the router that the hash is being calculated on.
- **next-hop-based**—The next-hop-based S-G-hash algorithm is predictable because no randomization is used to determine the hash value. Unlike the S-hash and basic S-G-hash algorithms, the next-hop-based hash mechanism is not subject to polarization.

Examples

The following example shows how to enable ECMP multicast load splitting on a router based on source address using the S-hash algorithm:

```
Switch(config)# ip multicast multipath
```

The following example shows how to enable ECMP multicast load splitting on a router based on source and group address using the basic S-G-hash algorithm:

```
Switch(config)# ip multicast multipath s-g-hash basic
```

The following example shows how to enable ECMP multicast load splitting on a router based on source, group, and next-hop address using the next-hop-based S-G-hash algorithm:

```
Switch(config)# ip multicast multipath s-g-hash next-hop-based
```

ip route-cache flow

To enable NetFlow statistics for IP routing, use the **ip route-cache flow** command. To disable NetFlow statistics, use the **no** form of this command.

ip route-cache flow [**infer-fields**]

no ip route-cache flow [**infer-fields**]

Syntax Description

infer-fields	(Optional) Includes the NetFlow fields as inferred by the software: Input identifier, Output identifier, and Routing information.

Defaults

NetFlow statistics is disabled.

Inferred information is excluded.

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(13)EW	Support for this command was introduced on the Catalyst 4500 series switches.
12.1(19)EW	Command enhanced to support infer fields.

Usage Guidelines

To use these commands, you need to install the Supervisor Engine IV and the NetFlow Service Card.

The NetFlow statistics feature captures a set of traffic statistics. These traffic statistics include the source IP address, destination IP address, Layer 4 port information, protocol, input and output identifiers, and other routing information that can be used for network analysis, planning, accounting, billing and identifying DoS attacks.

NetFlow switching is supported on IP and IP-encapsulated traffic over all interface types.

If you enter the **ip route-cache flow infer-fields** command after the **ip route-cache flow** command, you will purge the existing cache, and vice versa. This action is done to avoid having flows with and without inferred fields in the cache simultaneously.

For additional information on NetFlow switching, refer to the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide*.

Note NetFlow consumes additional memory and CPU resources compared to other switching modes. You need to know the resources required on your switch before enabling NetFlow.

Examples

This example shows how to enable NetFlow switching on the switch:

```
Switch# config terminal
Switch(config)# ip route-cache flow
Switch(config)# exit
Switch#
```

Note This command does not work on individual interfaces.

ip source binding

To add or delete a static IP source binding entry, use the **ip source binding** command. To delete the corresponding IP source binding entry, use the **no** form of this command.

ip source binding *ip-address mac-address* **vlan** *vlan-id* **interface** *interface-name*

no ip source binding *ip-address mac-address* **vlan** *vlan-id* **interface** *interface-name*

Syntax Description

ip-address	Binding IP address.
mac-address	Binding MAC address.
vlan *vlan-id*	VLAN number.
interface *interface-name*	Binding interface.

Defaults

This command has no default settings.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

The **ip source binding** command is used to add a static IP source binding entry only.

The **no** form of this command deletes the corresponding IP source binding entry. For the deletion to succeed, all required parameters must match.

Each static IP binding entry is keyed by a MAC address and VLAN number. If the CLI contains an existing MAC and VLAN, the existing binding entry will be updated with the new parameters; a separate binding entry will not be created.

Examples

This example shows how to configure the static IP source binding:

```
Switch# config terminal
Switch(config)# ip source binding 11.0.0.1 0000.000A.000B vlan 10 interface
fastethernet6/10
Switch(config)#
```

Related Commands

Command	Description
show ip source binding	Displays IP source bindings that are configured on the system.

ip sticky-arp

To enable sticky ARP, use the **ip sticky-arp** command. Use the **no** form of this command to disable sticky ARP.

ip sticky-arp

no ip sticky-arp

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

This command is supported on PVLANs only.

ARP entries that are learned on Layer 3 PVLAN interfaces are sticky ARP entries. (You should display and verify ARP entries on the PVLAN interface using the **show arp** command).

For security reasons, sticky ARP entries on the PVLAN interface do not age out. Connecting new equipment with the same IP address generates a message and the ARP entry is not created.

Because the ARP entries on the PVLAN interface do not age out, you must manually remove ARP entries on the PVLAN interface if a MAC address changes.

Unlike static entries, sticky-ARP entries are not stored and restored when you enter the **reboot** and **restart** commands.

Examples

This example shows how to enable sticky ARP:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config) ip sticky-arp
Switch(config)# end
Switch#
```

This example shows how to disable sticky ARP:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config) no ip sticky-arp
Switch(config)# end
Switch#
```

Related Commands

Command	Description
arp (refer to Cisco IOS documentation)	Enables Address Resolution Protocol (ARP) entries for static routing over the Switched Multimegabit Data Service (SMDS) network.
show arp (refer to Cisco IOS documentation)	Displays ARP information.

ip verify header vlan all

To enable IP header validation for Layer 2-switched IPv4 packets, use the **ip verify header vlan all** command. To disable the IP header validation, use the **no** form of this command.

ip verify header vlan all

no ip verify header vlan all

Syntax Description

This command has no default settings.

Defaults

The IP header is validated for bridged and routed IPv4 packets.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

This command does not apply to Layer 3-switched (routed) packets.

The Catalyst 4500 series switch checks the validity of the following fields in the IPv4 header for all switched IPv4 packets:

- The version must be 4.
- The header length must be greater than or equal to 20 bytes.
- The total length must be greater than or equal to four times the header length and greater than the Layer 2 packet size minus the Layer 2 encapsulation size.

If an IPv4 packet fails the IP header validation, the packet is dropped. If you disable the header validation, the packets with the invalid IP headers are bridged but are not routed even if routing was intended. The IPv4 access lists also are not applied to the IP headers.

Examples

This example shows how to disable the IP header validation for the Layer 2-switched IPv4 packets:

```
Switch# config terminal
Switch(config)# no ip verify header vlan all
Switch(config)# end
Switch#
```

ip verify source

To enable IP source guard on untrusted Layer 2 interfaces, use the **ip verify source** command. To disable IP source guard on untrusted Layer 2 interfaces, use the **no** form of this command.

ip verify source {**vlan dhcp-snooping** | **tracking**} [**port-security**]

no ip verify source {**vlan dhcp-snooping** | **tracking**} [**port-security**]

Syntax Description

vlan dhcp-snooping	Enables IP source guard on untrusted Layer 2 DHCP snooping interfaces.
tracking	Enables IP port security to learn static IP address learning on a port.
port-security	(Optional) Filters both source IP and MAC addresses using the port security feature.

Defaults

IP source guard is disabled.

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(19)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(37)SG	Added support for IP port security and tracking.

Examples

This example shows how to enable IP source guard on VLANs 10 through 20 on a per-port basis:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip dhcp snooping
Switch(config)# ip dhcp snooping vlan 10 20
Switch(config)# interface fastethernet6/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# switchport trunk native vlan 10
Switch(config-if)# switchport trunk allowed vlan 11-20
Switch(config-if)# no ip dhcp snooping trust
Switch(config-if)# ip verify source vlan dhcp-snooping
Switch(config)# end
Switch# show ip verify source interface f6/1
Interface  Filter-type  Filter-mode  IP-address       Mac-address        Vlan
---------  -----------  -----------  ---------------  -----------------  ----------
Fa6/1      ip-mac       active       10.0.0.1                            10
Fa6/1      ip-mac       active       deny-all                            11-20
Switch#
```

This example shows how to enable IP port security with IP-MAC filters on a Layer 2 access port:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ip device tracking
Switch(config)# interface fastEthernet 4/3
Switch(config-if)# switchport mode access
Switch(config-if)# switchport access vlan 1
Switch(config-if)# ip device tracking maximum 5
Switch(config-if)# switchport port-security
Switch(config-if)# switchport port-security maximum 5
Switch(config-if)# ip verify source tracking port-security
Switch(config-if)# end
```

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

Related Commands

Command	Description
ip device tracking maximum	Enables IP port security binding tracking on a Layer 2 port.
ip dhcp snooping	Globally enables DHCP snooping.
ip dhcp snooping information option	Enables DHCP option 82 data insertion.
ip dhcp snooping limit rate	Configures the number of the DHCP messages that an interface can receive per second.
ip dhcp snooping trust	Enables DHCP snooping on a trusted VLAN.
ip source binding	Adds or delete a static IP source binding entry.
show ip dhcp snooping	Displays the DHCP snooping configuration.
show ip dhcp snooping binding	Displays the DHCP snooping binding entries.
show ip source binding	Displays IP source bindings that are configured on the system.
show ip verify source	Displays the IP source guard configuration and filters on a particular interface.

ip verify unicast source reachable-via

To enable and configure unicast RPF checks on a Supervisor Engine 6-E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948E IPv4 interface, use the **ip verify unicast source reachable-via** command. To disable unicast RPF, use the **no** form of this command.

ip verify unicast source reachable-via rx allow-default

no ip verify unicast source reachable-via

Syntax Description

rx	Verifies that the source address is reachable on the interface where the packet was received.
allow-default	Verifies that the default route matches the source address.

Defaults

Disabled

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(40)SG	Support for this command was introduced on the Catalyst 4500 with a Supervisor Engine 6-E and the Catalyst 4900M chassis.

Usage Guidelines

In basic RX mode, unicast RPF ensures a source address must be reachable on the arrived interface. For example, the source must be reachable without load balancing.

Note Unicast RPF is an input function and is applied only on the input interface of a router at the upstream end of a connection.

Do not use unicast RPF on internal network interfaces. Internal interfaces might have routing asymmetry, which means that there are multiple routes to the source of a packet. Apply unicast RPF only where there is natural or configured symmetry.

Examples

This example shows how to enable unicast RPF exist-only checking mode:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# ip verify unicast source reachable-via rx allow-default
Switch(config-if)# end
Switch#
```

Related Commands

Command	Description
ip cef (refer to Cisco IOS documentation)	Enables Cisco Express Forwarding (CEF) on the switch.
show running-config	Displays the current running configuration for a switch.

ip wccp

To enable support of the specified Web Cache Communication Protocol (WCCP) service for participation in a service group, use the **ip wccp** command in global configuration mode. To disable the service group, use the **no** form of this command.

ip wccp {**web-cache** | *service-number*} [**accelerated**] [**group-address** *multicast-address*] [**redirect-list** *access-list*] [**group-list** *access-list*] [**password** [**0** | **7**] *password*]

no ip wccp {**web-cache** | *service-number*}[**accelerated**] [**group-address** *multicast-address*] [**redirect-list** *access-list*] [**group-list** *access-list*] [**password** [**0** | **7**] *password*]

Syntax Description

web-cache	Specifies the web-cache service. **Note** Web cache counts as one service. The maximum number of services, including those assigned with the *service-number* argument, are 8.
service-number	Dynamic service identifier, which means the service definition is dictated by the cache. The dynamic service number can be from 0 to 254. The maximum number of services is 8, which includes the web-cache service specified with the **web-cache** keyword. **Note** If Cisco cache engines are being used in your service group, the reverse-proxy service is indicated by a value of 99.
accelerated	(Optional) This option applies only to hardware-accelerated routers. This keyword configures the service group to prevent a connection being formed with a cache engine unless the cache engine is configured in a way that allows redirection on the router to benefit from hardware acceleration.
group-address *multicast-address*	(Optional) Multicast IP address that communicates with the WCCP service group. The multicast address is used by the router to determine which cache engine should receive redirected messages.
redirect-list *access-list*	(Optional) Access list that controls traffic redirected to this service group. The *access-list* argument should consist of a string of no more than 64 characters (name or number) that specifies the access list.
group-list *access-list*	(Optional) Access list that determines which cache engines are allowed to participate in the service group. The *access-list* argument specifies either the number or the name of a standard or extended access list.
password [**0**	**7**] *password*	(Optional) Message digest algorithm 5 (MD5) authentication for messages received from the service group. Messages that are not accepted by the authentication are discarded. The encryption type can be 0 or 7, with 0 specifying not yet encrypted and 7 for proprietary. The *password* argument can be up to eight characters in length.

Command Default

WCCP services are not enabled on the router.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(31)SG	Support introduced on the Catalyst 4500 series switch.
15.0(2)SG/3.2(0)SG	Supported extended to Supervisor Engine 6-E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948E.
15.0(2)SG1	Support for **redirect-list** was introduced.

Usage Guidelines

This command instructs a router to enable or disable the support for the specified service number or the web-cache service name. A service number can be from 0 to 254. Once the service number or name is enabled, the router can participate in the establishment of a service group.

When the **no ip wccp** command is entered, the router terminates participation in the service group, deallocates space if none of the interfaces still has the service configured, and terminates the WCCP task if no other services are configured.

The keywords following the **web-cache** keyword and the *service-number* argument are optional and may be specified in any order, but only may be specified once. The following sections outline the specific usage of each of the optional forms of this command.

ip wccp {**web-cache** | *service-number*} **group-address** *multicast-address*

A WCCP group address can be configured to set up a multicast address that cooperating routers and web caches can use to exchange WCCP protocol messages. If such an address is used, IP multicast routing must be enabled so that the messages that use the configured group (multicast) addresses are received correctly.

This option instructs the router to use the specified multicast IP address to coalesce the "I See You" responses for the "Here I Am" messages that it has received on this group address. The response is sent to the group address as well. The default is for no group address to be configured, in which case all "Here I Am" messages are responded to with a unicast reply.

ip wccp {**web-cache** | *service-number*} **redirect-list** *access-list*

This option instructs the router to use an access list to control the traffic that is redirected to the web caches of the service group specified by the service name given. The *access-list* argument specifies either the number or the name of a standard or extended access list. The access list itself specifies which traffic is permitted to be redirected. The default is for no redirect list to be configured (all traffic is redirected).

WCCP requires that the following protocol and ports not be filtered by any access lists:

- User Datagram Protocol (UDP) (protocol type 17) port 2048. This port is used for control signaling. Blocking this type of traffic will prevent WCCP from establishing a connection between the router and cache engines.

ip wccp {**web-cache** | *service-number*} **group-list** *access-list*

This option instructs the router to use an access list to control the cache engines that are allowed to participate in the specified service group. The *access-list* argument specifies either the number of a standard or extended access list or the name of any type of named access list. The access list itself specifies which cache engines are permitted to participate in the service group. The default is for no group list to be configured, in which case all cache engines may participate in the service group.

Note The **ip wccp** {**web-cache** | *service-number*} **group-list** command syntax resembles the **ip wccp** {**web-cache** | *service-number*} **group-listen** command, but these are entirely different commands. The **ip wccp group-listen** command is an interface configuration command used to configure an interface to listen for multicast notifications from a cache cluster. Refer to the description of the **ip wccp group-listen** command in the *Cisco IOS IP Application Services Command Reference*.

ip wccp {**web-cache** | *service-number*} **password** *password*

This option instructs the router to use MD5 authentication on the messages received from the service group specified by the service name given. Use this form of the command to set the password on the router. You must also configure the same password separately on each web cache. The password can be up to a maximum of eight characters. Messages that do not authenticate when authentication is enabled on the router are discarded. The default is for no authentication password to be configured and for authentication to be disabled.

Examples

The following example shows how to configure a router to run WCCP reverse-proxy service, using the multicast address of 239.0.0.0:

```
Router(config)# ip multicast-routing
Router(config)# ip wccp 99 group-address 239.0.0.0
Router(config)# interface gigabitethernet 3/1
Router(config-if)# ip wccp 99 group-listen
```

The following example shows how to configure a router to redirect web-related packets without a destination of 10.168.196.51 to the web cache:

```
Router(config)# access-list 100 deny ip any host 10.168.196.51
Router(config)# access-list 100 permit ip any any
Router(config)# ip wccp web-cache redirect-list 100
Router(config)# interface gigabitethernet 3/2
Router(config-if)# ip wccp web-cache redirect out
```

Related Commands

Command	Description
ip wccp check services all	Enables all WCCP services.
ip wccp version	Specifies which version of WCCP you wish to use on your router.
show ip wccp	Displays global statistics related to WCCP.

ip wccp check services all

To enable all Web Cache Communication Protocol (WCCP) services, use the **ip wccp check services all** command in global configuration mode. To disable all services, use the **no** form of this command.

ip wccp check services all

no ip wccp check services all

Syntax Description

This command has no arguments or keywords.

Defaults

WCCP services are not enabled on the router.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(31)SG	Support introduced on the Catalyst 4500 series switch.
IOS XE 3.2(0)SG (15.0(2)SG)	Support extended to Supervisor Engine 6-E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948E.

Usage Guidelines

With the **ip wccp check services all** command, WCCP can be configured to check all configured services for a match and perform redirection for those services if appropriate. The caches to which packets are redirected can be controlled by a redirect ACL access control list (ACL) as well as by the priority value of the service.

It is possible to configure an interface with more than one WCCP service. When more than one WCCP service is configured on an interface, the precedence of a service depends on the relative priority of the service compared to the priority of the other configured services. Each WCCP service has a priority value as part of its definition.

If no WCCP services are configured with a redirect ACL, the services are considered in priority order until a service is found which matches the IP packet. If no services match the packet, the packet is not redirected. If a service matches the packet and the service has a redirect ACL configured, then the IP packet will be checked against the ACL. If the packet is rejected by the ACL, the packet will not be passed down to lower priority services unless the **ip wccp check services all** command is configured. When the **ip wccp check services all** command is configured, WCCP will continue to attempt to match the packet against any remaining lower priority services configured on the interface.

Note The priority of a WCCP service group is determined by the web cache appliance. The priority of a WCCP service group cannot be configured via Cisco IOS software.

Note The **ip wccp check services all** command is a global WCCP command that applies to all services and is not associated with a single service.

Examples

The following example shows how to configure all WCCP services:

```
Router(config)# ip wccp check services all
```

Related Commands

Command	Description
ip wccp	Enables support of the specified WCCP service for participation in a service group.
ip wccp group-listen	Configures an interface on a router to enable or disable the reception of IP multicast packets for Web Cache Communication Protocol (WCCP).
ip wccp redirect	Enables packet redirection on an inbound or outbound interface using Web Cache Communication Protocol (WCCP).
ip wccp redirect exclude in	Configure an interface to exclude packets received on an interface from being checked for redirection.
ip wccp version	Specifies which version of WCCP you wish to use on your router.

ip wccp group-listen

To configure an interface on a router to enable or disable the reception of IP multicast packets for Web Cache Communication Protocol (WCCP), use the **ip wccp group-listen** command in interface configuration mode. To disable the reception of IP multicast packets for WCCP, use the **no** form of this command.

ip wccp {**web-cache** | *service-number*} **group-listen**

no ip wccp {**web-cache** | *service-number*} **group-listen**

Syntax Description

web-cache	The web cache service.
service-number	WCCP service number; valid values are from 0 to 254.

Defaults

This command is disabled by default.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(31)SG	Support introduced on the Catalyst 4500 series switch.
IOS XE 3.2(0)SG (15.0(2)SG)	Support extended to Supervisor Engine 6-E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948E.

Usage Guidelines

On routers that are to be members of a Service Group when IP multicast is used, the following configuration is required:

- Configure the IP multicast address for use by the WCCP Service Group.
- Configure the interfaces on which the router wishes to receive the IP multicast address with the **ip wccp** {**web-cache** | *service-number*} **group-listen** interface configuration command.

Examples

The following example shows how to enable the multicast packets for a web cache with a multicast address of 224.1.1.100:

```
Switch# configure terminal
Switch(config)# ip wccp web-cache group-address 224.1.1.100
Switch(config)# interface gigabitethernet 3/1
Switch(config-if)# ip wccp web-cache group-listen
```

Related Commands

Command	Description
ip wccp	Enables support of the WCCP service for participation in a service group.
ip wccp check services all	Enables all Web Cache Communication Protocol (WCCP) services.
ip wccp redirect	Enables WCCP redirection on an interface.
ip wccp redirect	Enables packet redirection on an inbound or outbound interface using Web Cache Communication Protocol (WCCP).
ip wccp redirect exclude in	Configures an interface to exclude packets received on an interface from being checked for redirection.
ip wccp version	Specifies which version of WCCP you wish to use on your router.

ip wccp redirect

To enable packet redirection on an inbound or outbound interface using Web Cache Communication Protocol (WCCP), use the **ip wccp redirect** command in interface configuration mode. To disable WCCP redirection, use the **no** form of this command.

ip wccp {**web-cache** | *service-number*} **redirect** {**in** | **out**}

no ip wccp {**web-cache** | *service-number*} **redirect** {**in** | **out**}

Syntax Description

web-cache	Enables the web cache service.
service-number	Identification number of the cache engine service group; valid values are from 0 to 254. If Cisco cache engines are used in the cache cluster, the reverse proxy service is indicated by a value of 99.
in	Specifies packet redirection on an inbound interface.
out	Specifies packet redirection on an outbound interface.

Command Default

Redirection checking on the interface is disabled.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(31)SG	Support introduced on the Catalyst 4500 series switch.
IOS XE 3.2(0)SG (15.0(2)SG)	Support extended to Supervisor Engine 6-E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948E.
15.0(2)SG1	**web-cache** and **service-number** keywords supports on Supervisor Engine 6-E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948E.

Usage Guidelines

The **ip wccp {web-cache | service-number} redirect in** command allows you to configure WCCP redirection on an interface receiving inbound network traffic. When the command is applied to an interface, all packets arriving at that interface will be compared against the criteria defined by the specified WCCP service. If the packets match the criteria, they will be redirected.

Likewise, the **ip wccp {web-cache | service-number} redirect out** command allows you to configure the WCCP redirection check at an outbound interface.

Tips

Be careful not to confuse the **ip wccp {web-cache | service-number} redirect** {**out** | **in**} interface configuration command with the **ip wccp redirect exclude in** interface configuration command.

Examples

The following example shows how to configure a session in which reverse proxy packets on Ethernet interface 3/1 are being checked for redirection and redirected to a Cisco Cache Engine:

```
Switch(config)# ip wccp 99
Switch(config)# interface gigabitethernet 3/1
Switch(config-if)# ip wccp 99 redirect out
```

The following example shows how to configure a session in which HTTP traffic arriving on GigabitEthernet interface 3/1 is redirected to a Cache Engine:

```
Switch(config)# ip wccp web-cache
Switch(config)# interface gigabitethernet 3/1
Switch(config-if)# ip wccp web-cache redirect in
```

Related Commands

Command	Description
ip wccp check services all	Configures an interface on a router to enable or disable the reception of IP multicast packets for Web Cache Communication Protocol (WCCP).
ip wccp group-listen	Configures an interface on a router to enable or disable the reception of IP multicast packets for Web Cache Communication Protocol (WCCP).
ip wccp redirect exclude in	Enables redirection exclusion on an interface.
show ip interface	Displays the usability status of interfaces that are configured for IP.
show ip wccp	Displays the WCCP global configuration and statistics.

p wccp redirect exclude in

To configure an interface to exclude packets received on an interface from being checked for redirection, use the **ip wccp redirect exclude in** command in interface configuration mode. To disable the ability of a router to exclude packets from redirection checks, use the **no** form of this command.

ip wccp redirect exclude in

no ip wccp redirect exclude in

Syntax Description

This command has no arguments or keywords.

Command Default

Redirection exclusion is disabled.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(31)SG	Support introduced on the Catalyst 4500 series switch.
IOS XE 3.2(0)SG (15.0(2)SG)	Support extended to Supervisor Engine 6-E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948E.

Usage Guidelines

This configuration command instructs the interface to exclude inbound packets from any redirection check. Note that the command is global to all the services and should be applied to any inbound interface that will be excluded from redirection.

This command is intended to be used to accelerate the flow of packets from a cache engine to the Internet as well as allow for the use of the Web Cache Communication Protocol (WCCP) v2 packet return feature.

Examples

In the following example, packets arriving on GigabitEthernet interface 3/1 are excluded from WCCP output redirection checks:

```
Router (config)# interface gigabitethernet 3/1
Router (config-if)# ip wccp redirect exclude in
```

Related Commands

Command	Description
ip wccp	Enables support of the WCCP service for participation in a service group.
ip wccp redirect	Enable packet redirection on an inbound or outbound interface using Web Cache Communication Protocol (WCCP).
ip wccp redirect out	Configures redirection on an interface in the outgoing direction.
ip wccp check services all	Configures an interface on a router to enable or disable the reception of IP multicast packets for Web Cache Communication Protocol (WCCP).

Command	Description
ip wccp group-listen	Configures an interface on a router to enable or disable the reception of IP multicast packets for Web Cache Communication Protocol (WCCP).
ip wccp redirect exclude in	Enables redirection exclusion on an interface.
show ip interface	Displays the usability status of interfaces that are configured for IP.
show ip wccp	Displays the WCCP global configuration and statistics.

ipv6 mld snooping

To enable IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping globally or on the specified VLAN, use the **ipv6 mld snooping** command without keywords. To disable MLD snooping on a switch or the VLAN, use the **no** form of this command.

ipv6 mld snooping [**vlan** *vlan-id*]

no ipv6 mld snooping [**vlan** *vlan-id*]

Syntax Description

vlan *vlan-id*	(Optional) Enables or disables IPv6 MLD snooping on the specified VLAN. The VLAN ID range is 1 to 1001 and 1006 to 4094.

Defaults

MLD snooping is globally disabled on the switch.

MLD snooping is enabled on all VLANs. However, MLD snooping must be globally enabled before VLAN snooping can take place.

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(40)SG	This command was introduced on the Catalyst 4500.

Usage Guidelines

When MLD snooping is globally disabled, it is disabled on all the existing VLAN interfaces. When you globally enable MLD snooping, it is enabled on all VLAN interfaces that are in the default state (enabled). VLAN configuration overrides global configuration on interfaces on which MLD snooping has been disabled.

If MLD snooping is globally disabled, you cannot enable it on a VLAN. If MLD snooping is globally enabled, you can disable it on individual VLANs.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

Examples

This example shows how to globally enable MLD snooping:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping
Switch(config)# end
Switch#
```

This example shows how to disable MLD snooping on a VLAN:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# no ipv6 mld snooping vlan 11
Switch(config)# end
Switch#
```

You can verify your settings by entering the **show ipv6 mld snooping** user EXEC command.

Related Commands

Command	Description
show ipv6 mld snooping	Displays IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping configuration of the switch or the VLAN.

ipv6 mld snooping last-listener-query-count

To configure IP version 6 (IPv6) Multicast Listener Discovery Mulitcast Address Specific Queries (MASQs) that will be sent before aging out a client, use the **ipv6 mld snooping last-listener-query-count** command. To reset the query count to the default settings, use the **no** form of this command.

ipv6 mld snooping [**vlan** *vlan-id*] **last-listener-query-count** *integer_value*

no ipv6 mld snooping [**vlan** *vlan-id*] **last-listener-query-count**

Syntax Description

vlan *vlan-id*	(Optional) Configures last-listener query count on the specified VLAN. The VLAN ID range is 1 to 1001 and 1006 to 4094.
integer_value	The integer range is 1 to 7.

Command Default

The default global count is 2.

The default VLAN count is 0 (the global count is used).

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(40)SG	This command was introduced on the Catalyst 4500.

Usage Guidelines

In MLD snooping, the IPv6 multicast switch periodically sends out queries to hosts belonging to the multicast group. If a host wants to leave a multicast group, it can silently leave or it can respond to the query with a Multicast Listener Done message (equivalent to an IGMP Leave message). When Immediate Leave is not configured (it should not be configured if multiple clients for a group exist on the same port), the configured last-listener query count determines the number of MASQs that are sent before an MLD client is aged out.

When the last-listener query count is set for a VLAN, this count overrides the value configured globally. When the VLAN count is not configured (set to the default of 0), the global count is used.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

Examples

This example shows how to globally set the last-listener query count:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping last-listener-query-count 1
Switch(config)# end
Switch#
```

This example shows how to set the last-listener query count for VLAN 10:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping vlan 10 last-listener-query-count 3
Switch(config)# end
Switch#
```

You can verify your settings by entering the **show ipv6 mld snooping** [**vlan** *vlan-id*] user EXEC command.

Related Commands

Command	Description
ipv6 mld snooping last-listener-query-interval	Configures IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping last-listener query interval on the switch or on a VLAN.
show ipv6 mld snooping	Displays IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping configuration of the switch or the VLAN.
show ipv6 mld snooping querier	Displays IP version 6 (IPv6) MLD snooping querier-related information most recently received by the switch or the VLAN.

ipv6 mld snooping last-listener-query-interval

To configure IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping last-listener query interval on the switch or on a VLAN, use the **ipv6 mld snooping last-listener-query-interval** command. To reset the query time to the default settings, use the **no** form of this command.

ipv6 mld snooping [**vlan** *vlan-id*] **last-listener-query-interval** *integer_value*

no ipv6 mld snooping [**vlan** *vlan-id*] **last-listener-query-interval**

Syntax Description

vlan *vlan-id*	(Optional) Configures last-listener query interval on the specified VLAN. The VLAN ID range is 1 to 1001 and 1006 to 4094.
integer_value	Sets the time period (in thousandths of a second) that a multicast switch must wait after issuing a MASQ before deleting a port from the multicast group. The range is 100 to 32,768. The default is 1000 (1 second),

Command Default

The default global query interval (maximum response time) is 1000 (1 second).

The default VLAN query interval (maximum response time) is 0 (the global count is used).

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(40)SG	This command was introduced on the Catalyst 4500.

Usage Guidelines

The last-listener-query-interval time is the maximum time that a multicast switch waits after issuing a Mulitcast Address Specific Query (MASQ) before deleting a port from the multicast group.

In MLD snooping, when the IPv6 multicast switch receives an MLD leave message, it sends out queries to hosts belonging to the multicast group. If there are no responses from a port to a MASQ for a length of time, the switch deletes the port from the membership database of the multicast address. The last listener query interval is the maximum time that the switch waits before deleting a nonresponsive port from the multicast group.

When a VLAN query interval is set, the global query interval is overridden. When the VLAN interval is set at 0, the global value is used.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

Examples

This example shows how to globally set the last-listener query interval to 2 seconds:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping last-listener-query-interval 2000
Switch(config)# end
Switch#
```

This example shows how to set the last-listener query interval for VLAN 1 to 5.5 seconds:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping vlan 1 last-listener-query-interval 5500
Switch(config)# end
Switch#
```

You can verify your settings by entering the **show ipv6 MLD snooping** [**vlan** *vlan-id*] user EXEC command.

Related Commands

Command	Description
ipv6 mld snooping last-listener-query-count	Configures IP version 6 (IPv6) Multicast Listener Discovery Mulitcast Address Specific Queries (MASQs) that will be sent before aging out a client.
show ipv6 mld snooping querier	Displays IP version 6 (IPv6) MLD snooping querier-related information most recently received by the switch or the VLAN.

ipv6 mld snooping listener-message-suppression

To enable IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping listener message suppression, use the **ipv6 mld snooping listener-message-suppression** command. To disable MLD snooping listener message suppression, use the **no** form of this command.

ipv6 mld snooping listener-message-suppression

no ipv6 mld snooping listener-message-suppression

Command Default

The default is for MLD snooping listener message suppression to be disabled.

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(40)SG	This command was introduced on the Catalyst 4500.

Usage Guidelines

MLD snooping listener message suppression is equivalent to IGMP snooping report suppression. When it is enabled, received MLDv1 reports to a group are forwarded to IPv6 multicast switchs only once in every report-forward time. This prevents the forwarding of duplicate reports.

Examples

This example shows how to enable MLD snooping listener message suppression:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping listener-message-suppression
Switch(config)# end
Switch#
```

This example shows how to disable MLD snooping listener message suppression:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# no ipv6 mld snooping listener-message-suppression
Switch(config)# end
Switch#
```

You can verify your settings by entering the **show ipv6 mld snooping** [**vlan** *vlan-id*] user EXEC command.

Related Commands

Command	Description
ipv6 mld snooping	Enables IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping globally or on the specified VLAN.
show ipv6 mld snooping	Displays IP version 6 (IPv6) MLD snooping configuration of the switch or the VLAN.

ipv6 mld snooping robustness-variable

To configure the number of IP version 6 (IPv6) Multicast Listener Discovery (MLD) queries that the switch sends before deleting a listener that does not respond, or to enter a VLAN ID to configure the number of queries per VLAN, use the **ipv6 mld snooping robustness-variable** command. To reset the variable to the default settings, use the **no** form of this command.

ipv6 mld snooping [**vlan** *vlan-id*] **robustness-variable** *integer_value*

no ipv6 mld snooping [**vlan** *vlan-id*] **robustness-variable**

Syntax Description

vlan *vlan-id*	(Optional) Configures the robustness variable on the specified VLAN. The VLAN ID range is 1 to 1001 and 1006 to 4094.
integer_value	The robustness value ranges from 1 to 3.

Command Default

The default global robustness variable (number of queries before deleting a listener) is 2.

The default VLAN robustness variable (number of queries before aging out a multicast address) is 0, which means that the system uses the global robustness variable for aging out the listener.

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(40)SG	This command was introduced on the Catalyst 4500.

Usage Guidelines

Robustness is measured by the number of MLDv1 queries sent with no response before a port is removed from a multicast group. A port is deleted when there are no MLDv1 reports received for the configured number of MLDv1 queries. The global value determines the number of queries that the switch waits before deleting a listener that does not respond, and it applies to all VLANs that do not have a VLAN value set.

The robustness value configured for a VLAN overrides the global value. If the VLAN robustness value is 0 (the default), the global value is used.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

Examples

This example shows how to configure the global robustness variable so that the switch sends out three queries before it deletes a listener port that does not respond:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping robustness-variable 3
Switch(config)# end
Switch#
```

This example shows how to configure the robustness variable for VLAN 1. This value overrides the global configuration for the VLAN:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping vlan 1 robustness-variable 1
Switch(config)# end
Switch#
```

You can verify your settings by entering the **show ipv6 MLD snooping** [**vlan** *vlan-id*] user EXEC command.

Related Commands

Command	Description
ipv6 mld snooping last-listener-query-count	Configures IP version 6 (IPv6) Multicast Listener Discovery Mulitcast Address Specific Queries (MASQs) that will be sent before aging out a client.
show ipv6 mld snooping	Displays IP version 6 (IPv6) MLD snooping configuration of the switch or the VLAN.

ipv6 mld snooping tcn

To configure IP version 6 (IPv6) Multicast Listener Discovery (MLD) Topology Change Notifications (TCNs), use the **ipv6 mld snooping tcn** commands. To reset the default settings, use the **no** form of the commands.

ipv6 mld snooping tcn {**flood query count** *integer_value* | **query solicit**}

no ipv6 mld snooping tcn {**flood query count** *integer_value* | **query solicit**}

Syntax Description

flood query count *integer_value*	Sets the flood query count, which is the number of queries that are sent before forwarding multicast data to only those ports requesting it. The range is 1 to 10.
query solicit	Enables soliciting of TCN queries.

Command Default

TCN query soliciting is disabled.

When enabled, the default flood query count is 2.

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(25)SG	This command was introduced on the Catalyst 4500.

Examples

This example shows how to enable TCN query soliciting:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping tcn query solicit.
Switch(config)# end
Switch#
```

This example shows how to set the flood query count to 5:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping tcn flood query count 5.
Switch(config)# end
Switch#
```

You can verify your settings by entering the **show ipv6 MLD snooping** [**vlan** *vlan-id*] user EXEC command.

Related Commands

Command	Description
show ipv6 mld snooping	Displays IP version 6 (IPv6) MLD snooping configuration of the switch or the VLAN.

ipv6 mld snooping vlan

To configure IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping parameters on the VLAN interface, use the **ipv6 mld snooping vlan** command. To reset the parameters to the default settings, use the **no** form of this command.

ipv6 mld snooping vlan *vlan-id* [**immediate-leave** | **mrouter interface** *interface-id* | **static** *ipv6-multicast-address* **interface** *interface-id*]

no ipv6 mld snooping vlan *vlan-id* [**immediate-leave** | **mrouter interface** *interface-id* | **static** *ip-address* **interface** *interface-id*]

Syntax Description

vlan *vlan-id*	Specifies a VLAN number. The range is 1 to 1001 and 1006 to 4094.
immediate-leave	(Optional) Enables MLD Immediate-Leave processing on a VLAN interface. Use the **no** form of the command to disable the Immediate Leave feature on the interface.
mrouter interface	(Optional) Configures a multicast switch port. The **no** form of the command removes the configuration.
static *ipv6-multicast-address*	(Optional) Configures a multicast group with the specified IPv6 multicast address.
interface *interface-id*	Adds a Layer 2 port to the group. The mrouter or static interface can be a physical port or a port-channel interface ranging from 1 to 48.

Command Default

MLD snooping Immediate-Leave processing is disabled.

By default, there are no static IPv6 multicast groups.

By default, there are no multicast switch ports.

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(40)SG	This command was introduced on the Catalyst 4500.

Usage Guidelines

You should only configure the Immediate-Leave feature when there is only one receiver on every port in the VLAN. The configuration is saved in NVRAM.

The **static** keyword is used for configuring the MLD member ports statically.

The configuration and the static ports and groups are saved in NVRAM.

VLAN numbers 1002 through 1005 are reserved for Token Ring and FDDI VLANs and cannot be used in MLD snooping.

Examples

This example shows how to enable MLD Immediate-Leave processing on VLAN 1:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping vlan 1 immediate-leave
Switch(config)# end
Switch#
```

This example shows how to disable MLD Immediate-Leave processing on VLAN 1:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# no ipv6 mld snooping vlan 1 immediate-leave
Switch(config)# end
Switch#
```

This example shows how to configure a port as a multicast switch port:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping vlan 1 mrouter interface GigabitEthernet1/1
Switch(config)# end
Switch#
```

This example shows how to configure a static multicast group:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# ipv6 mld snooping vlan 2 static FF12::34 interface GigabitEthernet1/1
Switch(config)# end
Switch#
```

You can verify your settings by entering the **show ipv6 mld snooping vlan** *vlan-id* user EXEC command.

Related Commands

Command	Description
ipv6 mld snooping	Enables IP version 6 (IPv6) Multicast Listener Discovery (MLD) snooping globally or on the specified VLAN.
show ipv6 mld snooping	Displays IP version 6 (IPv6) MLD snooping configuration of the switch or the VLAN.

issu abortversion

To cancel the ISSU upgrade or the downgrade process in progress and to restore the Catalyst 4500 series switch to its state before the start of the process, use the **issue abortversion** command.

issu abortversion *active-slot* [*active-image-new*]

Syntax Description

active-slot	Specifies the slot number for the current standby supervisor engine.
active-image-new	(Optional) Name of the new image present in the current standby supervisor engine.

Defaults

There are no default settings.

Command Modes

Privileged EXEC mode

Command History

Release	Modification
12.2(31)SGA	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

You can use the **issu abortversion** command at any time to stop the ISSU process. To complete the process enter the **issu commitversion** command. Before any action is taken, a check ensures that both supervisor engines are either in the run version (RV) or load version (LV) state.

When the **issu abortversion** command is entered before the **issu runversion** command, the standby supervisor engine is reset and reloaded with the old image. When the **issu abortversion** command is entered after the **issu runversion** command, a change takes place and the new standby supervisor engine is reset and reloaded with the old image.

Examples

This example shows how you can reset and reload the standby supervisor engine:

```
Switch# issu abortversion 2
Switch#
```

Related Commands

Command	Description
issu acceptversion	Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process.
issu commitversion	Loads the new Cisco IOS software image into the new standby supervisor engine.
issu loadversion	Starts the ISSU process.

Command	Description
issu runversion	Forces a change from the active supervisor engine to the standby supervisor engine and causes the newly active supervisor engine to run the new image specified.
show issu state	Displays the ISSU state and current booted image name during the ISSU process.

issu acceptversion

To halt the rollback timer and to ensure that the new Cisco IOS software image is not automatically stopped during the ISSU process, use the **issu acceptversion** command.

issu acceptversion *active-slot* [*active-image-new*]

Syntax Description

active-slot	Specifies the slot number for the currently active supervisor engine.
active-image-new	(Optional) Name of the new image on the currently active supervisor engine.

Defaults

Rollback timer resets automatically 45 minutes after you enter the **issu runversion** command.

Command Modes

Privileged EXEC mode

Command History

Release	Modification
12.2(31)SGA	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

After you are satisfied with the new image and have confirmed the new supervisor engine is reachable by both the console and the network, enter the **issu acceptversion** command to halt the rollback timer. If the **issu acceptversion** command is not entered within 45 minutes from the time the **issu runversion** command is entered, the entire ISSU process is automatically rolled back to the previous version of the software. The rollback timer starts immediately after you enter the **issu runversion** command.

If the rollback timer expires before the standby supervisor engine goes to a hot standby state, the timer is automatically extended by up to 15 minutes. If the standby state goes to a hot-standby state within this extension time or the 15 minute extension expires, the switch aborts the ISSU process. A warning message that requires your intervention is displayed every 1 minute of the timer extension.

If the rollback timer is set to a long period of time, such as the default of 45 minutes, and the standby supervisor engine goes into the hot standby state in 7 minutes, you have 38 minutes (45 minus 7) to roll back if necessary.

Use the **issu set rollback-timer** to configure the rollback timer.

Examples

This example shows how to halt the rollback timer and allow the ISSU process to continue:

```
Switch# issu acceptversion 2
Switch#
```

Related Commands

Command	Description
issu abortversion	Cancels the ISSU upgrade or the downgrade process in progress and restores the switch to its state before the start of the process.
issu commitversion	Loads the new Cisco IOS software image into the new standby supervisor engine.
issu loadversion	Starts the ISSU process.
issu runversion	Forces a change from the active supervisor engine to the standby supervisor engine and causes the newly active supervisor engine to run the new image specified.
issu set rollback-timer	Configures the In Service Software Upgrade (ISSU) rollback timer value.
show issu state	Displays the ISSU state and current booted image name during the ISSU process.

issu commitversion

To load the new Cisco IOS software image into the new standby supervisor engine, use the **issu commitversion** command.

issu commitversion *standby-slot* [*standby-image-new*]

Syntax Description

standby-slot	Specifies the slot number for the currently active supervisor engine.
standby-image-new	(Optional) Name of the new image on the currently active supervisor engine.

Defaults

Enabled by default.

Command Modes

Privileged EXEC mode

Command History

Release	Modification
12.2(31)SGA	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

The **issu commitversion** command verifies that the standby supervisor engine has the new Cisco IOS software image in its file system and that both supervisor engines are in the run version (RV) state. If these conditions are met, the following actions take place:

- The standby supervisor engine is reset and booted with the new version of Cisco IOS software.
- The standby supervisor engine moves into the Stateful Switchover (SSO) mode and is fully stateful for all clients and applications with which the standby supervisor engine is compatible.
- The supervisor engines are moved into final state, which is the same as initial state.

Entering the **issu commitversion** command completes the In Service Software Upgrade (ISSU) process. This process cannot be stopped or reverted to its original state without starting a new ISSU process.

Entering the **issu commitversion** command without entering the **issu acceptversion** command is equivalent to entering both the **issu acceptversion** and the **issu commitversion** commands. Use the **issu commitversion** command if you do not intend to run in the current state for an extended period of time and are satisfied with the new software version.

Examples

This example shows how you can configure the standby supervisor engine to be reset and reloaded with the new Cisco IOS software version:

```
Switch# issu commitversion 1
Switch#
```

Related Commands

Command	Description
issu acceptversion	Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process.
issu commitversion	Loads the new Cisco IOS software image into the new standby supervisor engine.
issu loadversion	Starts the ISSU process.
issu runversion	Forces a change from the active supervisor engine to the standby supervisor engine and causes the newly active supervisor engine to run the new image specified.
show issu state	Displays the ISSU state and current booted image name during the ISSU process.

issu loadversion

To start the ISSU process, use the **issu loadversion** command.

issu loadversion *active-slot active-image-new standby-slot standby-image-new* [**force**]

Syntax Description

active-slot	Specifies the slot number for the currently active supervisor engine.
active-image-new	Specifies the name of the new image on the currently active supervisor engine.
standby-slot	Specifies the standby slot on the networking device.
standby-image-new	Specifies the name of the new image on the standby supervisor engine.
force	(Optional) Overrides the automatic rollback when the new Cisco IOS software version is detected to be incompatible.

Defaults

This command has no default settings.

Command Modes

Privileged EXEC mode

Command History

Release	Modification
12.2(31)SGA	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

The **issu loadversion** command causes the standby supervisor engine to be reset and booted with the new Cisco IOS software image specified by the command. If both the old image and the new image are ISSU capable, ISSU compatible, and have no configuration mismatches, the standby supervisor engine moves into Stateful Switchover (SSO) mode, and both supervisor engines move into the load version (LV) state.

It will take several seconds after the **issu loadversion** command is entered for Cisco IOS software to load onto the standby supervisor engine and the standby supervisor engine to transition to SSO mode.

Examples

This example shows how to initiate the ISSU process:

```
Switch# issu loadversion 1 bootflash:new-image 2 slavebootflash:new-image
Switch#
```

Related Commands

Command	Description
issu abortversion	Cancels the ISSU upgrade or the downgrade process in progress and restores the switch to its state before the start of the process.
issu acceptversion	Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process.

Command	Description
issu commitversion	Loads the new Cisco IOS software image into the new standby supervisor engine.
issu runversion	Forces a change from the active supervisor engine to the standby supervisor engine and causes the newly active supervisor engine to run the new image specified.
show issu state	Displays the ISSU state and current booted image name during the ISSU process.

issu runversion

To force a change from the active supervisor engine to the standby supervisor engine and to cause the newly active supervisor engine to run the new image specified in the **issu loadversion** command, use the **issu runversion** command.

issu runversion *standby-slot* [*standby-image-new*]

Syntax Description

standby-slot	Specifies the standby slot on the networking device.
standby-image-new	(Optional) Specifies the name of the new image on the standby supervisor engine.

Defaults

This command has no default settings.

Command Modes

Privileged EXEC mode

Command History

Release	Modification
12.2(31)SGA	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

The **issu runversion** command changes the currently active-supervisor engine to standby-supervisor engine and the real standby-supervisor engine is booted with the old image version following and resets the switch. As soon as the standby-supervisor engine moves into the standby state, the rollback timer is started.

Examples

This example shows how to force a change of the active-supervisor engine to standby-supervisor engine:

```
Switch# issu runversion 2
Switch#
```

Related Commands

Command	Description
issu abortversion	Cancels the ISSU upgrade or the downgrade process in progress and restores the switch to its state before the start of the process.
issu acceptversion	Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process.
issu commitversion	Loads the new Cisco IOS software image into the new standby supervisor engine.

Command	Description
issu loadversion	Starts the ISSU process.
show issu state	Displays the ISSU state and current booted image name during the ISSU process.

issu set rollback-timer

To configure the In Service Software Upgrade (ISSU) rollback timer value, use the **issu set rollback-timer** command.

issu set rollback-timer *seconds*

Syntax Description

seconds	Specfies the rollback timer value, in seconds. The valid timer value range is from 0 to 7200 seconds (2 hours). A value of 0 seconds disables the rollback timer.

Defaults

Rollback timer value is 2700 seconds.

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(31)SGA	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Use the **issue set rollback-timer** command to configure the rollback timer value. You can only enable this command when the supervisor engines are in the init state.

Examples

This example shows how you can set the rollback timer value to 3600 seconds, or 1 hour:

```
Switch# configure terminal
Switch(config)# issu set rollback-timer 3600
Switch(config)# end
Switch#
```

Related Commands

Command	Description
issu acceptversion	Halts the rollback timer and ensures that the new Cisco IOS software image is not automatically stopped during the ISSU process.
issu set rollback-timer	Configures the In Service Software Upgrade (ISSU) rollback timer value.

l2protocol-tunnel

To enable protocol tunneling on an interface, use the **l2protocol-tunnel** command. You can enable tunneling for the Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunking Protocol (VTP) packets. To disable tunneling on the interface, use the **no** form of this command.

l2protocol-tunnel [**cdp** | **stp** | **vtp**]

no l2protocol-tunnel [**cdp** | **stp** | **vtp**]

Syntax Description

cdp	(Optional) Enables tunneling of CDP.
stp	(Optional) Enables tunneling of STP.
vtp	(Optional) Enables tunneling of VTP.

Defaults

The default is that no Layer 2 protocol packets are tunneled.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

You must enter this command, with or without protocol types, to tunnel Layer 2 packets.

Layer 2 protocol tunneling across a service-provider network ensures that Layer 2 information is propagated across the network to all customer locations. When protocol tunneling is enabled, protocol packets are encapsulated with a well-known Cisco multicast address for transmission across the network. When the packets reach their destination, the well-known MAC address is replaced by the Layer 2 protocol MAC address.

You can enable Layer 2 protocol tunneling for CDP, STP, and VTP individually or for all three protocols.

Examples

This example shows how to enable protocol tunneling for the CDP packets:

```
Switch(config-if)# l2protocol-tunnel cdp
Switch(config-if)#
```

Related Commands

Command	Description
l2protocol-tunnel cos	Configures the class of service (CoS) value for all tunneled Layer 2 protocol packets.

Command	Description
l2protocol-tunnel drop-threshold	Sets a drop threshold for the maximum rate of Layer 2 protocol packets per second to be received before an interface drops packets.
l2protocol-tunnel shutdown-threshold	Configures the protocol tunneling encapsulation rate.

l2protocol-tunnel cos

To configure the class of service (CoS) value for all tunneled Layer 2 protocol packets, use the **l2protocol-tunnel cos** command. To return to the default value of zero, use the **no** form of this command.

l2protocol-tunnel cos *value*

no l2protocol-tunnel cos

Syntax Description

value	Specifies the CoS priority value for tunneled Layer 2 protocol packets. The range is 0 to 7, with 7 being the highest priority.

Defaults

The default is to use the CoS value that is configured for data on the interface. If no CoS value is configured, the default is 5 for all tunneled Layer 2 protocol packets.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

When enabled, the tunneled Layer 2 protocol packets use this CoS value.

The value is saved in NVRAM.

Examples

This example shows how to configure a Layer 2 protocol tunnel CoS value of 7:

```
Switch(config)# l2protocol-tunnel cos 7
Switch(config)#
```

Related Commands

Command	Description
l2protocol-tunnel	Enables protocol tunneling on an interface.
l2protocol-tunnel drop-threshold	Sets a drop threshold for the maximum rate of Layer 2 protocol packets per second to be received before an interface drops packets.
l2protocol-tunnel shutdown-threshold	Configures the protocol tunneling encapsulation rate.

l2protocol-tunnel drop-threshold

To set a drop threshold for the maximum rate of Layer 2 protocol packets per second to be received before an interface drops packets, use the **l2protocol-tunnel drop-threshold** command. You can set the drop threshold for the Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunking Protocol (VTP) packets. To disable the drop threshold on the interface, use the **no** form of this command.

l2protocol-tunnel drop-threshold [**cdp | stp | vtp**] *value*

no l2protocol-tunnel drop-threshold [**cdp | stp | vtp**] *value*

Syntax Description

cdp	(Optional) Specifies a drop threshold for CDP.
stp	(Optional) Specifies a drop threshold for STP.
vtp	(Optional) Specifies a drop threshold for VTP.
value	Specifies a threshold in packets per second to be received for encapsulation before the interface shuts down, or specifies the threshold before the interface drops packets. The range is 1 to 4096. The default is no threshold.

Defaults

The default is no drop threshold for the number of the Layer 2 protocol packets.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

The **l2protocol-tunnel drop-threshold** command controls the number of protocol packets per second that are received on an interface before it drops packets. When no protocol option is specified with a keyword, the threshold is applied to each of the tunneled Layer 2 protocol types. If you also set a shutdown threshold on the interface, the drop-threshold value must be less than or equal to the shutdown-threshold value.

When the drop threshold is reached, the interface drops the Layer 2 protocol packets until the rate at which they are received is below the drop threshold.

Examples

This example shows how to configure the drop threshold rate:

```
Switch(config-if)# l2protocol-tunnel drop-threshold cdp 50
Switch(config-if)#
```

Related Commands

Command	Description
l2protocol-tunnel	Enables protocol tunneling on an interface.
l2protocol-tunnel cos	Configures the class of service (CoS) value for all tunneled Layer 2 protocol packets.
l2protocol-tunnel shutdown-threshold	Configures the protocol tunneling encapsulation rate.

l2protocol-tunnel shutdown-threshold

To configure the protocol tunneling encapsulation rate, use the **l2protocol-tunnel shutdown-threshold** command. You can set the encapsulation rate for the Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunking Protocol (VTP) packets. To disable the encapsulation rate on the interface, use the **no** form of this command.

l2protocol-tunnel shutdown-threshold [**cdp | stp | vtp**] *value*

no l2protocol-tunnel shutdown-threshold [**cdp | stp | vtp**] *value*

Syntax Description

cdp	(Optional) Specifies a shutdown threshold for CDP.
stp	(Optional) Specifies a shutdown threshold for STP.
vtp	(Optional) Specifies a shutdown threshold for VTP.
value	Specifies a threshold in packets per second to be received for encapsulation before the interface shuts down. The range is 1 to 4096. The default is no threshold.

Defaults

The default is no shutdown threshold for the number of Layer 2 protocol packets.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

The **l2-protocol-tunnel shutdown-threshold** command controls the number of protocol packets per second that are received on an interface before it shuts down. When no protocol option is specified with the keyword, the threshold is applied to each of the tunneled Layer 2 protocol types. If you also set a drop threshold on the interface, the shutdown-threshold value must be greater than or equal to the drop-threshold value.

When the shutdown threshold is reached, the interface is error disabled. If you enable error recovery by entering the **errdisable recovery cause l2ptguard** command, the interface is brought out of the error-disabled state and allowed to retry the operation again when all the causes have timed out. If the error recovery feature generation is not enabled for **l2ptguard**, the interface stays in the error-disabled state until you enter the **shutdown** and **no shutdown** commands.

Examples

This example shows how to configure the maximum rate:

```
Switch(config-if)# l2protocol-tunnel shutdown-threshold cdp 50
Switch(config-if)#
```

Related Commands

Command	Description
l2protocol-tunnel	Enables protocol tunneling on an interface.
l2protocol-tunnel cos	Configures the class of service (CoS) value for all tunneled Layer 2 protocol packets.
l2protocol-tunnel drop-threshold	Sets a drop threshold for the maximum rate of Layer 2 protocol packets per second to be received before an interface drops packets.

lacp port-priority

To set the LACP priority for the physical interfaces, use the **lacp port-priority** command.

lacp port-priority *priority*

Syntax Description

priority	Priority for the physical interfaces; valid values are from 1 to 65535.

Defaults

Priority is set to 32768.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.1(13)EW	This command was introduced on the Catalyst 4500 series switches.

Usage Guidelines

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

You must assign each port in the switch a port priority that can be specified automatically or by entering the **lacp port-priority** command. The port priority is used with the port number to form the port identifier. The port priority is used to decide which ports should be put in standby mode when there is a hardware limitation that prevents all compatible ports from aggregating.

Although this command is a global configuration command, the *priority* value is supported only on port channels with LACP-enabled physical interfaces.This command is supported on LACP-enabled interfaces.

When setting the priority, the higher numbers indicate lower priorities.

Examples

This example shows how to set the priority for the interface:

```
Switch(config-if)# lacp port-priority 23748
Switch(config-if)#
```

Related Commands

Command	Description
channel-group	Assigns and configure an EtherChannel interface to an EtherChannel group.
channel-protocol	Enables LACP or PAgP on an interface.
lacp system-priority	Sets the priority of the system for LACP.
show lacp	Displays LACP information.

lacp system-priority

To set the priority of the system for LACP, use the **lacp system-priority** command.

lacp system-priority *priority*

Syntax Description

priority	Priority of the system; valid values are from 1 to 65535.

Defaults

Priority is set to 32768.

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(13)EW	This command was introduced on the Catalyst 4500 series switches.

Usage Guidelines

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

You must assign each switch that is running LACP a system priority that can be specified automatically or by entering the **lacp system-priority** command. The system priority is used with the switch MAC address to form the system ID and is also used during negotiation with other systems.

Although this command is a global configuration command, the *priority* value is supported on port channels with LACP-enabled physical interfaces.

When setting the priority, tthe higher numbers indicate lower priorities.

You can also enter the **lacp system-priority** command in interface configuration mode. After you enter the command, the system defaults to global configuration mode.

Examples

This example shows how to set the system priority:

```
Switch(config)# lacp system-priority 23748
Switch(config)#
```

Related Commands

Command	Description
channel-group	Assigns and configure an EtherChannel interface to an EtherChannel group.
channel-protocol	Enables LACP or PAgP on an interface.
lacp port-priority	Sets the priority of the system for LACP.
show lacp	Displays LACP information.

lldp tlv-select power-management

To to enable power negotiation through LLDP, use the **lldp tlv-select power-management** interface command.

lldp tlv-select power-management

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled on POEP ports

Command Modes

Interface level

Command History

Release	Modification
12.2(54)SG	Support was introduced on the Catalyst 4500 series switch.

Usage Guidelines

You need to disable this feature if you do not want to perform power negotiation through LLDP.

This feature is not supported on non-POEP ports; the CLI is suppressed on such ports and TLV is not exchanged.

Examples

This example shows how to enable LLDP power negotiation on interface Gigabit Ethernet 3/1:

```
Switch# config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# int gi 3/1
Switch(config-if)# lldp tlv-select power-management
```

Related Commands

Command	Description
lldp run	Cisco IOS Command Reference library.

logging event link-status global (global configuration)

To change the default switch-wide global link-status event messaging settings, use the **logging event link-status global** command. Use the **no** form of this command to disable the link-status event messaging.

logging event link-status global

no logging event link-status global

Syntax Description

This command has no arguments or keywords.

Defaults

The global link-status messaging is disabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

If link-status logging event is not configured at the interface level, this global link-status setting takes effect for each interface.

Examples

This example shows how to globally enable link status message on each interface:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# logging event link-status global
Switch(config)# end
Switch#
```

Related Commands

Command	Description
logging event link-status (interface configuration)	Enables the link-status event messaging on an interface.

logging event link-status (interface configuration)

To enable the link-status event messaging on an interface, use the **logging event link-status** command. Use the **no** form of this command to disable link-status event messaging. Use the **logging event link-status use-global** command to apply the global link-status setting.

logging event link-status

no logging event link-status

logging event link-status use-global

Defaults

Global link-status messaging is enabled.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

To enable system logging of interface state-change events on a specific interface, enter the **logging event link-status** command in interface configuration mode.

To enable system logging of interface state-change events on all interfaces in the system, enter the **logging event link-status global** command in global configuration mode. All interfaces without the state change event configuration use the global setting.

Examples

This example shows how to enable logging event state-change events on interface gi11/1:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# logging event link-status
Switch(config-if)# end
Switch#
```

This example shows how to turn off logging event link status regardless of the global setting:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# no logging event link-status
Switch(config-if)# end
Switch#
```

This example shows how to enable the global event link-status setting on interface gi11/1:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# logging event link-status use-global
Switch(config-if)# end
Switch#
```

Related Commands

Command	Description
logging event link-status global (global configuration)	Changes the default switch-wide global link-status event messaging settings.

logging event trunk-status global (global configuration)

To enable the trunk-status event messaging globally, use the **logging event trunk-status global** command. Use the **no** form of this command to disable trunk-status event messaging.

logging event trunk-status global

no logging event trunk-status global

Syntax Description

This command has no arguments or keywords.

Defaults

Global trunk-status messaging is disabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

If trunk-status logging event is not configured at the interface level, the global trunk-status setting takes effect for each interface.

Examples

This example shows how to globally enable link status messaging on each interface:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# logging event trunk-status global
Switch(config)# end
Switch#
```

Related Commands

Command	Description
logging event trunk-status global (global configuration)	Enables the trunk-status event messaging on an interface.

logging event trunk-status (interface configuration)

To enable the trunk-status event messaging on an interface, use the **logging event trunk-status** command. Use the **no** form of this command to disable the trunk-status event messaging. Use the **logging event trunk-status use-global** command to apply the global trunk-status setting.

logging event trunk-status

no logging event trunk-status

logging event trunk-status use-global

Defaults

Global trunk-status messaging is enabled.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

To enable system logging of interface state-change events on a specific interface, enter the **logging event trunk-status** command in interface configuration mode.

To enable system logging of interface state-change events on all interfaces in the system, enter the **logging event trunk-status use-global** command in global configuration mode. All interfaces without the state change event configuration use the global setting.

Examples

This example shows how to enable logging event state-change events on interface gi11/1:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# logging event trunk-status
Switch(config-if)# end
Switch#
```

This example shows how to turn off logging event trunk status regardless of the global setting:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# no logging event trunk-status
Switch(config-if)# end
Switch#
```

This example shows how to enable the global event trunk-status setting on interface gi11/1:

```
Switch# config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# interface gi11/1
Switch(config-if)# logging event trunk-status use-global
Switch(config-if)# end
Switch#
```

Related Commands

Command	Description
logging event trunk-status global (global configuration)	Enables the trunk-status event messaging on an interface.

mab

To enable and configure MAC authorization bypass (MAB) on a port, use the **mab** command in interface configuration mode. To disable MAB, use the **no** form of this command.

mab [**eap**]

no mab [**eap**]

Note The **mab** command is totally independent of the effect of the **dot1x system-auth control** command.

Syntax Description

eap	(Optional) Specifies that a full EAP conversation should be used, as opposed to standard RADIUS Access-Request, Access-Accept conversation.

Command Default

Disabled

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced.

Usage Guidelines

When a port is configured for MAB as a fallback method, it operates in a typical dot1X method until a configurable number of failed attempts to request the identity of the host. The authenticator learns the MAC address of the host and uses that information to query an authentication server to see whether this MAC address will be granted access.

Examples

The following example shows how to enable MAB on a port:

```
Switch(config-if)# mab
Switch(config-if)#
```

The following example shows how to enable and configure MAB on a port:

```
Switch(config-if)# mab eap
Switch(config-if)#
```

The following example shows how to disable MAB on a port:

```
Switch(config-if)# no mab
Switch(config-if)#
```

Related Commands

Command	Description
show authentication	Displays Authentication Manager information.
show mab	Displays MAB information.
show running-config	Displays the running configuration information.

mac access-list extended

To define the extended MAC access lists, use the **mac access-list extended** command. To remove the MAC access lists, use the **no** form of this command.

mac access-list extended *name*

no mac access-list extended *name*

Syntax Description

name	ACL to which the entry belongs.

Defaults

MAC access lists are not defined.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

When you enter the ACL name, follow these naming conventions:

- Maximum of 31 characters long and can include a-z, A-Z, 0-9, the dash character (-), the underscore character (_), and the period character (.)
- Must start with an alpha character and must be unique across all ACLs of all types
- Case sensitive
- Cannot be a number
- Must not be a keyword; keywords to avoid are all, default-action, map, help, and editbuffer

When you enter the **mac access-list extended** *name* command, you use the following subset to create or delete entries in a MAC layer access list:

[**no**] {**permit** | **deny**} {{*src-mac mask* | **any**} [*dest-mac mask*]} [**protocol-family** {**appletalk** | **arp-non-ipv4** | **decnet** | **ipx** | **ipv6** | **rarp-ipv4** | **rarp-non-ipv4** | **vines** | **xns**} | <*arbitrary ethertype*> | *name-coded ethertype*].

Table 2-7 describes the syntax of the **mac access-list extended** subcommands.

Table 2-7 mac access-list extended Subcommands

Subcommand	Description
any	Specifies any source-host or destination-host.
arbitrary ethertype	(Optional) Specifies an arbitrary ethertype in the range 1536 to 65535 (Decimal or Hexadecimal)
deny	Prevents access if the conditions are matched.

Table 2-7 mac access-list extended Subcommands (continued)

Subcommand	Description
dest-mac mask	(Optional) Specifies a destination MAC address of the form: *dest-mac-address dest-mac-address-mask*.
name-coded ethertype	(Optional) Denotes a predefined *name-coded ethertype* for common protocols: aarp—AppleTalk ARP amber—DEC-Amber appletalk—AppleTalk/EtherTalk dec-spanning—DEC-Spanning-Tree decnet-iv—DECnet Phase IV diagnostic—DEC-Diagnostic dsm—DEC-DSM etype-6000—0x6000 etype-8042—0x8042 lat—DEC-LAT lavc-sca—DEC-LAVC-SCA mop-console—DEC-MOP Remote Console mop-dump—DEC-MOP Dump msdos—DEC-MSDOS mumps—DEC-MUMPS netbios—DEC-NETBIOS protocol-family An Ethernet protocol family vines-echo—VINES Echo vines-ip—VINES IP xns-idp—XNS IDP
no	(Optional) Deletes a statement from an access list.
permit	Allows access if the conditions are matched.
protocol-family	(Optional) Name of the protocol family. Table 2-8 lists which packets are mapped to a particular protocol family.
src-mac mask	Source MAC address in the form: *source-mac-address source-mac-address-mask*.

Table 2-8 describes mapping an Ethernet packet to a protocol family.

Table 2-8 Mapping an Ethernet Packet to a Protocol Family

Protocol Family	Ethertype in Packet Header
Appletalk	0x809B, 0x80F3
Arp-Non-Ipv4	0x0806 and protocol header of Arp is a non-Ip protocol family
Decnet	0x6000-0x6009, 0x8038-0x8042

Table 2-8 Mapping an Ethernet Packet to a Protocol Family

Protocol Family	Ethertype in Packet Header
Ipx	0x8137-0x8138
Ipv6	0x86DD
Rarp-Ipv4	0x8035 and protocol header of Rarp is Ipv4
Rarp-Non-Ipv4	0x8035 and protocol header of Rarp is a non-Ipv4 protocol family
Vines	0x0BAD, 0x0BAE, 0x0BAF
Xns	0x0600, 0x0807

When you enter the *src-mac mask* or *dest-mac mask* value, follow these guidelines:

- Enter the MAC addresses as three 4-byte values in dotted hexadecimal format such as 0030.9629.9f84.
- Enter the MAC address masks as three 4-byte values in dotted hexadecimal format. Use 1 bit as a wildcard. For example, to match an address exactly, use 0000.0000.0000 (can be entered as 0.0.0).
- For the optional *protocol* parameter, you can enter either the EtherType or the keyword.
- Entries without a *protocol* parameter match any protocol.
- The access list entries are scanned in the order that you enter them. The first matching entry is used. To improve performance, place the most commonly used entries near the beginning of the access list.
- An implicit **deny any any** entry exists at the end of an access list unless you include an explicit **permit any any** entry at the end of the list.
- All new entries to an existing list are placed at the end of the list. You cannot add entries to the middle of a list.

Examples

This example shows how to create a MAC layer access list named mac_layer that denies traffic from 0000.4700.0001, which is going to 0000.4700.0009, and permits all other traffic:

```
Switch(config)# mac access-list extended mac_layer
Switch(config-ext-macl)# deny 0000.4700.0001 0.0.0 0000.4700.0009 0.0.0 protocol-family
appletalk
Switch(config-ext-macl)# permit any any
Switch(config-ext-macl)# end
Switch#
```

Related Commands

Command	Description
show vlan access-map	Displays VLAN access map information.

mac-address-table aging-time

To configure the aging time for the entries in the Layer 2 table, use the **mac-address-table aging-time** command. To reset the *seconds* value to the default setting, use the **no** form of this command.

mac-address-table aging-time *seconds* [**vlan** *vlan_id*]

no mac-address-table aging-time *seconds* [**vlan** *vlan_id*]

Syntax Description

seconds	Aging time in seconds; valid values are 0 and from 10 to 1000000 seconds.
vlan *vlan_id*	(Optional) Single VLAN number or a range of VLANs; valid values are from 1 to 4094.

Defaults

Aging time is set to 300 seconds.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

If you do not enter a VLAN, the change is applied to all routed-port VLANs.

Enter 0 seconds to disable aging.

Examples

This example shows how to configure the aging time to 400 seconds:

```
Switch(config)# mac-address-table aging-time 400
Switch(config)#
```

This example shows how to disable aging:

```
Switch(config)# mac-address-table aging-time 0
Switch(config)
```

Related Commands

Command	Description
show mac-address-table aging-time	Displays MAC address table aging information.

mac-address-table dynamic group protocols

To enable the learning of MAC addresses in both the "ip" and "other" protocol buckets, even though the incoming packet may belong to only one of the protocol buckets, use the **mac-address-table dynamic group protocols** command. To disable grouped learning, use the **no** form of this command.

mac-address-table dynamic group protocols {**ip** | **other**} {**ip** | **other**}

no mac-address-table dynamic group protocols {**ip** | **other**} {**ip** | **other**}

Syntax Description

ip	Specifies the "ip" protocol bucket.
other	Specifies the "other" protocol bucket.

Defaults

The group learning feature is disabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

The entries within the "ip" and "other" protocol buckets are created according to the protocol of the incoming traffic.

When you use the **mac-address-table dynamic group protocols** command, an incoming MAC address that might belong to either the "ip" or the "other" protocol bucket, is learned on both protocol buckets. Therefore, any traffic destined to this MAC address and belonging to any of the protocol buckets is unicasted to that MAC address, rather than flooded. This reduces the unicast Layer 2 flooding that might be caused if the incoming traffic from a host belongs to a different protocol bucket than the traffic that is destined to the sending host.

Examples

This example shows that the MAC addresses are initially assigned to either the "ip" or the "other" protocol bucket:

```
Switch# show mac-address-table dynamic
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0000.0000.5000   dynamic other                 GigabitEthernet1/1
   1    0001.0234.6616   dynamic ip                    GigabitEthernet3/1
   1    0003.3178.ec0a   dynamic assigned              GigabitEthernet3/1
   1    0003.4700.24c3   dynamic ip                    GigabitEthernet3/1
   1    0003.4716.f475   dynamic ip                    GigabitEthernet3/1
   1    0003.4748.75c5   dynamic ip                    GigabitEthernet3/1
   1    0003.47f0.d6a3   dynamic ip                    GigabitEthernet3/1
   1    0003.47f6.a91a   dynamic ip                    GigabitEthernet3/1
```

```
   1    0003.ba06.4538   dynamic ip                    GigabitEthernet3/1
   1    0003.fd63.3eb4   dynamic ip                    GigabitEthernet3/1
   1    0004.2326.18a1   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5d.de53   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5e.6ecc   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5e.f60e   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5f.06f7   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5f.072f   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5f.08f6   dynamic ip                    GigabitEthernet3/1
   1    0004.5a5f.090b   dynamic ip                    GigabitEthernet3/1
   1    0004.5a88.b075   dynamic ip                    GigabitEthernet3/1
   1    0004.c1bd.1b40   dynamic ip                    GigabitEthernet3/1
   1    0004.c1d8.b3c0   dynamic ip                    GigabitEthernet3/1
   1    0004.c1d8.bd00   dynamic ip                    GigabitEthernet3/1
   1    0007.e997.74dd   dynamic ip                    GigabitEthernet3/1
   1    0007.e997.7e8f   dynamic ip                    GigabitEthernet3/1
   1    0007.e9ad.5e24   dynamic ip                    GigabitEthernet3/1
   1    000b.5f0a.f1d8   dynamic ip                    GigabitEthernet3/1
   1    000b.fdf3.c498   dynamic ip                    GigabitEthernet3/1
   1    0010.7be8.3794   dynamic assigned              GigabitEthernet3/1
   1    0012.436f.c07f   dynamic ip                    GigabitEthernet3/1
   1    0050.0407.5fe1   dynamic ip                    GigabitEthernet3/1
   1    0050.6901.65af   dynamic ip                    GigabitEthernet3/1
   1    0050.da6c.81cb   dynamic ip                    GigabitEthernet3/1
   1    0050.dad0.af07   dynamic ip                    GigabitEthernet3/1
   1    00a0.ccd7.20ac   dynamic ip                    GigabitEthernet3/1
   1    00b0.64fd.1c23   dynamic ip                    GigabitEthernet3/1
   1    00b0.64fd.2d8f   dynamic assigned              GigabitEthernet3/1
   1    00d0.b775.c8bc   dynamic ip                    GigabitEthernet3/1
   1    00d0.b79e.de1d   dynamic ip                    GigabitEthernet3/1
   1    00e0.4c79.1939   dynamic ip                    GigabitEthernet3/1
   1    00e0.4c7b.d765   dynamic ip                    GigabitEthernet3/1
   1    00e0.4c82.66b7   dynamic ip                    GigabitEthernet3/1
   1    00e0.4c8b.f83e   dynamic ip                    GigabitEthernet3/1
   1    00e0.4cbc.a04f   dynamic ip                    GigabitEthernet3/1
   1    0800.20cf.8977   dynamic ip                    GigabitEthernet3/1
   1    0800.20f2.82e5   dynamic ip                    GigabitEthernet3/1
Switch#
```

This example shows how to assign MAC addresses that belong to either the “ip” or the “other” bucket to both buckets:

```
Switch(config)# mac-address-table dynamic group protocols ip other
Switch(config)# exit
Switch# show mac address-table dynamic
Unicast Entries
 vlan   mac address     type        protocols               port
-------+---------------+--------+---------------------+--------------------
   1    0000.0000.5000   dynamic ip,other              GigabitEthernet1/1
   1    0001.0234.6616   dynamic ip,other              GigabitEthernet3/1
   1    0003.4700.24c3   dynamic ip,other              GigabitEthernet3/1
   1    0003.4716.f475   dynamic ip,other              GigabitEthernet3/1
   1    0003.4748.75c5   dynamic ip,other              GigabitEthernet3/1
   1    0003.47c4.06c1   dynamic ip,other              GigabitEthernet3/1
   1    0003.47f0.d6a3   dynamic ip,other              GigabitEthernet3/1
   1    0003.47f6.a91a   dynamic ip,other              GigabitEthernet3/1
   1    0003.ba0e.24a1   dynamic ip,other              GigabitEthernet3/1
   1    0003.fd63.3eb4   dynamic ip,other              GigabitEthernet3/1
   1    0004.2326.18a1   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a5d.de53   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a5d.de55   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a5e.6ecc   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a5e.f60e   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a5f.08f6   dynamic ip,other              GigabitEthernet3/1
```

```
   1    0004.5a5f.090b   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a64.f813   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a66.1a77   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a6b.56b2   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a6c.6a07   dynamic ip,other              GigabitEthernet3/1
   1    0004.5a88.b075   dynamic ip,other              GigabitEthernet3/1
   1    0004.c1bd.1b40   dynamic ip,other              GigabitEthernet3/1
   1    0004.c1d8.b3c0   dynamic ip,other              GigabitEthernet3/1
   1    0004.c1d8.bd00   dynamic ip,other              GigabitEthernet3/1
   1    0005.dce0.7c0a   dynamic assigned             GigabitEthernet3/1
   1    0007.e997.74dd   dynamic ip,other              GigabitEthernet3/1
   1    0007.e997.7e8f   dynamic ip,other              GigabitEthernet3/1
   1    0007.e9ad.5e24   dynamic ip,other              GigabitEthernet3/1
   1    0007.e9c9.0bc9   dynamic ip,other              GigabitEthernet3/1
   1    000b.5f0a.f1d8   dynamic ip,other              GigabitEthernet3/1
   1    000b.fdf3.c498   dynamic ip,other              GigabitEthernet3/1
   1    0012.436f.c07f   dynamic ip,other              GigabitEthernet3/1
   1    0050.0407.5fe1   dynamic ip,other              GigabitEthernet3/1
   1    0050.6901.65af   dynamic ip,other              GigabitEthernet3/1
   1    0050.da6c.81cb   dynamic ip,other              GigabitEthernet3/1
   1    0050.dad0.af07   dynamic ip,other              GigabitEthernet3/1
   1    00a0.ccd7.20ac   dynamic ip,other              GigabitEthernet3/1
   1    00b0.64fd.1b84   dynamic assigned             GigabitEthernet3/1
   1    00d0.b775.c8bc   dynamic ip,other              GigabitEthernet3/1
   1    00d0.b775.c8ee   dynamic ip,other              GigabitEthernet3/1
   1    00d0.b79e.de1d   dynamic ip,other              GigabitEthernet3/1
   1    00e0.4c79.1939   dynamic ip,other              GigabitEthernet3/1
   1    00e0.4c7b.d765   dynamic ip,other              GigabitEthernet3/1
   1    00e0.4c82.66b7   dynamic ip,other              GigabitEthernet3/1
   1    00e0.4c8b.f83e   dynamic ip,other              GigabitEthernet3/1
   1    00e0.4c8c.0861   dynamic ip,other              GigabitEthernet3/1
   1    0800.20d1.bf09   dynamic ip,other              GigabitEthernet3/1
Switch#
```

mac address-table learning vlan

To enable MAC address learning on a VLAN, use the **mac address-table learning** global configuration command. Use the **no** form of this command to disable MAC address learning on a VLAN to control which VLANs can learn MAC addresses.

mac address-table learning vlan *vlan-id*

no mac address-table learning vlan *vlan-id*

Syntax Description

vlan-id	Specifies a single VLAN ID or a range of VLAN IDs separated by a hyphen or comma. Valid VLAN IDs are 1 to 4094.

Defaults

Enabled on all VLANs

Command Modes

Global configuration

Command History

Release	Modification
12.2(54)SG	This command was modified to support the disable learning feature on the Catalyst 4500 series switch.

Usage Guidelines

When you control MAC address learning on a VLAN, you can manage the available table space by controlling which VLANs, and which ports can learn MAC addresses.

You can disable MAC address learning on a single VLAN ID (for example, by entering **no mac address-table learning vlan 223**) or on a range of VLAN IDs (for example, by entering **no mac address-table learning vlan 1-20, 15**.)

Before you disable MAC address learning, familiarize yourself with the network topology and the switch system configuration. If you disable MAC address learning on a VLAN, flooding may occur in the network. For example, if you disable MAC address learning on a VLAN with a configured switch virtual interface (SVI), the switch floods all IP packets in the Layer 2 domain. If you disable MAC address learning on a VLAN that includes more than two ports, every packet entering the switch is flooded in that VLAN domain. Disable MAC address learning only in VLANs that contain two ports. Use caution before disabling MAC address learning on a VLAN with an SVI.

You cannot disable MAC address learning on a VLAN that the switch uses internally. This action causes the switch to generate an error message and rejects the **no mac address-table learning vlan** command. To view used internal VLANs, enter the **show vlan internal usage** privileged EXEC command.

If you disable MAC address learning on a VLAN configured as a PVLAN primary or a secondary VLAN, the MAC addresses are still learned on the VLAN (primary or secondary) associated with the PVLAN.

You cannot disable MAC address learning on an RSPAN VLAN. The configuration is not allowed.

If you disable MAC address learning on a VLAN that includes a secure port, MAC address learning is not disabled on the secure port. If you later disable port security on the interface, the disabled MAC address learning state is enabled.

To display the MAC address learning status of a specific VLAN or for all VLANs, enter the **show mac-address-table learning vlan** command.

Examples

This example shows how to disable MAC address learning on VLAN 2003:

```
Switch(config)# no mac address-table learning vlan 2003
```

Related Commands

Command	Description
show mac address-table learning	Displays the MAC address learning status on all VLANs or on the specified VLAN.

mac-address-table notification

To enable MAC address notification on a switch, use the **mac-address-table notification** command. To return to the default setting, use the **no** form of this command

mac-address-table notification [[**change** [**history-size** *hs_value* | **interval** *intv_value*]] | [**mac-move**] | [**threshold** [**limit** *percentage* | **interval** *time*]] | [**learn-fail** [**interval** *time* | **limit** *num_fail*]]

no mac-address-table notification [[**change** [**history-size** *hs_value* | **interval** *intv_value*]] | [**mac-move**] | [**threshold** [**limit** *percentage* | **interval** *time*]] | [**learn-fail** [**interval** *time* | **limit** *num_fail*]]

Syntax Description

change	(Optional) Specifies enabling MAC change notification.
history-size *hs_value*	(Optional) Sets a maximum number of entries in the MAC change notification history table. The range is 0 to 500 entries.
interval *intv_value*	(Optional) Sets a notification trap interval: the set interval time between two consecutive traps. The range is 0 to 2,147,483,647 seconds.
mac-move	(Optional) Specifies enabling MAC move notification.
threshold	(Optional) Specifies enabling MAC threshold notification.
limit *percentage*	(Optional) Specifies the percentage of MAT utilization threshold; valid values are from 1 to 100 percent.
interval *time*	(Optional) Specifies the time between MAC threshold notifications; valid values are greater than or equal to 120 seconds.
learn-fail	(Optional) Specifies syslog (level 6) notifications of failures to install MAC addresses learned in software into hardware. Disabled by default.
interval *time*	(Optional) Specifies the syslog interval between hardware MAC learning failure notifications. The default value is 150 seconds. The range is between 1 to 100000 seconds.
limit *num_fail*	(Optional) Specifies the number of hardware MAC learning failures to be allowed in a notification interval.

Defaults

MAC address notification feature is disabled.

The default MAC change trap interval value is 1 second.

The default number of entries in the history table is 1.

MAC move notification is disabled.

MAC threshold monitoring feature is disabled.

The default limit is 50 percent.

The default time is 120 seconds.

Hardware MAC learning failure syslog notification is disabled.

The default limit is 1000.

The default interval is 150 seconds.

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(31)SG	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(52)SG	Support for the **learn-fail** keyword, Supervisor Engine 6-E, and Catalyst 4900M chassis added.

Usage Guidelines

You can enable the MAC change notification feature using the **mac-address-table notification change** command. If you do this, you must also enable MAC notification traps on an interface using the **snmp trap mac-notification change interface** configuration command and configure the switch to send MAC change traps to the NMS using the **snmp-server enable traps mac-notification** global configuration command.

When the *history-size* option is configured, the existing MAC change history table is deleted, and a new table is created.

Examples

This example shows how to set the MAC address notification history table size to 300 entries:

```
Switch(config)# mac-address-table notification change history-size 300
Switch(config)#
```

This example shows how to set the MAC address notification interval time to 1250 seconds:

```
Switch(config)# mac-address-table notification change interval 1250
Switch(config)#
```

This example shows how to enable hardware MAC address learning failure syslog notification:

```
Switch(config)# mac address-table notification learn-fail
```

This example shows how to set the interval of hardware MAC address learning failure syslog notification to 30 seconds:

```
Switch(config)# mac address-table notification learn-fail interval 30
```

Related Commands

Command	Description
clear mac-address-table	Clears the global counter entries from the Layer 2 MAC address table.
mac-address-table notification	Enables MAC address notification on a switch.
snmp-server enable traps	Enables SNMP notifications.
snmp trap mac-notification change	Enables SNMP MAC address notifications.

mac-address-table static

To configure the static MAC addresses for a VLAN interface or drop unicast traffic for a MAC address for a VLAN interface, use the **mac-address-table static** command. To remove the static MAC address configurations, use the **no** form of this command.

mac-address-table static *mac-addr* {**vlan** *vlan-id*} {**interface** *type* | **drop**}

no mac-address-table static *mac-addr* {**vlan** *vlan-id*} {**interface** *type*} {**drop**}

Syntax Description

mac-addr	MAC address; optional when using the **no** form of this command.
vlan *vlan-id*	VLAN and valid VLAN number; valid values are from 1 to 4094.
interface *type*	Interface type and number; valid options are **FastEthernet** and **GigabitEthernet**.
drop	Drops all traffic received from and going to the configured MAC address in the specified VLAN.

Defaults

This command has no default settings.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

When a static MAC address is installed, it is associated with a port.

The output interface specified must be a Layer 2 interface and not an SVI.

If you do not enter a protocol type, an entry is automatically created for each of the four protocol types.

Entering the **no** form of this command does not remove the system MAC addresses.

When removing a MAC address, entering **interface** *int* is optional. For unicast entries, the entry is removed automatically. For multicast entries, if you do not specify an interface, the entire entry is removed. You can specify the selected ports to be removed by specifying the interface.

Examples

This example shows how to add the static entries to the MAC address table:

```
Switch(config)# mac-address-table static 0050.3e8d.6400 vlan 100 interface fastethernet5/7
Switch(config)#
```

Related Commands

Command	Description
show mac-address-table static	Displays the static MAC address table entries only.

macro apply cisco-desktop

To enable the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop, use the **macro apply cisco-desktop c**ommand.

macro apply cisco-desktop $AVID *access_vlanid*

Syntax Description

$AVID *access_vlanid*	Specifies an access VLAN ID.

Defaults

This command has no default settings.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

This command can only be viewed and applied; it cannot be modified.

Ensure that the existing configuration on the interface does not conflict with the intended macro configuration. Before you apply the macro, clear the configuration on the interface with the **default interface** command.

Examples

This example shows how to enable the Cisco-recommended features and settings on port fa2/1:

```
Switch(config)# interface FastEthernet2/1
Switch(config-if)# macro apply cisco-desktop $AVID 50
Switch(config-if)#
```

The contents of this macro are as follows:

```
# Basic interface - Enable data VLAN only
# Recommended value for access vlan (AVID) should not be 1
switchport access vlan $AVID [access_vlanid]
switchport mode access
# Enable port security limiting port to a single
# MAC address -- that of desktop
switchport port-security
# Ensure port-security age is greater than one minute
# and use inactivity timer
# "Port-security maximum 1" is the default and will not
# Show up in the config
switchport port-security violation restrict
switchport port-security aging time 2
switchport port-security aging type inactivity
# Configure port as an edge network port
spanning-tree portfast
spanning-tree bpduguard enable
```

Related Commands

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

macro apply cisco-phone

To enable the Cisco-recommended features and settings that are suitable for connecting a switch port to a standard desktop and a Cisco IP phone, use the **macro apply cisco-phone** command.

macro apply cisco-phone $AVID *access_vlanid* **$VVID** *voice_vlanid*

Syntax Description

$AVID *access_vlanid*	Specifies an access VLAN ID.
$VVID *voice_vlanid*	Specifies a voice VLAN ID.

Defaults

This command has no default settings.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

This command can only be viewed and applied; it cannot be modified.

Ensure that the existing configuration on the interface does not conflict with the intended macro configuration. Before you apply the macro, clear the configuration on the interface with the **default interface** command.

Examples

This example shows how to enable the Cisco-recommended features and settings on port fa2/1:

```
Switch(config)# interface FastEthernet2/1
Switch(config-if)# macro apply cisco-phone $AVID 10 $VVID 50
Switch(config-if)#
```

The contents of this macro are as follows:

```
# VoIP enabled interface - Enable data VLAN
# and voice VLAN (VVID)
# Recommended value for access vlan (AVID) should not be 1\
switchport access vlan $AVID [access_vlan_id]
switchport mode access
# Update the Voice VLAN (VVID) value which should be
# different from data VLAN
# Recommended value for voice vlan (VVID) should not be 1
switchport voice vlan $VVID [voice_vlan_id]
# Enable port security limiting port to a 3 MAC
# addressees -- One for desktop and two for phone
switchport port-security
switchport port-security maximum 3
# Ensure port-security age is greater than one minute
# and use inactivity timer
switchport port-security violation restrict
switchport port-security aging time 2
```

```
switchport port-security aging type inactivity
# Enable auto-qos to extend trust to attached Cisco phone
auto qos voip cisco-phone
# Configure port as an edge network port
spanning-tree portfast
spanning-tree bpduguard enable@
```

Related Commands

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

macro apply cisco-router

To enable the Cisco-recommended features and settings that are suitable for connecting a switch port to a router, use the **macro apply cisco-router** command.

macro apply cisco-router $NVID *native_vlanid*

Syntax Description

$NVID *native_vlanid*	Specifies a native VLAN ID.

Defaults

This command has no default settings.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

This command can only be viewed and applied; it cannot be modified.

Ensure that the existing configuration on the interface does not conflict with the intended macro configuration. Before you apply the **macro apply cisco-router** command, clear the configuration on the interface with the **default interface** command.

Examples

This example shows how to enable the Cisco-recommended features and settings on port fa2/1:

```
Switch(config)# interface FastEthernet2/1
Switch(config-if)# macro apply cisco-router $NVID 80
Switch(config-if)#
```

The contents of this macro are as follows:

```
# Access Uplink to Distribution
switchport trunk encapsulation dot1q
# Define unique Native VLAN on trunk ports
# Recommended value for native vlan (NVID) should not be 1
switchport trunk native vlan $NVID [native_vlan_id]
# Update the allowed VLAN range (VRANGE) such that it
# includes data, voice and native VLANs
# switchport trunk allowed vlan $VRANGE [vlan_range]
# Hardcode trunk and disable negotiation to
# speed up convergence
# Hardcode speed and duplex to router
switchport mode trunk
switchport nonegotiate
speed 100
duplex full
# Configure qos to trust this interface
auto qos voip trust
qos trust dscp
```

```
# Ensure fast access to the network when enabling the interface.
# Ensure that switch devices cannot become active on the interface.
spanning-tree portfast
spanning-tree bpduguard enable
```

Related Commands

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

macro apply cisco-switch

To enable the Cisco-recommended features and settings that are suitable for connecting a switch port to another switch, use the **macro apply cisco-switch** command.

macro apply cisco-switch $NVID *native_vlanid*

Syntax Description

$NVID *native_vlanid*	Specifies a native VLAN ID.

Defaults

This command has no default settings.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

This command can only be viewed and applied; it cannot be modified.

Ensure that the existing configuration on the interface does not conflict with the intended macro configuration. Before you apply this macro, clear the configuration on the interface with the **default interface** command.

Examples

This example shows how to enable the Cisco-recommended features and settings on port fa2/1:

```
Switch(config)# interface FastEthernet2/1
Switch(config-if)# macro apply cisco-switch $NVID 45
Switch(config-if)#
```

The contents of this macro are as follows:

```
# Access Uplink to Distribution
switchport trunk encapsulation dot1q
# Define unique Native VLAN on trunk ports
# Recommended value for native vlan (NVID) should not be 1
switchport trunk native vlan $NVID [native_vlan_id]
# Update the allowed VLAN range (VRANGE) such that it
# includes data, voice and native VLANs
# switchport trunk allowed vlan $VRANGE
# Hardcode trunk and disable negotiation to
# speed up convergence
switchport mode trunk
switchport nonegotiate
# Configure qos to trust this interface
auto qos voip trust
# 802.1w defines the link as pt-pt for rapid convergence
spanning-tree link-type point-to-point
```

Related Commands

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

macro auto device

Use the **macro auto device** command to simplify changing the parameters for a built-in functions for a device type. Use the **no** form of this command to revert to the intial parameter values.

macro auto device *device_type* [*params values*]

no macro auto device *device_type* [*params values*]

Syntax Description

device_type	Specifies the device type. • phone—Apply interface configs on detecting a phone • switch—Apply interface configs on detecting a switch • router—Apply interface configs on detecting a router • ap—Apply interface configs on detecting an ap • lwap—Apply interface configs on detecting a light weight ap • dmp—Apply interface configs on detecting a DMP • ipvsc—Apply interface configs on detecting a IPVSC
param name=value	(Optional) *parameter=value*—Replace default values that begin with $. Enter new values in the form of name value pair separated by a space: [<name1>=<value1> <name2>=<value2>...]. Default values are shown in parenthesis.

Command Modes

Global configuration

Command History

Release	Modification
12.2(54)SG	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Although you can use the **macro auto execute** command to produce the same effect as the **macro auto device** command, the later is simpler.

Examples

This example shows how to change the access VLAN and voice VLAN from their default value to user defined values for phone devices.

```
(config)# macro auto device phone ACCESS_VLAN=10 VOICE_VLAN=20
```

Related Commands

Command	Description
macro auto execute (built-in function)	Changes built-in function default values or to map user-defined triggers to built-in functions, and to pass the parameter values.
macro auto execute (remotely-defined trigger)	Maps a trigger to a remotely defined functions.

Command	Description
macro auto execute (user-defined function)	Maps a trigger to a user-defined function.
macro auto global processing	Enables Auto Smartports on a switch.
macro auto processing	Enables Auto SmartPorts macros on a specific interface.
macro auto sticky	Specifies not to remove configurations applied by ASP across link flaps and device removal.
shell trigger	Creates a user defined trigger.

macro auto execute (built-in function)

Use the **macro auto execute** configuration command to change built-in function default values or to map user-defined triggers to built-in functions and to pass the parameter values. Use the **no** form of this command to unmap the trigger.

macro auto execute *event_trigger* **builtin** *shell_function* [*param name=values*]

no macro auto execute *event_trigger* **builtin** *shell_function* [*param name=values*]

Syntax Description

event_trigger	Defines mapping from an event trigger to a built-in macro. Specify an *event trigger*: • CISCO_PHONE_EVENT • CISCO_SWITCH_EVENT • CISCO_ROUTER_EVENT • CISCO_WIRELESS_AP_EVENT • CISCO_WIRELESS_LIGHTWEIGHT_AP_EVENT • CISCO_DMP_EVENT • CISCO_IPVSC_EVENT • WORD—Apply a user-defined event trigger.
shell_function	Specifies a built-in macro name: • CISCO_PHONE_AUTO_SMARTPORT (Optional) Specify the parameter values: $ACCESS_VLAN=(1) and $VOICE_VLAN=(2). • CISCO_SWITCH_AUTO_SMARTPORT (Optional) Specify the parameter values: $NATIVE_VLAN=(1). • CISCO_ROUTER_AUTO_SMARTPORT (Optional) Specify the parameter values: $NATIVE_VLAN=(1). • CISCO_AP_AUTO_SMARTPORT (Optional) Specify the parameter values: $NATIVE_VLAN=(1). • CISCO_LWAP_AUTO_SMARTPORT (Optional) Specify the parameter values: $ACCESS_VLAN=(1). • CISCO_DMP_AUTO_SMARTPORT • CISCO_IP_CAMERA_AUTO_SMARTPORT
param name=value	(Optional) Specifies values for the parameters that are to be used in the function body.

Defaults

Auto Smartports is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.2(54)SG	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

The switch automatically maps from builtin event triggers to builtin functions. The builtin functions are system-defined functions in the software image.

Use the **macro auto execute** global configuration command to replace the builtin function default values with values specific to your switch.

You can also create user-defined triggers and use this command to map the triggers to builtin functions.

You can create user-defined event triggers by entering the **shell trigger** global configuration command. Use the **show shell** privileged EXEC command to display the contents of the builtin and user-defined triggers and functions.

Examples

This example shows how to use two built-in Auto Smartports macros for connecting Cisco switches and Cisco IP phones to the switch. It modifies the default voice VLAN, access VLAN, and native VLAN for the trunk interface:

```
Switch# configure terminal
Switch(config)#!!! the next command modifies the access and voice vlans
Switch(config)#!!! for the built in Cisco IP phone auto smartport macro
Switch(config)# macro auto execute CISCO_PHONE_EVENT builtin CISCO_PHONE_AUTO_SMARTPORT
ACCESS_VLAN=10 VOICE_VLAN=20
Switch(config)#
Switch(config)#!!! the next command modifies the native vlan
Switch(config)#!!! for the built in switch auto smartport macro
Switch(config)# macro auto execute CISCO_SWITCH_EVENT builtin CISCO_SWITCH_AUTO_SMARTPORT
NATIVE_VLAN=10
Switch(config)#!!! the next example creates a user-defined trigger and maps it to a
builtin functions
Switch(config)# shell trigger myTrigger "user-defined trigger"
Switch(config)# macro auto execute myTrigger builtin CISCO_PHONE_AUTO_SMARTPORT_ACCESSVLAN
voice_vlan
Switch(config)#!!! the next command enables auto smart ports globally
Switch(config)# macro auto global processing fallback CDP

Switch# !!! here's the running configuration of the interface connected
Switch# !!! to another Cisco Switch after the Macro is applied
Switch#
Switch# show running-config interface Gi1/0/1
Building configuration...

Current configuration : 284 bytes
!
interface GigabitEthernet1/0/1
 switchport trunk encapsulation dot1q
 switchport trunk native vlan 10
 switchport mode trunk
 srr-queue bandwidth share 10 10 60 20
 queue-set 2
 priority-queue out
 mls qos trust cos
 auto qos voip trust
 macro description CISCO_SWITCH_EVENT
end
```

Related Commands

Command	Description
macro auto device	Simplifies changing the parameters for a built-in functions for a device type.
macro auto execute (remotely-defined trigger)	Maps a trigger to a remotely defined functions.
macro auto execute (user-defined function)	Maps a trigger to a user-defined function.
macro auto global processing	Enables Auto Smartports on a switch.
macro auto processing	Enables Auto SmartPorts macros on a specific interface.
macro auto sticky	Specifies not to remove configurations applied by ASP across link flaps and device removal.
shell trigger	Creates a user defined trigger.

macro auto execute (remotely-defined trigger)

Use the **macro auto execute** configuration command to map a trigger to a remotely defined function. Use the **no** form of this command to unmap the trigger.

macro auto execute *trigger_name* **remote** *url*

no macro auto execute *trigger_name* **remote** *url*

Syntax Description

trigger_name	Specifies the trigger name.
url	Specifies the remotely-defined URL

Defaults

None

Command Modes

Global configuration

Command History

Release	Modification
12.2(54)SG	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

This command enables you to store shell functions in a central location and utilized by ASP on many switches. This alleviates the problem of updating functions on every switch for each modification.

Triggering of the remotely defined function requires network connectivity to the URL, which is accessed for each execution of the function.

Examples

This example shows how to map a trigger to the remotely defined function **myfunction** - the filename that contains the function body:

```
Switch(config)# macro auto execute mytrigger remote tftp://dirt/tftpboot/myfunction
```

Related Commands

Command	Description
macro auto device	Simplifies changing the parameters for a built-in functions for a device type.
macro auto execute (built-in function)	Changes built-in function default values or to map user-defined triggers to built-in functions, and to pass the parameter values.
macro auto execute (user-defined function)	Maps a trigger to a user-defined function.
macro auto global processing	Enables Auto Smartports on a switch.
macro auto processing	Enable Auto SmartPorts macros on a specific interface.

Command	Description
macro auto sticky	Specifies not to remove configurations applied by ASP across link flaps and device removal.
shell trigger	Create a user defined trigger.

macro auto execute (user-defined function)

Use the **macro auto execute** configuration command to map a trigger to a user-defined function. Use the **no** form of this command to unmap the trigger.

macro auto execute *trigger_name* **[***param_name=value***]** {*function body*}

no macro auto execute *trigger_name* **[***param_name=value***]**

Syntax Description

trigger_name	Specifies the trigger name.
param name=value	(Optional) Specifies values for the parameters that are to be used in the function body.
function_body	Shell functions with CLIs.

Defaults

None.

Command Modes

Global configuration

Command History

Release	Modification
12.2(54)SG	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Because the function defined in this command does not have a name, you cannot use it to map to another trigger. This is the only way that you can map a trigger to a user defined function. Shell functions defined in the non-configure mode can not be used to map triggers.

Examples

This example shows how to map the user-defined event trigger **Cisco Digital Media Player** (DMP) to a user-defined macro.

a. Connect the DMP to an 802.1x- or MAB-enabled switch port.

b. On the RADIUS server, set the attribute-value pair to **auto-smart-port**=CISCO_DMP_EVENT.

c. On the switch, create the event trigger CISCO_DMP_EVENT, and enter the user-defined macro commands shown below.

d. The switch recognizes the attribute-value pair=CISCO_DMP_EVENT response from the RADIUS server and applies the macro associated with this event trigger.

```
Switch(config)# shell trigger CISCO_DMP_EVENT Cisco DMP player
Switch(config)# macro auto execute CISCO_DMP_EVENT {
if [[ $LINKUP -eq YES ]]; then
conf t
 interface $INTERFACE
   macro description $TRIGGER
   switchport access vlan 1
   switchport mode access
   switchport port-security
```

```
   switchport port-security maximum 1
   switchport port-security violation restrict
   switchport port-security aging time 2
   switchport port-security aging type inactivity
   spanning-tree portfast
   spanning-tree bpduguard enable
   exit
fi
if [[ $LINKUP -eq NO ]]; then
conf t
interface $INTERFACE
     no macro description $TRIGGER
     no switchport access vlan 1
     if [[ $AUTH_ENABLED -eq NO ]]; then
        no switchport mode access
     fi
     no switchport port-security
     no switchport port-security maximum 1
     no switchport port-security violation restrict
     no switchport port-security aging time 2
     no switchport port-security aging type inactivity
     no spanning-tree portfast
     no spanning-tree bpduguard enable
     exit
fi
}
Switch(config)# end
```

Related Commands

Command	Description
macro auto device	Simplifies changing the parameters for a built-in functions for a device type.
macro auto execute (built-in function)	Changes built-in function default values or to map user-defined triggers to built-in functions, and to pass the parameter values.
macro auto execute (remotely-defined trigger)	Maps a trigger to a remotely defined functions.
macro auto global processing	Enables Auto Smartports on a switch.
macro auto processing	Enables Auto SmartPorts macros on a specific interface.
macro auto sticky	Specifies not to remove configurations applied by ASP across link flaps and device removal.
shell trigger	Creates a user defined trigger.

macro auto global processing

Use the **macro auto global processing** global configuration command to enable Auto SmartPorts macros on the switch. Use the **no** form of this command to disable Auto SmartPorts (ASP) macros globally.

macro auto global processing [**cdp** | **lldp**]

no macro auto global processing [cdp | **ldp**]

Note Starting with Release 15.0(2)SG, the **fallback** option has been deprecated.

Syntax Description

cdp	Selects CDP as fallback mode.
lldp	Selects LLDP as fallback mode.

Defaults

Auto Smartports is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.2(54)SG	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Use the **macro auto global processing** global configuration command to globally enable Auto Smartports macros on the *switch*. To disable ASP macros on a specific *port*, use the **no macro auto processing** command in the interface mode before ASP is enabled globally.

Auto Smartports macros dynamically configure ports based on the device type detected on the port. When the switch detects a new device on a port it applies the appropriate ASP macro. When a link-down event occurs on a port, the switch removes the macro. For example, when you connect a Cisco IP phone to a port, ASP automatically applies the IP phone macro. The IP phone macro enables quality of service (QoS), security features, and a dedicated voice VLAN to ensure proper treatment of delay-sensitive voice traffic.

ASP uses event triggers to map devices to macros. The most common event triggers are based on Cisco Discovery Protocol (CDP) messages received from connected devices. The detection of a device invokes a CDP event trigger: Cisco IP phone, Cisco wireless access point, Cisco switch, or Cisco router. Other event triggers use MAC authentication bypass (MAB) and 802.1X authentication messages.

Use CDP if port authentication is enabled and the RADIUS server does not send an event trigger.

Select LLDP to apply auto configuration if authentication fails.

If authentication is enabled on a port, a switch ignores CDP and LLDP messages unless the **cdp** keyword is enabled.

When using 802.1X or MAB authentication, configure the RADIUS server to support the Cisco attribute-value (AV) pair **auto-smart-port=***event trigger.*

When CDP-identified devices advertise multiple capabilities, a switch chooses a capability in this priority order: switch, router, access point, lightweight access point, phone, host.

To verify that an ASP macro is applied to an interface, use the **show running config** command.

The **macro auto global processing cdp** and **macro auto global processing lldp** commands enables ASP globally if it is not already enabled, and set the fallback to CDP or LLDP, respectively. However, the **no macro auto global processing [cdp | lldp]** command only removes the fallback mechanism. It does not disable ASP globally; only the **no macro auto global processing** command disables ASP globally.

The keywords **cdp** and **lldp** are also controlled at the interface level; by default, CDP is the fallback mechanism on an interface. If you prefer LLDP, first enter the **no macro auto processing cdp** command, then enter the **macro auto processing lldp** command.

If you want to activate both CDP and LLDP, you must enable them in sequence. For example, you would first enter the **macro auto processing cdp** command, then the **macro auto processing lldp** command.

Examples

This example shows how enable ASP on a switch and to disable the feature on Gi1/0/1:

```
Switch(config)# interface interface Gi1/0/1
Switch(config-if)# no macro auto processing
Switch(config)# macro auto global processing
```

Related Commands

Command	Description
macro auto device	Simplifies changing the parameters for a built-in functions for a device type.
macro auto execute (built-in function)	Changes built-in function default values or to map user-defined triggers to built-in functions, and to pass the parameter values.
macro auto execute (remotely-defined trigger)	Maps a trigger to a remotely defined functions.
macro auto execute (user-defined function)	Maps a trigger to a user-defined function.
macro auto processing	Enables ASP macros on a specific interface.
macro auto sticky	Enables a user to not remove configurations applied by ASP across link flaps and device removal.
shell trigger	Creates a user defined trigger.

macro auto mac-address-group

Use the **macro auto mac-address-group** command to configure a group of MAC-address or OUIs as a trigger. Use the **no** form of this command to unconfigure the group.

macro auto mac-address-group *grp_name*

no macro auto mac-address-group *grp_namel*

Syntax Description

grp_name	Specifies the group name.

Command Modes

Global configuration

Command History

Release	Modification
12.2(54)SG	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

This command changes the mode to config-mac-addr-grp, in which you can add or remove a MAC address or OUI from the group.

You can specify a list of MACs or OUIs, or a range of OUIs (maximum of 5 in the range).

Examples

This example shows how to configure **testGroup** as a trigger:

```
Switch(config)# macro auto mac-address-group testGroup
Switch(config-addr-grp-mac)# mac-address list 1111.1111.1111 2222.2222.2222
Switch(config-addr-grp-mac)# exit
Switch(config)# exit
```

Related Commands

Command	Description
macro auto execute (built-in function)	Changes built-in function default values or to map user-defined triggers to built-in functions, and to pass the parameter values.
macro auto execute (remotely-defined trigger)	Maps a trigger to a remotely defined functions.
macro auto execute (user-defined function)	Maps a trigger to a user-defined function.
macro auto global processing	Enables Auto Smartports on a switch.
macro auto processing	Enables Auto SmartPorts macros on a specific interface.
macro auto sticky	Specifies not to remove configurations applied by ASP across link flaps and device removal.
shell trigger	Creates a user defined trigger.

macro auto processing

Note Only use this command when Auto SmartPorts (ASP) is enabled globally; when ASP is disabled globally, interface-level control has no effect.

Use the **macro auto processing** interface configuration command to enable ASP macros on a specific interface. Use the **no** form of this command to disable ASP on a specific interface before ASP is enabled globally.

macro auto processing [fallback cdp] [fallback lldp]

no macro auto processing [fallback cdp] [fallback lldp]

Syntax Description

fallback cdp	Specifies as CDP as the fallback mechanism.
fallback lldp	Specifies as LLDP as the fallback mechanism.

Defaults

Fallback mechanism is CDP.

Command Modes

Interface level configuration

Command History

Release	Modification
12.2(54)SG	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

The **no macro auto processing** command should be configured on all interfaces where ASP is not desirable (such as Layer 3 and EtherChannel interfaces) before ASP is enabled globally.

At the interface level, the default fallback mechanism is CDP. To change the mechanism to LLDP, enter the **no macro auto processing fallback cdp** command, followed by the **macro auto processing fallback lldp** command.

Examples

This example shows how to enable the feature on an interface:

```
Switch(config)# interface Gi3/1
Switch(config-if)# macro auto processing
```

Related Commands

Command	Description
macro auto execute (built-in function)	Configures mapping from an event trigger to a built-in macro.
shell trigger	Creates a user defined trigger.
show shell functions	Displays configurations included for all the builtin functions including user created and built-in functions.

Command	Description
show shell triggers	Displays detail for all supported user created and built-in triggers.
macro auto execute (built-in function)	Changes built-in function default values or to map user-defined triggers to built-in functions, and to pass the parameter values.
macro auto execute (remotely-defined trigger)	Maps a trigger to a remotely defined functions.
macro auto execute (user-defined function)	Maps a trigger to a user-defined function.
macro auto global processing	Enables Auto Smartports on a switch.

macro auto sticky

Use the **macro auto sticky** configuration to specify not to remove configurations applied by ASP across link flaps and device removal.

macro auto sticky

Syntax Description

This command has no arguments or keywords.

Defaults

Not sticky (macros are removed

Command Modes

Global configuration

Command History

Release	Modification
12.2(54)SG	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

This command enables you to avoid unnecessary removal of ASP configurations when a feature intentionally shuts down a link (like EnergyWise, which shuts down inactive links to save energy). When such a feature is enabled, you don't want ASP macros to be applied and removed unnecessarily. So you configure the sticky feature.

Examples

This example shows how to specify not to remove configurations:

```
Switch(config)# macro auto sticky
```

Related Commands

Command	Description
macro auto execute (built-in function)	Changes built-in function default values or to map user-defined triggers to built-in functions, and to pass the parameter values.
macro auto execute (remotely-defined trigger)	Maps a trigger to a remotely defined functions.
macro auto execute (user-defined function)	Maps a trigger to a user-defined function.
macro auto global processing	Enables Auto Smartports on a switch.
macro auto processing	Enables Auto SmartPorts macros on a specific interface.
shell trigger	Creates a user defined trigger.

macro global apply cisco-global

To apply the system-defined default template to the switch, use the **macro global apply cisco-global** global configuration command on the switch stack or on a standalone switch.

macro global apply cisco-global

Syntax Description

This command has no keywords or variables.

Defaults

This command has no default setting.

Command Modes

Global configuration mode

Command History

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

Examples

These examples show how to apply the system-defined default to the switch:

```
Switch(config)# macro global apply cisco-global
Changing VTP domain name from gsg-vtp to [smartports] Device mode already VTP TRANSPARENT.
Switch(config)#
```

macro global apply system-cpp

To apply the control plane policing default template to the switch, use the **macro global apply system-cpp** global configuration command on the switch stack or on a standalone switch.

macro global apply system-cpp

Syntax Description

This command has no keywords or variables.

Defaults

This command has no default setting.

Command Modes

Global configuration mode

Command History

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

Examples

This example shows how to apply the system-defined default to the switch:

```
Switch (config)# macro global apply system-cpp
Switch (config)#
```

Related Commands

Command	Description
macro global apply cisco-global	Applies the system-defined default template to the switch.
macro global description	Enters a description about the macros that are applied to the switch.

macro global description

To enter a description about the macros that are applied to the switch, use the **macro global description** global configuration command on the switch stack or on a standalone switch. Use the **no** form of this command to remove the description.

macro global description *text*

no macro global description *text*

Syntax Description

text	Enters a description about the macros that are applied to the switch.

Defaults

This command has no default setting.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

This command associates 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.

Examples

This example shows how to add a description to a switch:

```
Switch(config)# macro global description udld aggressive mode enabled
```

You can verify your settings by entering the **show parser macro description** privileged EXEC command.

Related Commands

Command	Description
macro global apply cisco-global	Applies the system-defined default template to the switch.

main-cpu

To enter the main CPU submode and manually synchronize the configurations on the two supervisor engines, use the **main-cpu** command.

main-cpu

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default settings.

Command Modes

Redundancy mode

Command History

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

Usage Guidelines

The main CPU submode is used to manually synchronize the configurations on the two supervisor engines. From the main CPU submode, use the **auto-sync** command to enable automatic synchronization of the configuration files in NVRAM.

Note After you enter the main CPU submode, you can use the **auto-sync** command to automatically synchronize the configuration between the primary and secondary route processors based on the primary configuration. In addition, you can use all of the redundancy commands that are applicable to the main CPU.

Examples

This example shows how to reenable the default automatic synchronization feature using the auto-sync standard command to synchronize the startup-config and config-register configuration of the active supervisor engine with the standby supervisor engine. The updates for the boot variables are automatic and cannot be disabled.

```
Switch(config)# redundancy
Switch(config-red)# main-cpu
Switch(config-r-mc)# auto-sync standard
Switch(config-r-mc)# end
Switch# copy running-config startup-config
Switch#
```

Related Commands

Command	Description
auto-sync	Enables automatic synchronization of the configuration files in NVRAM.

match

To specify a match clause by selecting one or more ACLs for a VLAN access-map sequence, use the **match** subcommand. To remove the match clause, use the **no** form of this command.

match {**ip address** {*acl-number* | *acl-name*}} | {**mac address** *acl-name*}

no match {**ip address** {*acl-number* | *acl-name*}} | {**mac address** *acl-name*}

Note If a match clause is not specified, the action for the VLAN access-map sequence is applied to all packets. All packets are matched against that sequence in the access map.

Syntax Description

ip address *acl-number*	Selects one or more IP ACLs for a VLAN access-map sequence; valid values are from 1 to 199 and from 1300 to 2699.
ip address *acl-name*	Selects an IP ACL by name.
mac address *acl-name*	Selects one or more MAC ACLs for a VLAN access-map sequence.

Defaults

This command has no default settings.

Command Modes

VLAN access-map mode

Command History

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

Usage Guidelines

The match clause specifies the IP or MAC ACL for traffic filtering.

The MAC sequence is not effective for IP packets. IP packets should be access controlled by IP match clauses.

Refer to the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide* for additional configuration guidelines and restrictions.

Refer to the *Cisco IOS Command Reference* publication for additional **match** command information.

Examples

This example shows how to define a match clause for a VLAN access map:

```
Switch(config)# vlan access-map ganymede 10
Switch(config-access-map)# match ip address 13
Switch(config-access-map)#
```

Related Commands

Command	Description
show vlan access-map	Displays the contents of a VLAN access map.
vlan access-map	Enters VLAN access-map command mode to create a VLAN access map.

match (class-map configuration)

To define the match criteria for a class map, use the **match** class-map configuration command. To remove the match criteria, use the **no** form of this command.

Non-Supervisor Engine 6-E

match {**access-group** *acl-index-or-name* | **cos** *cos-list* | [**lp**] **dscp** *dscp-list* | [**lp**] **precedence** *ip-precedence-list*

no match {**access-group** *acl-index-or-name* | **cos** *cos-list* | [**lp**] **dscp** *dscp-list* | [**lp**] **precedence** *ip-precedence-list*

Supervisor Engine 6-E and Catalyst 4900M chassis

match {**access-group** *acl-index-or-name* | **cos** *cos-list* | [**lp**] **dscp** *dscp-list* | [**lp**] **precedence** *ip-precedence-list* | **qos-group** *value* | **protocol** [**ip** | **ipv6** | **arp**]

no match {**access-group** *acl-index-or-name* | **cos** *cos-list* | [**lp**] **dscp** *dscp-list* | [**lp**] **precedence** *ip-precedence-list* | **qos-group** *value* | **protocol** [**ip** | **ipv6** | **arp**]

Syntax Description

access-group *acl-index-or-name*	Number or name of an IP standard or extended access control list (ACL) or MAC ACL. For an IP standard ACL, the ACL index range is 1 to 99 and 1300 to 1999. For an IP extended ACL, the ACL index range is 100 to 199 and 2000 to 2699.
cos *cos-list*	Lists up to four Layer 2 class of service (CoS) values to match against a packet. Separate each value with a space. The range is 0 to 7.
[**lp**] **dscp** *dscp-list*	(Optional) IP keyword. It specifies that the match is for IPv4 packets only. If not used, the match is for both IPv4 and IPv6 packets. Lists up to eight IP Differentiated Services Code Point (DSCP) values to match against a packet. Separate each value with a space. The range is 0 to 63. You also can enter a mnemonic name for a commonly used value.
[**lp**] **precedence** *ip-precedence-list*	(Optional) IP keyword. It specifies that the match is for IPv4 packets only. If not used, the match is for both IPv4 and IPv6 packets. Lists up to eight IP-precedence values to match against a packet. Separate each value with a space. The range is 0 to 7. You also can enter a mnemonic name for a commonly used value.
qos-group *value*	Specifies the internally generated qos-group value assigned to a packet on the input qos classification.
protocol ip	Specifies IP in the Ethernet header. The match criteria are supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. Though visible in the command-line help strings, the only protocol types supported are IP, IPv6, and ARP.

protocol ipv6	Specifies IPv6 in the Ethernet header. The match criteria are supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. Though visible in the command-line help strings the only protocol types supported are IP, IPv6, and ARP.
protocol arp	Specifies ARP in the Ethernet header. The match criteria are supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. Though visible in the command-line help strings the only protocol types supported are IP, IPv6, and ARP.

Defaults

No match criteria are defined.

Command Modes

Class-map configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switches.
12.2(40)SG	Added support for the Supervisor Engine 6-E and Catalyst 4900M chassis.
12.2(46)SG	Added support for the **match protocol arp** command on the Supervisor Engine 6-E and Catalyst 4900M chassis.

Usage Guidelines

Before entering the **match** command, you must first enter the **class-map** global configuration command to specify the name of the class whose match criteria you want to establish. The **match** command is used to specify which fields in the packets are examined to classify the packets. If a packet matches the specified criteria, the packet is considered a member of the class and is forwarded according to the quality of service (QoS) specifications set in the traffic policy.

For the **match ip dscp** *dscp-list* or the **match ip precedence** *ip-precedence-list* command, you can enter a mnemonic name for a commonly used value. For example, you can enter the **match ip dscp af11** command, which is the same as entering the **match ip dscp 10** command. You can enter the **match ip precedence critical** command, which is the same as entering the **match ip precedence 5** command. For a list of supported mnemonics, enter the **match ip dscp ?** or the **match ip precedence ?** command to see the command-line help strings.

To match only IPv6 packets, you must use the **match protocol ipv6** command. To match only IPv4 packets you can use either the **ip** prefix or the protocol **ip** keyword.

To match only ARP packets, you must use the **match protocol arp** command.

You can configure the **match cos** *cos-list*, **match ip dscp** *dscp-list*, **match ip precedence** *ip-precedence-list* command in a class map within a policy map.

The **match cos** *cos-list* command applies only to Ethernet frames that carry a VLAN tag.

The **match qos-group** command is used by the class-map to identify a specific QoS group value assigned to a packet. The QoS group value is local to the switch and is associated with a packet on the input Qos classification.

Packets that do not meet any of the matching criteria are classified as members of the default traffic class. You configure it by specifying **class-default** as the class name in the **class** policy-map configuration command. For more information, see the "class" section on page 2-67.

Examples

This example shows how to create a class map called class2, which matches all the inbound traffic with DSCP values of 10, 11, and 12:

```
Switch# configure terminal
Switch(config)# class-map class2
Switch(config-cmap)# match ip dscp 10 11 12
Switch(config-cmap)# exit
Switch#
```

This example shows how to create a class map called class3, which matches all the inbound traffic with IP-precedence values of 5, 6, and 7 for both IPv4 and IPv6 traffic:

```
Switch# configure terminal
Switch(config)# class-map class3
Switch(config-cmap)# match ip precedence 5 6 7
Switch(config-cmap)# exit
Switch#
```

This example shows how to delete the IP-precedence match criteria and to classify traffic using acl1:

```
Switch# configure terminal
Switch(config)# class-map class2
Switch(config-cmap)# match ip precedence 5 6 7
Switch(config-cmap)# no match ip precedence
Switch(config-cmap)# match access-group acl1
Switch(config-cmap)# exit
Switch#
```

This example shows how to specify a class-map that applies only to IPv6 traffic on a Supervisor Engine 6-E:

```
Switch# configure terminal
Switch(config)# class-map match all ipv6 only
Switch(config-cmap)# match dscp af21
Switch(config-cmap)# match protocol ipv6
Switch(config-cmap)# exit
Switch#
```

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

Related Commands

Command	Description
class-map	Creates a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode.
show class-map	Displays class map information.

match flow ip

To specify match criteria to treat flows with a unique source or destination address as new flows, use the **match flow ip** command. To disable this function, use the **no** form of this command.

match flow ip {**source-address** [**ip destination-address ip protocol L4 source-address L4 destination-address**] | **destination-address**}

no match flow ip {**source-address** [**ip destination-address ip protocol L4 source-address L4 destination-address**] | **destination-address**}

Syntax Description

source-address	Establishes a new flow from a flow with a unique IP source address.
ip destination-address ip protocol L4 source-address L4 destination-address	(Optional) Comprises the full flow keyword; treats each flow with unique IP source, destination, protocol, and Layer 4 source and destination address as a new flow.
destination-address	Establishes a new flow from a flow with a unique IP destination address.

Defaults

This command has no default settings..

Command Modes

class-map configuration submode

Command History

Release	Modification
12.2(25)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(25)SG	Support for the full flow option was added.

Usage Guidelines

When you specify the source-address keyword, each flow with a unique source address is treated as a new flow.

When you specify the destination-address keyword, each flow with a unique destination address is treated as a new flow.

A policy map is called a *flow-based* policy map when you configure the flow keywords on the class map that it uses. To attach a flow-based policy map as a child to an aggregate policy map, use the **service-policy** command.

Note The **match flow** command is available on the Catalyst 4500 series switch only when Supervisor Engine VI (WS-X4516-10GE) is present.

Examples

This example shows how to create a flow-based class map associated with a source address:

```
Switch(config)# class-map match-all c1
Switch(config-cmap)# match flow ip source-address
Switch(config-cmap)# end
Switch#
Switch# show class-map c1
Class Map match-all c1 (id 2)
  Match flow  ip source-address
Switch#
```

This example shows how to create a flow-based class map associated with a destination address:

```
Switch(config)# class-map match-all c1
Switch(config-cmap)# match flow ip destination-address
Switch(config-cmap)# end
Switch#

Switch# show class-map c1
 Class Map match-all c1 (id 2)
   Match flow  ip destination-address
Switch#
```

Assume there are two active flows on the Fast Ethernet interface 6/1 with source addresses 192.168.10.20 and 192.168.10.21. The following example shows how to maintain each flow to 1 Mbps with an allowed burst value of 9000 bytes:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# class-map c1
Switch(config-cmap)# match flow ip source-address
Switch(config-cmap)# exit
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# police 1000000 9000
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface fastethernet6/1
Switch(config-if)# service-policy input p1
Switch(config-if)# end
Switch# write memory

Switch# show policy-map interface
FastEthernet6/1

 Service-policy input: p1

   Class-map: c1 (match-all)
     15432182 packets
     Match: flow  ip source-address
     police: Per-interface
       Conform: 64995654 bytes Exceed: 2376965424 bytes

   Class-map: class-default (match-any)
     0 packets
     Match: any
       0 packets
Switch#
```

This example shows two active flows on the Fast Ethernet interface 6/1 with destination addresses of 192.168.20.20 and 192.168.20.21. The following example shows how to maintain each flow to 1 Mbps with an allowed burst value of 9000 bytes:

```
Switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# class-map c1
Switch(config-cmap)# match flow ip destination-address
Switch(config-cmap)# exit
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# police 1000000 9000
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface fastethernet6/1
Switch(config-if)# service-policy input p1
Switch(config-if)# end
Switch# write memory

Switch# show policy-map interface
 FastEthernet6/1

  Service-policy input: p1

    Class-map: c1 (match-all)
      2965072 packets
      Match: flow  ip destination-address
      police: Per-interface
        Conform: 6105636 bytes Exceed: 476652528 bytes

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
Switch#
```

Assume there are two active flows as shown below on the Fast Ethernet interface 6/1:

```
SrcIp          DstIp          IpProt SrcL4Port DstL4Port
-------------------------------------------------------
192.168.10.10  192.168.20.20  20     6789       81
192.168.10.10  192.168.20.20  20     6789       21
```

With the following configuration, each flow is policed to a 1000000 bps with an allowed 9000-byte burst value.

Note If you use the **match flow ip source-address|destination-address** command, these two flows are consolidated into one flow because they have the same source and destination address.

```
Switch# conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# class-map c1
Switch(config-cmap)# match flow ip source-address ip destination-address ip protocol l4
source-port l4 destination-port
Switch(config-cmap)# exit
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# police 1000000 9000
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface fastEthernet 6/1
```

```
Switch(config-if)# service-policy input p1
Switch(config-if)# end
Switch# write memory
Switch# show policy-map interface
FastEthernet6/1

class-map c1
   match flow  ip source-address ip destination-address ip protocol l4 source-port l4
destination-port
!
 policy-map p1
    class c1
       police 1000000 bps 9000 byte conform-action transmit exceed-action drop
!
interface FastEthernet 6/1
  service-policy input p1

Switch# show class-map c1
 Class Map match-all c1 (id 2)
   Match flow  ip source-address ip destination-address ip protocol l4 source-port l4
destination-port

Switch# show policy-map p1
  Policy Map p1
    Class c1
      police 1000000 bps 9000 byte conform-action transmit exceed-action drop

Switch# show policy-map interface
 FastEthernet6/1

  Service-policy input: p1

    Class-map: c1 (match-all)
      15432182 packets
      Match: flow  ip source-address ip destination-address ip protocol l4 source-port l4
destination-port
      police: Per-interface
        Conform: 64995654 bytes Exceed: 2376965424 bytes


    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
Switch#
```

Related Commands

Command	Description
service-policy (interface configuration)	Attaches a policy map to an interface.
show class-map	Displays class map information.
show policy-map	Displays information about the policy map.
show policy-map interface	Displays the statistics and configurations of the input and output policies that are attached to an interface.

mdix auto

To enable the automatic medium-dependent interface crossover (auto-MDIX) feature on the interface, use the **mdix auto** command. When auto-MDIX is enabled, the interface automatically detects the required cable connection type (straight-through or crossover) and configures the connection appropriately. Use the **no** form of this command to disable auto-MDIX.

mdix auto

no mdix auto

Syntax Description

This command has no arguments or keywords.

Defaults

Auto-MDIX is enabled.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(31)SGA	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(46)SG	Added supported and unsupported linecard information to the usage guidelines.

Usage Guidelines

The following linecards support Auto-MDIX through the CLI on their copper media ports: WS-X4124-RJ45, WS-X4148-RJ45 (hardware revision 3.0 or higher), and WS-X4232-GB-RJ45 (hardware revision 3.0, or higher), WS-X4920-GE-RJ45, and WS-4648-RJ45V+E (Auto-MDIX support when inline power is disabled on the port).

Linecards that support auto-MDIX by default when port auto-negotiation enabled and cannot be turned off using an **mdix** CLI command include: WS-X4448-GB-RJ45, WS-X4548-GB-RJ45, WS-X4424-GB-RJ45, and WS-X4412-2GB-T.

Linecards that cannot support auto-MDIX functionality, either by default or CLI commands, include: WS-X4548-GB-RJ45V, WS-X4524-GB-RJ45V, WS-X4506-GB-T, WS-X4148-RJ, WS-X4248-RJ21V, WS-X4248-RJ45V, WS-X4224-RJ45V, and WS-X4232-GB-RJ.

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

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

Examples

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

```
Switch# configure terminal
Switch(config)# interface FastEthernet6/3
Switch(config-if)# speed auto
Switch(config-if)# mdix auto
Switch(config-if)# end
```

Related Commands

Command	Description
speed	Configures the interface speed.
show interfaces	Displays traffic on a specific interface.
show interfaces capabilities	Displays the interface capabilities for an interface or for all the interfaces on a switch.
show interfaces status	Displays the interface status.

media-type

To select the connector for a dual-mode capable port, use the **media-type** command.

media-type {**rj45** | **sfp**}

Syntax Description

rj45	Uses the RJ-45 connector.
sfp	Uses the SFP connector.

Defaults

sfp

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(20)EWA	Support for this command was introduced for the WS-X4306-GB-T module and the WS-X4948 chassis.

Usage Guidelines

This command is supported on all ports on the WS-X4306-GB-T module and ports 1/45-48 on the WS-X4948 chassis.

Entering the **show interface capabilities** command provides the Multiple Media Types field, which displays the value **no** if a port is not dual-mode capable and lists the media types (**sfp** and **rj45**) for dual-mode capable ports.

Examples

This example shows how to configure port 5/45 on a WS-X4948 chassis to use the RJ-45 connector:

```
Switch(config)# interface gigabitethernet 5/45
Switch(config-if)# media-type rj45
```

mode

To set the redundancy mode, use the **mode** command.

mode {**rpr** | **sso**}

Syntax Description

rpr	Specifies RPR mode.
sso	Specifies SSO mode.

Defaults

For Catalyst 4500 series switches that are configured with Supervisor Engine II+, Supervisor Engine IV, and Supervisor Engine V, the defaults are as follows:

- SSO if the supervisor engine is using Cisco IOS Release 12.2(20)EWA.
- RPR if the supervisor engine is using Cisco IOS Release 12.1(12c)EW through 12.2(18)EW, as well as 12.1(*xx*)E.

Note If you are upgrading the current supervisor engine from Cisco IOS Release 12.2(18)EW or an earlier release to 12.2(20)EWA, and the RPR mode has been saved to the startup configuration, both supervisor engines will continue to operate in RPR mode after the software upgrade. To use SSO mode, you must manually change the redundancy mode to SSO.

Command Modes

Redundancy configuration mode

Command History

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

Usage Guidelines

RPR and SSO mode are not supported on Catalyst 4500 series switches that are configured with Supervisor Engine 2.

The **mode** command can be entered only from within redundancy configuration mode.

Follow these guidelines when configuring your system to RPR or SSO mode:

- You must use identical Cisco IOS images and supervisor engines to support RPR and SSO mode. Redundancy may not work due to differences between the Cisco IOS release and supervisor engine capabilities.
- Any modules that are not online at the time of a switchover are reset and reloaded on a switchover.
- If you perform an OIR of the module within 60 seconds before a stateful switchover, the module resets during the stateful switchover and the port states are restarted.
- The FIB tables are cleared on a switchover. Routed traffic is interrupted until route tables reconverge.

The redundant supervisor engine reloads on any mode change and begins to work in the current mode.

Examples

This example shows how to set the redundancy mode to SSO:

```
Switch(config)# redundancy
Switch(config-red)# mode sso
Switch(config-red)#
```

Related Commands

Command	Description
redundancy	Enters the redundancy configuration mode.
redundancy force-switchover	Forces a switchover from the active to the standby supervisor engine.
show redundancy	Displays redundancy facility information.
show running-config	Displays the running configuration of a switch.

monitor session

To enable the SPAN sessions on interfaces or VLANs, use the **monitor session** command. To remove one or more source or destination interfaces from a SPAN session, or a source VLAN from a SPAN session, use the **no** form of this command.

monitor session *session* {**destination interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number*} [**encapsulation** {**isl** | **dot1q**}] [**ingress** [**vlan** *vlan_id*] [**learning**]]} | {**remote vlan** *vlan_id*} | {**source** {**interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number* | **Port-channel** *interface-number*}} | [**vlan** *vlan_id*] |{**remote vlan** *vlan_id*} | {**cpu** [**queue** *queue_id* | **acl** {**input** {**error** {**rx**} | **log** {**rx**} | **punt** {**rx**} | **rx**}} | **output** {**error** {**rx**} | **forward** {**rx**} | **log** {**rx**} | **punt** {**rx**} | **rx**} | **adj-same-if** {**rx**} | **all** {**rx**} | **bridged** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4** {**rx**} | **rx**} | **control-packet** {**rx**} | **mtu-exceeded** {**rx**} | **routed** {**forward** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4** {**rx**} | **rx**} | **received** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4**{**rx**} | **rx**} | **rx**] | **rpf-failure** {**rx**} | **unknown-sa** {**rx**}]}]} [**,** | **-** | **rx** | **tx** | **both**]} | {**filter** {**ip access-group** [**name** | **id**]}{**vlan** *vlan_id* [**,** | **-**]} | {**packet-type** {**good** | **bad**}} | {**address-type** {**unicast** | **multicast** | **broadcast**} [**rx** | **tx** | **both**]}

no monitor session *session* {**destination interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number*} [**encapsulation** {**isl** | **dot1q**}] [**ingress** [**vlan** *vlan_id*] [**learning**]]} | {**remote vlan** *vlan_id*} | {**source** {**interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number* | **Port-channel** *interface-number*}} | [**vlan** *vlan_id*] |{**remote vlan** *vlan_id*} | {**cpu** [**queue** *queue_id* | **acl** {**input** {**error** {**rx**} | **log** {**rx**} | **punt** {**rx**} | **rx**}} | **output** {**error** {**rx**} | **forward** {**rx**} | **log** {**rx**} | **punt** {**rx**} | **rx**} | **adj-same-if** {**rx**} | **all** {**rx**} | **bridged** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4** {**rx**} | **rx**} | **control-packet** {**rx**} | **mtu-exceeded** {**rx**} | **routed** {**forward** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4** {**rx**} | **rx**} | **received** {**1** {**rx**} | **2** {**rx**} | **3** {**rx**} | **4**{**rx**} | **rx**} | **rx**] | **rpf-failure** {**rx**} | **unknown-sa** {**rx**}]}]} [**,** | **-** | **rx** | **tx** | **both**]} | {**filter** {**ip access-group** [**name** | **id**]}{**vlan** *vlan_id* [**,** | **-**]} | {**packet-type** {**good** | **bad**}} | {**address-type** {**unicast** | **multicast** | **broadcast**} [**rx** | **tx** | **both**]}

Supervisor Engine 6-E and Catalyst 4900M chassis

monitor session *session* {**destination interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number*} [**encapsulation** {**isl** | **dot1q**}] [**ingress** [**vlan** *vlan_id*] [**learning**]]} | {**remote vlan** *vlan_id*} | {**source** { **interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number* | **Port-channel** *interface-number*}} | [**vlan** *vlan_id*] |{**remote vlan** *vlan_id*} | {**cpu** [**queue** *queue_id* | **acl** { **input** {**copy** {**rx**} | **error** {**rx**} | **forward** {**rx**} | **punt** {**rx**} | **rx**} } | **output** {**copy** {**rx**} | **error** {**rx**} | **forward** {**rx**} | **punt** {**rx**} | **rx**} | **all** {**rx**} | **control-packet** {**rx**} | **esmp** {**rx**} | **l2-forward** { **adj-same-if** {**rx**} | **bridge-cpu** {**rx**} | **ip-option** {**rx**} | **ipv6-scope-check-fail** {**rx**} | **l2-src-index-check-fail** {**rx**} | **mcast-rpf-fail** {**rx**} | **non-arpa** {**rx**} | **router-cpu** {**rx**} | **ttl-expired** {**rx**} | **ucast-rpf-fail** {**rx**} | **rx**} | **l3-forward** { **forward** {**rx**} | **glean** {**rx**} | **receive** {**rx**} | **rx**} **mtu-exceeded** {**rx**} | **unknown-port-vlan-mapping** {**rx**} | **unknown-sa** {**rx**}]} [**,** | **-** | **rx** | **tx** | **both**]} | {**filter** {**ip access-group** [**name** | **id**]}{**vlan** *vlan_id* [**,** | **-**]} | {**packet-type** {**good** | **bad**}} | {**address-type** {**unicast** | **multicast** | **broadcast**} [**rx** | **tx** | **both**]}

no monitor session *session* {**destination interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number*} [**encapsulation** {**isl** | **dot1q**}] [**ingress** [**vlan** *vlan_id*] [**learning**]]} | {**remote vlan** *vlan_id*} | {**source** {**cpu**{**both** | **queue** | **rx** | **tx**} | **interface** {**FastEthernet** *interface-number* | **GigabitEthernet** *interface-number* | **Port-channel** *interface-number*}} | [**vlan** *vlan_id*] |{**remote vlan** *vlan_id*} | {**cpu** [**queue** *queue_id* | **acl** {**input** {**copy** {**rx**} | **error** {**rx**} | **forward** {**rx**} | **punt** {**rx**} | **rx**} } | **output** {**copy** {**rx**} | **error** {**rx**} | **forward** {**rx**} | **punt** {**rx**} | **rx**} | **all** {**rx**} | **control-packet** {**rx**} | **esmp** {**rx**} | **l2-forward**

{ **adj-same-if** {rx} | **bridge-cpu** {**rx**} | **ip-option** {**rx**} | **ipv6-scope-check-fail** {**rx**} | **l2-src-index-check-fail** {**rx**} | **mcast-rpf-fail** {**rx**} | **non-arpa** {**rx**} | **router-cpu** {**rx**} | **ttl-expired** {**rx**} | **ucast-rpf-fail** {**rx**} | **rx**} | **l3-forward** {**forward** {**rx**} | **glean** {**rx**} | **receive** {**rx**} | **rx**} **mtu-exceeded** {**rx**} | **unknown-port-vlan-mapping** {**rx**} | **unknown-sa** {**rx**}]} [**,** | **-** | **rx** | **tx** | **both**]} | {**filter** {**ip access-group** [**name** | **id**]}{**vlan** *vlan_id* [**,** | **-**]} | {**packet-type** {**good** | **bad**}} | {**address-type** {**unicast** | **multicast** | **broadcast**} [**rx** | **tx** | **both**]}

Syntax Description

session	Number of a SPAN session; valid values are from 1 to 6.
destination	Specifies a SPAN destination.
interface	Specifies an interface.
FastEthernet *interface-number*	Specifies a Fast Ethernet module and port number; valid values are from 1 to 6.
GigabitEthernet *interface-number*	Specifies a Gigabit Ethernet module and port number; valid values are from 1 to 6.
encapsulation	(Optional) Specifies the encapsulation type of the destination port.
isl	(Optional) Specifies ISL encapsulation.
dot1q	(Optional) Specifies dot1q encapsulation.
ingress	(Optional) Indicates whether the ingress option is enabled.
vlan *vlan_id*	(Optional) Specifies the VLAN; valid values are from 1 to 4094.
learning	(Optional) Enables host learning on ingress-enabled destination ports.
remote vlan *vlan_id*	Specifies an RSPAN source or destination session on a switch.
source	Specifies a SPAN source.
Port-channel *interface-number*	Specifies a port-channel interface; valid values are from 1 to 64.
cpu	Causes traffic received or sent from the CPU to be copied to the destination of the session.
queue *queue_id*	(Optional) Specifies that only traffic received on the specific CPU subqueue should be copied to the destination of the session. Valid values are from 1 to 64, or by the following names: all, control-packet, esmp, mtu-exceeded, unknown-port-vlan-mapping, unknown-sa, acl input, acl input copy, acl input error, acl input forward, acl input punt, acl output, acl output copy, acl output error, acl output forward, acl output punt, l2-forward, adj-same-if, bridge-cpu, ip-option, ipv6-scope-check-fail, l2-src-index-check-fail, mcast-rpf-fail, non-arpa, router-cpu, ttl-expired, ucast-rpf-fail, l3-forward, forward, glean, receive.
acl	(Optional) Specifies input and output ACLs; valid values are from 14 to 20.
input	Specifies input ACLs; valid values are from 14 to 16.
error	Specifies the ACL software errors.
log/copy	Specifies packets for ACL logging.
punt	Specifies packets punted due to overflows.
rx	Specifies monitoring received traffic only.

output	Specifies output ACLs; valid values are from 17 to 20.
l2-forward	(Optional) Layer 2 or Layer 3 exception packets.
bridge-cpu	Specifies packets bridged to CPU.
ip-option	Specifies packets with an IP option.
ipv6-scope-check-fail	Specifies IPv6 packets with scope-check failures.
l2-src-index-check-fail	Specifies IP packets with mismatched SRC MAC and SRC IP addresses.
mcast-rpf-fail	Specifies IPv4/IPv6 multicast RPF failures.
non-arpa	Specifies packets with non-ARPA encapsulation.
router-cpu	Specifies software routed packets.
ttl-expired	Specifies IPv4 routed pacekts exceed TTL.
adj-same-if	Specifies packets routed to the incoming interface.
bridged	Specifies Layer 2 bridged packets.
1	Specifies packets with the highest priority.
2	Specifies packets with the a high priority.
3	Specifies packets with the a medium priority.
4	Specifies packets with the a low priority.
ucast-rpf-fail	Specifies IPv4/IPv6 Unicast RPF failures.
all	(Optional) all queues.
l3-forward	(Optional) Layer 3 packets.
forward	Specifies special Layer 3 forwards tunnel encapsulation.
glean	Specifies special Layer 3 forwards glean.
receive	Specifies packets addressed to a port.
control-packet	(Optional) Layer 2 control packets.
esmp	(Optional) ESMP packets.
mtu-exceeded	(Optional) Output Layer 3 interface MTU exceeded.
routed	Specifies Layer 3 routed packets.
received	Specifies packets addressed to a port.
rpf-failure	Specifies Multicast RPF failed packets.
unknown-port-vlan-mapping	(Optional) Packets with missing port-VLAN mapping.
unknown-sa	(Optional) Packets with missing source-IP-addresses.
,	(Optional) Symbol to specify another range of SPAN VLANs; valid values are from 1 to 4094.
-	(Optional) Symbol to specify a range of SPAN VLANs.
both	(Optional) Monitors and filters received and transmitted traffic.
rx	(Optional) Monitors and filters received traffic only.
tx	(Optional) Monitors and filters transmitted traffic only.
filter	Limits SPAN source traffic to specific VLANs.
ip access-group	(Optional) Specifies an IP access group filter, either a name or a number.
name	(Optional) Specifies an IP access list name.

id	(Optional) Specifies an IP access list number. Valid values are 1 to 199 for an IP access list and 1300 to 2699 for an IP expanded access list.
vlan *vlan_id*	(Optional) Specifies the VLAN to be filtered. The number is entered as a single value or a range; valid values are from 1 to 4094.
packet-type	Limits SPAN source traffic to packets of a specified type.
good	Specifies a good packet type
bad	Specifies a bad packet type.
address-type unicast | multicast | broadcast	Limits SPAN source traffic to packets of a specified address type. Valid types are unicast, multicast, and broadcast.

Defaults

Received and transmitted traffic, as well as all VLANs, packet types, and address types are monitored on a trunking interface.

Packets are transmitted untagged out the destination port; ingress and learning are disabled.

All packets are permitted and forwarded "as is" on the destination port.

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.1(11b)EW	Support for differing directions within a single-user session and extended VLAN addressing was added.
12.1(19)EW	Support for ingress packets, encapsulation specification, packet and address type filtering, and CPU source sniffing enhancements was added.
12.1(20)EW	Support for remote SPAN and host learning on ingress-enabled destination ports was added.
12.2(20)EW	Support for an IP access group filter was added.
12.2(40)SG	Support for Supervisor Engine 6-E and Catlyst 4900M chassis CPU queue options were added.

Usage Guidelines

Only one SPAN destination for a SPAN session is supported. If you attempt to add another destination interface to a session that already has a destination interface that is configured, you will get an error. You must first remove a SPAN destination interface before changing the SPAN destination to a different interface.

Beginning in Cisco IOS Release 12.1(12c)EW, you can configure sources from different directions within a single user session.

Note Beginning in Cisco IOS Release 12.1(12c)EW, SPAN is limited to two sessions containing ingress sources and four sessions containing egress sources. Bidirectional sources support both ingress and egress sources.

A particular SPAN session can either monitor VLANs or monitor individual interfaces: you cannot have a SPAN session that monitors both specific interfaces and specific VLANs. If you first configure a SPAN session with a source interface, and then try to add a source VLAN to the same SPAN session, you will receive an error. You will also receive an error message if you configure a SPAN session with a source VLAN, and then try to add a source interface to that session. You must first clear any sources for a SPAN session before switching to another type of source. CPU sources may be combined with source interfaces and source VLANs.

When configuring the **ingress** option on a destination port, you must specify an ingress VLAN if the configured encapsulation type is untagged (the default) or is 802.1Q. If the encapsulation type is ISL, then no ingress VLAN specification is necessary.

By default, when you enable ingress, no host learning is performed on destination ports. When you enter the **learning** keyword, host learning is performed on the destination port, and traffic to learned hosts is forwarded out the destination port.

If you enter the **filter** keyword on a monitored trunking interface, only traffic on the set of specified VLANs is monitored. Port-channel interfaces are displayed in the list of **interface** options if you have them configured. VLAN interfaces are not supported. However, you can span a particular VLAN by entering the **monitor session** *session* **source vlan** *vlan-id* command.

The packet-type filters are supported only in the Rx direction. You can specify both Rx- and Tx-type filters and multiple-type filters at the same time (for example, you can use **good** and **unicast** to only sniff nonerror unicast frames). As with VLAN filters, if you do not specify the type, the session will sniff all packet types.

The **queue** identifier allows sniffing for only traffic that is sent or received on the specified CPU queues. The queues may be identified either by number or by name. The queue names may contain multiple numbered queues for convenience.

Examples

This example shows how to configure IP access group 100 on a SPAN session:

```
Switch# configure terminal
Switch(config)# monitor session 1 filter ip access-group 100
Switch(config)# end
Switch(config)#
```

This example shows how to add a source interface to a SPAN session:

```
Switch# configure terminal
Switch(config)# monitor session 1 source interface fa2/3
Switch(config)# end
Switch(config)#
Switch(config)#
Switch(config)#
```

This example shows how to configure the sources with different directions within a SPAN session:

```
Switch# configure terminal
Switch(config)# monitor session 1 source interface fa2/3 rx
Switch(config)# monitor session 1 source interface fa2/2 tx
Switch(config)# end
```

This example shows how to remove a source interface from a SPAN session:

```
Switch# configure terminal
Switch(config)# no monitor session 1 source interface fa2/3
Switch(config)# end
```

This example shows how to limit SPAN traffic to VLANs 100 through 304:

```
Switch# configure terminal
Switch(config)# monitor session 1 filter vlan 100 - 304
Switch(config)# end
```

This example shows how to configure RSPAN VLAN 20 as the destination:

```
Switch# configure terminal
Switch(config)# monitor session 2 destination remote vlan 20
Switch(config)# end
```

This example shows how to use queue names and queue number ranges for the CPU as a SPAN source on Supervisor Engine 6-E:

```
Switch# configure terminal
Switch(config)# monitor session 2 source cpu queue control-packet rx
Switch(config)# monitor session 3 source cpu queue 10 rx
Switch(config)# end
```

Note For Supervisor Engine 6-E, control-packet is mapped to queue 10.

Related Commands

Command	Description
show monitor	Displays information about the SPAN session.

mtu

To enable jumbo frames on an interface by adjusting the maximum size of a packet or maximum transmission unit (MTU), use the **mtu** command. To return to the default setting, use the **no** form of this command.

mtu *bytes*

no mtu

Syntax Description

bytes	Byte size; valid values are from 1500 to 9198.

Defaults

The default settings are as follows:

- Jumbo frames are disabled
- 1500 bytes for all ports

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

Jumbo frames are supported on nonblocking Gigabit Ethernet ports, switch virtual interfaces (SVI), and EtherChannels. Jumbo frames are not available for stub-based ports.

The baby giants feature uses the global **system mtu** *size* command to set the global baby giant MTU. It allows all stub-based port interfaces to support an Ethernet payload size of up to 1552 bytes.

Both the **system mtu** command and the per-interface **mtu** command work on interfaces that can support jumbo frames, but the per-interface **mtu** command takes precedence.

Examples

This example shows how to specify an MTU of 1800 bytes:

```
Switch(config)# interface GigabitEthernet 1/1
Switch(config-if)# mtu 1800
```

Related Commands

Command	Description
system mtu	Sets the maximum Layer 2 or Layer 3 payload size.

name

To set the MST region name, use the **name** command. To return to the default name, use the **no** form of this command.

name *name*

no name *name*

Syntax Description

name	Specifies the name of the MST region. The name can be any string with a maximum length of 32 characters.

Defaults

The MST region name is not set.

Command Modes

MST configuration mode

Command History

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

Usage Guidelines

Two or more Catalyst 4500 series switches with the same VLAN mapping and configuration version number are considered to be in different MST regions if the region names are different.

Examples

This example shows how to name a region:

```
Switch(config-mst)# name Cisco
Switch(config-mst)#
```

Related Commands

Command	Description
instance	Maps a VLAN or a set of VLANs to an MST instance.
revision	Sets the MST configuration revision number.
show spanning-tree mst	Displays MST protocol information.
spanning-tree mst configuration	Enters the MST configuration submode.

netflow-lite exporter

To define an exporter and to enter NetFlow-lite exporter submode, use the **netflow-lite exporter** command. To delete an exporter, use the **no** form of this command.

netflow-lite exporter *exporter*

no netflow-lite exporter *exporter*

Syntax Description

exporter	Specifies an exporter.

Defaults

None

Command Modes

global configuration mode

Command History

Release	Modification
15.0(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

The exporter's name identifies the exporter. Mandatory parameters for a minimal complete exporter configuration are the destination IP address of the collector, source IP address (on the switch) to use and UDP destination port of the collector. Any unspecified non-mandatory parameters take on default values.

The exporter name can be specified when activating sampling at a data source via the **monitor** command.

The exporter submode also allows you to specify the refresh frequency for the NetFlow templates. Metadata about the NetFlow packet sampling process like sampler configuration parameters and snmp interface table mapping can also be exported periodically to the collector.

Deleting or removing the value of a non-mandatory parameter restores the default.

Examples

This example shows how to configure an NetFlow exporter:

```
Switch# config terminal
Switch(config)# netflow-lite exporter exporter1
Switch(config-netflow-lite-exporter)# destination 5.5.5.6
Switch(config-netflow-lite-exporter)# source 5.5.5.5
Switch(config-netflow-lite-exporter)# transport udp 8188
Switch(config-netflow-lite-exporter)# ttl 128
Switch(config-netflow-lite-exporter)# cos 7
Switch(config-netflow-lite-exporter)# dscp 32
Switch(config-netflow-lite-exporter)# template data timeout 1
Switch(config-netflow-lite-exporter)# options sampler-table timeout 1
Switch(config-netflow-lite-exporter)# options interface-table timeout 1
Switch(config-netflow-lite-exporter)# export-protocol netflow-v9
Switch(config-netflow-lite-exporter)# exit
Switch(config)#
```

```
Display the exporter
Switch# show netflow-lite exporter exporter1
Netflow-lite  Exporter exporter1:
  Network Protocol Configuration:
    Destination IP address:   5.5.5.6
    Source IP Address:        5.5.5.5
    VRF label:
    DSCP:                     0x20
    TTL:                      128
    COS:                      7
  Transport Protocol Configuration:
    Transport Protocol:       UDP
    Destination Port:         8188
    Source Port:              61670
  Export Protocol Configuration:
    Export Protocol:                  netflow-v9
    Template data timeout:            60
    Options sampler-table timeout:    1800
    Options interface-table timeout:  1800
  Exporter Statistics:
    Packets Exported:         0
```

You can verify your settings with the **show netflow-lite exporter** privileged EXEC command.

Related Commands

Command	Description
export-protocol (netflow-lite exporter submode)	Specifies the export protocol for the NetFlow-lite collector.
netflow-lite exporter	Defines an exporter and to enter NetFlow-lite exporter submode.
destination (netflow-lite exporter submode)	Specifies a destination address in netflow-lite submode.
source (netflow-lite exporter submode)	Specifies a source Layer 3 interface of the NetFlow-lite collector.
transport udp (netflow-lite exporter submode)	Specifies a UDP transport destination port for a NetFlow-lite collector.
ttl (netflow-lite exporter submode)	Specifies a ttl value for the NetFlow-lite collector.
cos (netflow-lite exporter submode)	Specifies a cos value for the NetFlow-lite collector.
dscp (netflow-lite exporter submode)	Specifies a cos value for the NetFlow-lite collector.
template data timeout (netflow-lite exporter submode)	Specifies a template data timeout for the NetFlow-lite collector.
options timeout (netflow-lite exporter submode)	Specifies an options timeout for the NetFlow-lite collector.

netflow-lite monitor

To define a monitor instance on an interface and to enter netflow-lite monitor submode, use the **netflow-lite monitor** command. To delete the monitor, use the **no** form of this command.

netflow-lite monitor *sampler-name*

no netflow-lite sampler *sampler-name*

Syntax Description

sampler-name	Specifies a sample.

Defaults

None

Command Modes

global configuration mode

Command History

Release	Modification
15.0(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Only a single packet sampling instance is supported on a data source. These commands are entered under the physical port interface mode, port channel interface, or config VLAN mode. Monitor is not supported on other interfaces. If the physical port is a member of a port channel, applying the monitor to the port has no effect. You must apply the monitor to the port channel instead.

Note VLAN sampling is not supported in Cisco IOS Release 15.0(2)SG. It will be supported in a later release.

Mandatory parameters are sampler and exporter. If no exporter is associated with a monitor, no samples are exported. If so, no input packet sampling occurs for that target interface. A warning message displays indicating that the sampler or exporter is invalid if any mandatory parameters are missing.

The packet sampling mechanism tries to achieve random 1-in-N sampling. Internally 2 levels of sampling are done. The accuracy of the first level of sampling depends on the size of the packets arriving at a given interface. To tune the relative accuracy of the algorithm the **average-packet-size** parameter can be used.

The system automatically determines the average packet size at an interface based on observation of input traffic and uses that value in its first level of sampling.

Valid range of packet sizes that can be used by the algorithm is 64 - 9216 bytes. Any number below 64 bytes is taken to mean that automatic determination of average packet size is desired.

Examples

The following example shows how to configure a monitor on a port interface Gigabit 1/3:

```
Switch# config terminal
Switch(config)# int GigabitEthernet1/3
Switch(config-if)# netflow-lite monitor 1
Switch(config-netflow-lite-monitor)# sampler sampler1
Switch(config-netflow-lite-monitor)# average-packet-size 128
Switch(config-netflow-lite-monitor)# exporter exporter1
Switch(config-netflow-lite-monitor)# exit
Switch(config-if)# exit
Switch(config)# exit
Switch# show netflow-lite monitor 1 interface gi1/3
Interface GigabitEthernet1/3:
  Netflow-lite  Monitor-1:
    Active:               TRUE
    Sampler:              sampler1
    Exporter:             exporter1
    Average Packet Size:  0
  Statistics:
    Packets exported:     0
    Packets observed:     0
    Packets dropped:      0
    Average Packet Size observed: 64
    Average Packet Size used: 64
```

Similarly, you can configure a monitor on a VLAN in VLAN config mode:

```
Switch# config terminal
Switch(config)# vlan config 2
Switch(config-vlan-config)# netflow-lite monitor 1
Switch(config-netflow-lite-monitor)# average-packet-size 128
Switch(config-netflow-lite-monitor)# exporter exporter1
Switch(config-netflow-lite-monitor)# sampler sampler1
Switch(config-netflow-lite-monitor)# exit
Switch(config-vlan-config)# exit
Switch# show netflow-lite monitor 1 vlan 2
VlanID-2:
  Netflow-lite  Monitor-1:
    Active:               TRUE
    Sampler:              sampler1
    Exporter:             exporter1
    Average Packet Size:  0
  Statistics:
    Packets exported:     0
    Packets observed:     0
    Packets dropped:      0
    Average Packet Size observed: 64
    Average Packet Size used: 64
```

You can verify your settings with the **show netflow-lite sampler** privileged EXEC command.

Related Commands

Command	Description
sampler (netflow-lite monitor submode)	Activate sampling on an interface in netflow-lite monitor submode.
average-packet-size (netflow-lite monitor submode)	Specifies the average packet size at the observation point.
exporter (netflow-lite monitor submode)	Assigns an exporter in netflow-lite monitor submode.

netflow-lite sampler

To configure packet sampling parameters as a reusable named entity and to enter netflow-lite sampler submode, use the **netflow-lite sampler** command. To delete the sampler, use the **no** form of this command.

netflow-lite sampler *name*

no netflow-lite sampler *name*

Syntax Description

name	Specifies a sampler.

Defaults

None

Command Modes

global configuration mode

Command History

Release	Modification
15.0(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

The sampler CLI construct allows the user to configure the rate at which input packets are to be sampled. Packet sampling rate can range from 32 to 2^15 in powers of 2. A sampling rate of 1 is allowed for troubleshooting for up to two 1 Gigabit ports only and is essentially equivalent to rx span. It cannot be configured on 10GE ports because the bandwidth demand on the fpga for export is too high.

Mandatory parameters are packet rate.

You can update a sampler in use at a target interface, but you cannot remove or unconfigure mandatory parameters.

All mandatory parameters must be present to validate a sampler. Any unspecified non-mandatory parameters take on default values.

Examples

This example shows how to configure packet sampling parameters as a reusable named entity and to display the sampler:

```
Switch# config terminal
Switch(config)# netflow-lite sampler sampler1
Switch(config-netflow-lite-sampler)# packet-rate 32
Switch(config-netflow-lite-sampler)# packet-section size 128
Switch(config-netflow-lite-sampler)# packet-offset 16
Switch(config-netflow-lite-sampler)# exit
Switch(config)# exit
Switch#
```

```
Switch# show netflow-lite sampler sampler1
Netflow-lite Sampler sampler1:
  Id :                    1
  Packet Sampling rate:   1 out of 32
  Packet Section Size:    64    bytes
  Packet offset:          16    bytes
```

You can verify your settings with the **show netflow-lite exporter** privileged EXEC command.

Related Commands

Command	Description
packet-offset (netflow-lite sampler submode)	Specifies a starting packet offset in netflow-lite submode.
packet-rate (netflow-lite sampler submode)	Specifies a packet sampling rate in netflow-lite sampler submode.
packet-section size (netflow-lite sampler submode)	Specifies a sampled header size in netflow-lite submode.

nmsp

To configure Network Mobility Services Protocol (NMSP) on the switch, use the **nmsp** command. 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.

nmsp {**enable** | {**notification interval** {**attachment** | **location**} *interval-seconds*}}

no nmsp {**enable** | {**notification interval** {**attachment** | **location**} *interval-seconds*}}

Syntax Description

enable	Enables the NMSP features on the switch.
notification interval	Specifies the NMSP notification interval.
attachment	Specifies the attachment notification interval.
location	Specifies the location notification interval.
interval-seconds	Duration in seconds before a switch sends the location or attachment updates to the MSE. The range is 1 to 30; the default is 30.

Defaults

NMSP is disabled, NMSP notification interval attachment and NMSP notification interval location defaults are 30 seconds.

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(52)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Use the **nmsp** global configuration command to enable the switch to send encrypted NMSP location and attachment notifications to a Cisco Mobility Services Engine (MSE).

Examples

This example shows how to enable NMSP on a switch and set the location notification time to 10 seconds:

```
Switch(config)# nmsp enable
Switch(config)# nmsp notification interval location 10
Switch(config)#
```

Related Commands

Command	Description
clear nmsp statistics	Clears the NMSP statistic counters.
nmsp attachment suppress	Suppress reporting attachment information from a specified interface.
show nmsp	Displays the NMSP information.

nmsp attachment suppress

To suppress reporting attachment information from a specified interface, use the **nmsp attachment suppress interface** command. This command is available only when your switch is running the cryptographic (encrypted) software image. Use the **no** form of this command to report attachment information.

nmsp attachment suppress

no nmsp attachment suppress

Syntax Description

This command has no arguments or keywords.

Defaults

Attachment information is reported.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(52)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Use the **nmsp attachment suppress** interface configuration command to configure an interface to not send attachment notifications to a Cisco Mobility Services Engine (MSE).

Examples

This example shows how to configure an interface to not send attachment information to the MSE:

```
Switch(config)# switch interface gigabitethernet1/2
Switch(config-if)# nmsp attachment suppress
Switch(config-if)#
```

Related Commands

Command	Description
nmsp	Configures Network Mobility Services Protocol (NMSP) on the switch.
show nmsp	Displays the NMSP information.

options timeout (netflow-lite exporter submode)

To specify an options timeout for the NetFlow-lite collector, use the **options timeout** command. To delete the value, use the **no** form of this command.

options {**sampler-table** | **interface-table**} **timeout** *seconds*

no options {**sampler-table** | **interface-table**} **timeout** *second*

Syntax Description

sampler-table	Specifies timeout value for export of sampler configuration.
interface-table	Specifies timeout value for export of snmp ifIndex mapping.
seconds	Specifies a n options timeout for the NetFlow-lite collector.

Defaults

1800 seconds

Command Modes

netflow-lite exporter submode

Command History

Release	Modification
15.0(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Default timeout value is 1800 seconds or 30 minutes. The timeout value configured really depends on the collector and how often it needs the templates to be refreshed.

Examples

This example shows how to specify an options timeout for the NetFlow-lite collector:

```
Switch# config terminal
Switch(config)# netflow-lite exporter exporter1
Switch(config-netflow-lite-exporter)# destination 5.5.5.6
Switch(config-netflow-lite-exporter)# source 5.5.5.5
Switch(config-netflow-lite-exporter)# transport udp 8188
Switch(config-netflow-lite-exporter)# ttl 128
Switch(config-netflow-lite-exporter)# cos 7
Switch(config-netflow-lite-exporter)# dscp 32
Switch(config-netflow-lite-exporter)# template data timeout 1
Switch(config-netflow-lite-exporter)# options sampler-table timeout 1
Switch(config-netflow-lite-exporter)# options interface-table timeout 1
Switch(config-netflow-lite-exporter)# export-protocol netflow-v9
Switch(config-netflow-lite-exporter)# exit
Switch(config)#
```

```
Display the exporter
Switch# show netflow-lite exporter exporter1
Netflow-lite  Exporter exporter1:
  Network Protocol Configuration:
    Destination IP address:   5.5.5.6
    Source IP Address:        5.5.5.5
    VRF label:
    DSCP:                     0x20
    TTL:                      128
    COS:                      7
  Transport Protocol Configuration:
    Transport Protocol:       UDP
    Destination Port:         8188
    Source Port:              61670
  Export Protocol Configuration:
    Export Protocol:                  netflow-v9
    Template data timeout:            60
    Options sampler-table timeout:    1800
    Options interface-table timeout:  1800
  Exporter Statistics:
    Packets Exported:         0
```

You can verify your settings with the **show netflow-lite exporter** privileged EXEC command.

Related Commands

Command	Description
cos (netflow-lite exporter submode)	Specifies a cos value for the NetFlow-lite collector.
source (netflow-lite exporter submode)	Specifies a source Layer 3 interface of the NetFlow-lite collector.
transport udp (netflow-lite exporter submode)	Specifies a UDP transport destination port for a NetFlow-lite collector.
ttl (netflow-lite exporter submode)	Specifies a ttl value for the NetFlow-lite collector.
destination (netflow-lite exporter submode)	Specifies a destination address in netflow-lite submode.
template data timeout (netflow-lite exporter submode)	Specifies a template data timeout for the NetFlow-lite collector.
export-protocol (netflow-lite exporter submode)	Specifies the export protocol for the NetFlow-lite collector.
dscp (netflow-lite exporter submode)	Specifies a cos value for the NetFlow-lite collector.

packet-offset (netflow-lite sampler submode)

To specify a starting packet offset in netflow-lite submode, use the **packet-offset** command. To reset to the default, use the **no** form of this command.

packet-offset *offset*

no packet-offset *offset*

Syntax Description

offset	Specifies the starting packet offset in bytes (maximum of 48).

Defaults

starts at byte 0 of L2 header

Command Modes

netflow-lite exporter submode

Command History

Release	Modification
15.0(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Default packet section offset value is 0. The packet section extracted from the sampled packet start at offset 0 of the packet.

Examples

This example shows how to specify a starting packet offset:

```
Switch# config terminal
Switch(config)# netflow-lite sampler sampler1
Switch(config-netflow-lite-sampler)# packet-rate 32
Switch(config-netflow-lite-sampler)# packet-section size 128
Switch(config-netflow-lite-sampler)# packet-offset 16
Switch(config-netflow-lite-sampler)# exit
Switch(config)# exit
Switch# show netflow-lite sampler sampler1
Netflow-lite Sampler sampler1:
  Id :                    1
  Packet Sampling rate:   1 out of 32
  Packet Section Size:    64    bytes
  Packet offset:          16    bytes
```

You can verify your settings with the **show netflow-lite sampler** privileged EXEC command.

Related Commands.

Command	Description
packet-section size (netflow-lite sampler submode)	Specifies a sampled header size in netflow-lite submode.
packet-rate (netflow-lite sampler submode)	Specifies a packet sampling rate in netflow-lite sampler submode

packet-rate (netflow-lite sampler submode)

To specify a packet sampling rate in netflow-lite sampler submode, use the **packet rate** command. To delete a packet sampling rate, use the **no** form of this command.

packet rate *n*

no packet rate *n*

Syntax Description

n	Specifies the packet sampling rate.

Defaults

None

Command Modes

netflow-lite exporter submode

Command History

Release	Modification
15.0(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Packet sampling rate can range from 32 to 2^15 in powers of 2. A rate of 1 is allowed for trouble shooting (equivalent to rx span) only for two 1Gigabit Ethernet ports. You cannot configure a rate of 1 on 10 Gigabit Ethernet ports because the bandwidth demand for export is too high.

This is a mandatory parameter. Up to 2 x 1 Gigabit Ethernet ports can be configured with 1-in-1 sampling. The best packet sampling rate that can be configured on any 1 Gigabit or 10 Gigabit Ethernet port is 1-in-32. Packet sampling rates can be configured in powers of 2 (1-in-64, 1-in-128, etc).

Examples

This example shows how to specify a packet sampling rate in netflow-lite sampler submode:

```
Switch# config terminal
Switch(config)# netflow-lite sampler sampler1
Switch(config-netflow-lite-sampler)# packet-rate 32
Switch(config-netflow-lite-sampler)# packet-section size 128
Switch(config-netflow-lite-sampler)# packet-offset 16
Switch(config-netflow-lite-sampler)# exit
Switch(config)# exit
Switch#

Switch# show netflow-lite sampler sampler1
Netflow-lite Sampler sampler1:
  Id :                    1
  Packet Sampling rate:   1 out of 32
  Packet Section Size:    64    bytes
  Packet offset:          16    bytes
```

You can verify your settings with the **show netflow-lite sampler** privileged EXEC command.

Related Commands

Command	Description
packet-section size (netflow-lite sampler submode)	Specifies a sampled header size in netflow-lite submode.
packet-offset (netflow-lite sampler submode)	Specifies a starting packet offset in netflow-lite submode.

packet-section size (netflow-lite sampler submode)

To specify a sampled header size in netflow-lite submode, use the **packet-section size** command. To store the default, use the **no** form of this command.

packet-section size *bytes*

no packet-section size *bytes*

Syntax Description

bytes	Specifies the sampled header size. Size ranges from 16 to 252 bytes in increments of 4 bytes.

Defaults

64 bytes

Command Modes

netflow-lite exporter submode

Command History

Release	Modification
15.0(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Default packet section size is 64 bytes which normally would cover Layer 2, Layer 3, and Layer 4 headers for an input IPv4 packet.

Examples

This example shows how to specify a sampled header size:

```
Switch# config terminal
Switch(config)# netflow-lite sampler sampler1
Switch(config-netflow-lite-sampler)# packet-rate 32
Switch(config-netflow-lite-sampler)# packet-section size 128
Switch(config-netflow-lite-sampler)# packet-offset 16
Switch(config-netflow-lite-sampler)# exit
Switch(config)# exit
Switch#

Switch# show netflow-lite sampler sampler1
Netflow-lite Sampler sampler1:
  Id :                  1
  Packet Sampling rate:  1 out of 32
  Packet Section Size:   64    bytes
  Packet offset:         16    bytes
```

You can verify your settings with the **show netflow-lite sampler** privileged EXEC command.

Related Commands

Command	Description
packet-rate (netflow-lite sampler submode)	Specifies a packet sampling rate in netflow-lite sampler submode.
packet-offset (netflow-lite sampler submode)	Specifies a starting packet offset in netflow-lite submode.

pagp learn-method

To learn the input interface of the incoming packets, use the **pagp learn-method** command. To return to the default value, use the **no** form of this command.

pagp learn-method {**aggregation-port** | **physical-port**}

no pagp learn-method

Syntax Description

aggregation-port	Specifies learning the address on the port channel.
physical-port	Specifies learning the address on the physical port within the bundle.

Defaults

Aggregation port is enabled.

Command Modes

Interface configuration mode

Command History

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

Examples

This example shows how to enable physical port address learning within the bundle:

```
Switch(config-if)# pagp learn-method physical-port
Switch(config-if)#
```

This example shows how to enable aggregation port address learning within the bundle:

```
Switch(config-if)# pagp learn-method aggregation-port
Switch(config-if)#
```

Related Commands

Command	Description
show pagp	Displays information about the port channel.

pagp port-priority

To select a port in hot standby mode, use the **pagp port-priority** command. To return to the default value, use the **no** form of this command.

pagp port-priority *priority*

no pagp port-priority

Syntax Description

priority	Port priority number; valid values are from 1 to 255.

Defaults

Port priority is set to 128.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

The higher the priority, the better the chances are that the port will be selected in the hot standby mode.

Examples

This example shows how to set the port priority:

```
Switch(config-if)# pagp port-priority 45
Switch(config-if)#
```

Related Commands

Command	Description
pagp learn-method	Learns the input interface of the incoming packets.
show pagp	Displays information about the port channel.

passive-interface

To disable sending routing updates on an interface, use the **passive-interface** command. To reenable the sending of routing updates, use the **no** form of this command.

passive-interface [[**default**] {*interface-type interface-number*}] | {**range** *interface-type interface-number-interface-type interface-number*}

no passive-interface [[**default**] {*interface-type interface-number*}] | {**range** *interface-type interface-number-interface-type interface-number*}

Syntax Description

default	(Optional) All interfaces become passive.
interface-type	Specifies the interface type.
interface-number	Specifies the interface number.
range	Specifies the range of subinterfaces being configured; see the "Usage Guidelines" section.

Defaults

Routing updates are sent on the interface.

Command Modes

Router configuration mode

Command History

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

Usage Guidelines

You can use the **passive-interface range** command on the following interfaces: FastEthernet, GigabitEthernet, VLAN, Loopback, Port-channel, 10-GigabitEthernet, and Tunnel. When you use the **passive-interface range** command on a VLAN interface, the interface should be the existing VLAN SVIs. To display the VLAN SVIs, enter the **show running config** command. The VLANs that are not displayed cannot be used in the **passive-interface range** command.

The values that are entered with the **passive-interface range** command are applied to all the existing VLAN SVIs.

Before you can use a macro, you must define a range using the **define interface-range** command.

All configuration changes that are made to a port range through the **passive-interface range** command are retained in the running-configuration as individual passive-interface commands.

You can enter the **range** in two ways:

- Specifying up to five interface ranges
- Specifying a previously defined macro

You can either specify the interfaces or the name of an interface-range macro. An interface range must consist of the same interface type, and the interfaces within a range cannot span across the modules.

You can define up to five interface ranges on a single command; separate each range with a comma:

interface range gigabitethernet 5/1-20, gigabitethernet4/5-20.

Use this format when entering the *port-range*:

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

You cannot specify both a macro and an interface range in the same command. After creating a macro, you can enter additional ranges. If you have already entered an interface range, the CLI does not allow you to enter a macro.

You can specify a single interface in the **range** *range* value. This makes the command similar to the **passive-interface** *interface-number* command.

Note The **range** keyword is only supported in OSPF, EIGRP, RIP, and ISIS router mode.

If you disable the sending of routing updates on an interface, the particular subnet will continue to be advertised to other interfaces, and updates from other routers on that interface continue to be received and processed.

The **default** keyword sets all interfaces as passive by default. You can then configure individual interfaces where adjacencies are desired using the **no passive-interface** command. The **default** keyword is useful in Internet service provider (ISP) and large enterprise networks where many of the distribution routers have more than 200 interfaces.

For the Open Shortest Path First (OSPF) protocol, OSPF routing information is neither sent nor received through the specified router interface. The specified interface address appears as a stub network in the OSPF domain.

For the Intermediate System-to-Intermediate System (IS-IS) protocol, this command instructs IS-IS to advertise the IP addresses for the specified interface without actually running IS-IS on that interface. The **no** form of this command for IS-IS disables advertising IP addresses for the specified address.

Note For IS-IS you must keep at least one active interface and configure the interface with the **ip router isis** command.

Enhanced Interior Gateway Routing Protocol (EIGRP) is disabled on an interface that is configured as passive although it advertises the route.

Examples

The following example sends EIGRP updates to all interfaces on network 10.108.0.0 except GigabitEthernet interface 1/1:

```
Switch(config)# interface gigabitethernet 1/1
Switch(config-if)# router eigrp 109
Switch(config-router)# network 10.108.0.0
Switch(config-router)# passive-interface gigabitethernet 1/1
Switch(config-router)#
```

The following configuration enables IS-IS on Ethernet interface 1 and serial interface 0 and advertises the IP addresses of Ethernet interface 0 in its link-state protocol data units (PDUs):

```
Switch(config-if)# router isis Finance
Switch(config-router)# passive-interface Ethernet 0
Switch(config-router)# interface Ethernet 1
Switch(config-router)# ip router isis Finance
Switch(config-router)# interface serial 0
Switch(config-router)# ip router isis Finance
Switch(config-router)#
```

The following example sets all interfaces as passive, then activates Ethernet interface 0:

```
Switch(config-if)# router ospf 100
Switch(config-router)# passive-interface default
Switch(config-router)# no passive-interface ethernet0
Switch(config-router)# network 10.108.0.1 0.0.0.255 area 0
Switch(config-router)#
```

The following configuration sets the Ethernet ports 3 through 4 on module 0 and GigabitEthernet ports 4 through 7 on module 1 as passive:

```
Switch(config-if)# router ospf 100
Switch(config-router)# passive-interface range ethernet0/3-4,gigabitethernet1/4-7
Switch(config-router)#
```

permit

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

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

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

Syntax Description

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

Defaults

This command has no default settings.

Command Modes

arp-nacl configuration mode

Command History

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

Usage Guidelines

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

Examples

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

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

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

Related Commands

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

police

To configure the Traffic Policing feature, use the **police** QoS policy-map class configuration command. To remove the Traffic Policing feature from the configuration, use the **no** form of this command.

police {*bps* | *kbps* | *mbps* |*gbps*} [*burst-normal*] [*burst-max*] **conform-action** *action* **exceed-action** *action* [**violate-action** *action*]

no police {*bps* | *kbps* | *mbps* |*gbps*} [*burst-normal*] [*burst-max*] **conform-action** *action* **exceed-action** *action* [**violate-action** *action*]

Syntax Description

bps	Average rate, in bits per second. Valid values are 32,000 to 32,000,000,000.
kbps	Average rate, in kilobytes per second. Valid values are 32 to 32,000,000.
mbps	Average rate, in megabits per second. Valid values are 1 to 32,000.
gbps	Average rate, in gigabits per second. Valid values are 1 to 32.
burst-normal	(Optional) Normal burst size, in bytes. Valid values are 64 to 2,596,929,536. Burst value of up to four times the configured rate can be supported.
burst-max	(Optional) Excess burst size, in bytes. Valid values are 64 to 2,596,929,536. Burst value of upto four times the configured rate can be supported.
conform-action	Action to take on packets that conform to the rate limit.
exceed-action	Action to take on packets that exceed the rate limit.
violate-action	(Optional) Action to take on packets that violate the normal and maximum burst sizes.
action	Action to take on packets. Specify one of the following keywords: • **drop**—Drops the packet. • **set-cos-transmit** new-ios—Sets the class of services (CoS) value to a new value and send the packet. The range is 0 to 7. • **set-dscp-transmit** *value*—Sets the IP differentiated services code point (DSCP) value and transmits the packet with the new IP DSCP value setting. • **set-prec-transmit** *value*—Sets the IP precedence and transmits the packet with the new IP precedence value setting. • **transmit**—Transmits the packet. The packet is not altered.

Defaults

This command is disabled by default.

Command Modes

Policy-map class configuration mode (when specifying a single action to be applied to a market packet)

Policy-map class police configuration mode (when specifying multiple actions to be applied to a marked packet)

Command History

Release	Modification
12.2(40)SG	This command was introduced on Catalyst 4900M and Supervisor Engine 6-E.

Usage Guidelines

Use the **police** command to mark a packet with different quality of service (QoS) values based on conformance to the service-level agreement.

Traffic policing will not be executed for traffic that passes through an interface.

Specifying Multiple Actions

The **police** command allows you to specify multiple policing actions. When specifying multiple policing actions when configuring the **police** command, note the following points:

- You can specify a maximum of four actions at one time.
- You cannot specify contradictory actions such as **conform-action** *transmit* and **conform-action** *drop*.

Using the Police Command with the Traffic Policing Feature

The **police** command can be used with Traffic Policing feature. The Traffic Policing feature works with a token bucket algorithm. Two types of token bucket algorithms are a single-token bucket algorithm and a two-token bucket algorithm. A single-token bucket system is used when the **violate-action** option is not specified, and a two-token bucket system is used when the **violate-action** option is specified.

Token Bucket Algorithm with One Token Bucket

The one token bucket algorithm is used when the **violate-action** option is not specified in the **police** command of the command-line interface (CLI).

The conform bucket is initially set to the full size (the full size is the number of bytes specified as the normal burst size).

When a packet of a given size (for example, “B” bytes) arrives at specific time (time “T”) the following actions occur:

- Tokens are updated in the conform bucket. If the previous arrival of the packet was at T1 and the current time is T, the bucket is updated with (T - T1) worth of bits based on the token arrival rate. The token arrival rate is calculated as follows:

  (time between packets <which is equal to T - T1> * policer rate)/8 bytes
- If the number of bytes in the conform bucket B is greater than or equal to 0, the packet conforms and the conform action is taken on the packet. If the packet conforms, B bytes are removed from the conform bucket and the conform action is completed for the packet.
- If the number of bytes in the conform bucket B (minus the packet size to be limited) is fewer than 0, the exceed action is taken.

Token Bucket Algorithm with Two Token Buckets (Refer to RFC 2697)

The two-token bucket algorithm is used when the **violate-action** is specified in the **police** command CLI.

The conform bucket is initially full (the full size is the number of bytes specified as the normal burst size).

The exceed bucket is initially full (the full exceed bucket size is the number of bytes specified in the maximum burst size).

The tokens for both the conform and exceed token buckets are updated based on the token arrival rate, or committed information rate (CIR).

When a packet of given size (for example, "B" bytes) arrives at specific time (time "T") the following actions occur:

- Tokens are updated in the conform bucket. If the previous arrival of the packet was at T1 and the current arrival of the packet is at t, the bucket is updated with T -T1 worth of bits based on the token arrival rate. The refill tokens are placed in the conform bucket. If the tokens overflow the conform bucket, the overflow tokens are placed in the exceed bucket.

  The token arrival rate is calculated as follows:

  (time between packets <which is equal to T-T1> * policer rate)/8 bytes
- If the number of bytes in the conform bucket - B is greater than or equal to 0, the packet conforms and the conform action is taken on the packet. If the packet conforms, B bytes are removed from the conform bucket and the conform action is taken. The exceed bucket is unaffected in this scenario.
- If the number of bytes in the conform bucket B is less than 0, the excess token bucket is checked for bytes by the packet. If the number of bytes in the exceed bucket B is greater than or equal to 0, the exceed action is taken and B bytes are removed from the exceed token bucket. No bytes are removed from the conform bucket.
- If the number bytes in the exceed bucket B is fewer than 0, the packet violates the rate and the violate action is taken. The action is complete for the packet.

Examples

Token Bucket Algorithm with One Token Bucket

This example shows how to define a traffic class (using the **class-map** command) and associate the match criteria from the traffic class with the Traffic Policing configuration, which is configured in the service policy (using the **policy-map** command). The **service-policy** command is then used to attach this service policy to the interface.

In this particular example, Traffic Policing is configured with the average rate at 8000 bits per second and the normal burst size at 1000 bytes for all packets leaving Gigabit Ethernet interface 6/1:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# class-map access-match
Switch(config-cmap)# match access-group 1
Switch(config-cmap)# exit
Switch(config)# policy-map police-setting
Switch(config-pmap)# class access-match
Switch(config-pmap-c)# police 8000 1000 conform-action transmit exceed-action drop
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface gigabitethernet 6/1
Switch(config-if)# service-policy output police-setting
Switch(config-if)# end
```

In this example, the initial token buckets starts full at 1000 bytes. If a 450-byte packet arrives, the packet conforms because enough bytes are available in the conform token bucket. The conform action (send) is taken by the packet and 450 bytes are removed from the conform token bucket (leaving 550 bytes).

If the next packet arrives 0.25 seconds later, 250 bytes are added to the token bucket ((0.25 * 8000)/8), leaving 800 bytes in the token bucket. If the next packet is 900 bytes, the packet exceeds and the exceed action (drop) is taken. No bytes are taken from the token bucket.

Token Bucket Algorithm with Two Token Buckets Example (Refer to RFC 2697)

In this particular example, Traffic Policing is configured with the average rate at 8000 bits per second, the normal burst size at 1000 bytes, and the excess burst size at 1000 bytes for all packets leaving Gigabit Ethernet interface 6/1.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# class-map access-match
Switch(config-cmap)# match access-group 1
Switch(config-cmap)# exit
Switch(config)# policy-map police-setting
Switch(config-pmap)# class access-match
Switch(config-pmap-c)# police 8000 1000 1000 conform-action transmit exceed-action
set-qos-transmit 1 violate-action drop
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface gigabitethernet 6/1
Switch(config-if)# service-policy output police-setting
Switch(config-if)# end
```

In this example, the initial token buckets starts full at 1000 bytes. If a 450-byte packet arrives, the packet conforms because enough bytes are available in the conform token bucket. The conform action (send) is taken by the packet and 450 bytes are removed from the conform token bucket (leaving 550 bytes).

If the next packet arrives 0.25 seconds later, 250 bytes are added to the conform token bucket ((0.25 * 8000)/8), leaving 800 bytes in the conform token bucket. If the next packet is 900 bytes, the packet does not conform because only 800 bytes are available in the conform token bucket.

The exceed token bucket, which starts full at 1000 bytes (as specified by the excess burst size) is then checked for available bytes. Because enough bytes are available in the exceed token bucket, the exceed action (set the QoS transmit value of 1) is taken and 900 bytes are taken from the exceed bucket (leaving 100 bytes in the exceed token bucket.

If the next packet arrives 0.40 seconds later, 400 bytes are added to the token buckets ((.40 * 8000)/8). Therefore, the conform token bucket now has 1000 bytes (the maximum number of tokens available in the conform bucket) and 200 bytes overflow the conform token bucket (because it only 200 bytes were needed to fill the conform token bucket to capacity). These overflow bytes are placed in the exceed token bucket, giving the exceed token bucket 300 bytes.

If the arriving packet is 1000 bytes, the packet conforms because enough bytes are available in the conform token bucket. The conform action (transmit) is taken by the packet and 1000 bytes are removed from the conform token bucket (leaving 0 bytes).

If the next packet arrives 0.20 seconds later, 200 bytes are added to the token bucket ((.20 * 8000)/8). Therefore, the conform bucket now has 200 bytes. If the arriving packet is 400 bytes, the packet does not conform because only 200 bytes are available in the conform bucket. Similarly, the packet does not exceed because only 300 bytes are available in the exceed bucket. Therefore, the packet violates and the violate action (drop) is taken.

Related Commands

Command	Description
police (percent)	Configures traffic policing on the basis of a percentage of bandwidth available on an interface.
police (two rates)	Configures traffic policing using two rates, the committed information rate (CIR) and the peak information rate (PIR).
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
service-policy (policy-map class)	Creates a service policy that is a quality of service (QoS) policy within a policy map.
show policy-map	Displays information about the policy map.
show policy-map interface	Displays the statistics and configurations of the input and output policies that are attached to an interface.

police (percent)

To configure traffic policing on the basis of a percentage of bandwidth available on an interface, use the **police** command in QoS policy-map class configuration mode. To remove traffic policing from the configuration, use the **no** form of this command.

police cir percent *percent* [**bc** *conform-burst-in-msec*] [**pir percent** *percentage*] [**be** *peak-burst-inmsec*]

no police cir percent *percent* [**bc** *conform-burst-in-msec*] [**pir percent** *percentage*] [**be** *peak-burst-inmsec*]

Syntax Description

cir	Committed information rate. Indicates that the CIR will be used for policing traffic.
percent	Specifies that a percentage of bandwidth will be used for calculating the CIR.
percent	Specifies the bandwidth percentage. Valid range is a number from 1 to 100.
bc	(Optional) Conform burst (bc) size used by the first token bucket for policing traffic.
conform-burst-in-msec	(Optional) Specifies the bc value in milliseconds. Valid range is a number from 1 to 2000.
pir	(Optional) Peak information rate (PIR). Indicates that the PIR will be used for policing traffic.
percent	(Optional) Specifies that a percentage of bandwidth will be used for calculating the PIR.
percent	(Optional) Specifies the bandwidth percentage. Valid range is a number from 1 to 100.
be	(Optional) Peak burst (be) size used by the second token bucket for policing traffic.
peak-burst-in-msec	(Optional) Specifies the be size in milliseconds. Valid range is a number from 1 to 2000.
action	Action to take on packets. Specify one of the following keywords: • **drop**—Drops the packet. • **set-cos-transmit** new-ios—Sets the class of services (CoS) value to a new value and send the packet. The range is 0 to 7. • **set-dscp-transmit** *value*—Sets the IP differentiated services code point (DSCP) value and transmits the packet with the new IP DSCP value setting. • **set-prec-transmit** *value*—Sets the IP precedence and transmits the packet with the new IP precedence value setting. • **transmit**—Transmits the packet. The packet is not altered.

Command Default

This command is disabled by default.

Command Modes

Policy-map class configuration mode

Command History

Release	Modification
12.2(40)SG	Command was introduced on Supervisor Engine 6E and the Catalyst 4900M.

Usage Guidelines

This command calculates the CIR and PIR on the basis of a percentage of the maximum amount of bandwidth available on the interface. When a policy map is attached to the interface, the equivalent CIR and PIR values in bits per second (bps) are calculated on the basis of the interface bandwidth and the percent value entered with this command. The **show policy-map interface** command can then be used to verify the bps rate calculated.

The calculated CIR and PIR bps rates must be in the range of 32,000 and 32,000,000,000 bps. If the rates are outside this range, the associated policy map cannot be attached to the interface. If the interface bandwidth changes (for example, more is added), the bps values of the CIR and the PIR are recalculated on the basis of the revised amount of bandwidth. If the CIR and PIR percentages are changed after the policy map is attached to the interface, the bps values of the CIR and PIR are recalculated.

This command also allows you to specify the values for the conform burst size and the peak burst size in milliseconds. If you want bandwidth to be calculated as a percentage, the conform burst size and the peak burst size must be specified in milliseconds (ms).

Examples

This example shows how to configure traffic policing using a CIR and a PIR based on a percentage of bandwidth on Gigabit interface 6/2. In this example, a CIR of 20 percent and a PIR of 40 percent have been specified. Additionally, an optional bc value and be value (300 ms and 400 ms, respectively) have been specified.

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# policy-map policy1
Switch(config-pmap)# class-map class1
Switch(config-pmap-c)# police cir percent 20 bc 3 ms pir percent 40 be 4 ms
Switch(config-pmap-c)# exit
Switch(config-pmap-c)# interface gigabitethernet 6/2
Switch(config-if)# service-policy output policy
Switch(config-if)# end
```

police rate

To configure single or dual rate policer, use the **police rate** command in policy-map configuration mode. To remove traffic policing from the configuration, use the **no** form of this command.

Syntax for Bytes Per Second

police rate *units* **bps** [**burst** *burst-in-bytes* **bytes**] [**peak-rate** *peak-rate-in-bps* **bps**] [**pack-burst** *peak-burst-in-bytes* **bytes**]

no police rate *units* **bps** [**burst** *burst-in-bytes* **bytes**] [**peak-rate** *peak-rate-in-bps* **bps**] [**pack-burst** *peak-burst-in-bytes* **bytes**]

Syntax for Percent

police rate percent *percentage* [**burst** *ms* **ms**] [**peak-rate** *percent* **percentage**] [**pack-burst** *ms* **ms**]

no police rate percent *percentage* [**burst** *ms* **ms**] [**peak-rate** *percent* **percentage**] [**pack-burst** *ms* **ms**]

Syntax Description

units	Specifies the traffic police rate in bits per second. Valid range is 32,000 to 32,000,000,000.
bps	(Optional) Bits per second (bps) will be used to determine the rate at which traffic is policed. **Note** If a rate is not specified, traffic is policed via bps.
burst *burst-in-bytes* **bytes**	(Optional) Specifies the burst rate, in bytes, will be used for policing traffic. Valid range is from 64 to 2,596,929,536.
peak-rate *peak-rate-in-bps* **bps**	(Optional) Specifies the peak burst value, in bytes, for the peak rate. Valid range is from 32,000 to 32,000,000,000.
peak-burst *peak-burst-in-bytes* **bytes**	(Optional) Specifies the peak burst value, in bytes, will be used for policing traffic. If the police rate is specified in bps, the valid range of values is 64 to 2,596,929,536.
percent	(Optional) A percentage of interface bandwidth will be used to determine the rate at which traffic is policed.
percentage	(Optional) Bandwidth percentage. Valid range is a number from 1 to 100.
burst *ms* **ms**	(Optional) Burst rate, in milliseconds, will be used for policing traffic. Valid range is a number from 1 to 2,000.
peak-rate percent *percentage*	(Optional) A percentage of interface bandwidth will be used to determine the PIR. Valid range is a number from 1 to 100.
peak-burst *ms* **ms**	(Optional) Peak burst rate, in milliseconds, will be used for policing traffic. Valid range is a number from 1 to 2,000.

Command Default

This command is disabled by default.

Command Modes

Policy-map configuration mode

Command History

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

Usage Guidelines

Use the **police rate** command to limit traffic on the basis of pps, bps, or a percentage of interface bandwidth.

If the **police rate** command is issued, but the a rate is not specified, traffic that is destined will be policed on the basis of bps.

Examples

This example shows how to configure policing on a class to limit traffic to an average rate of 1,500,000 bps:

```
Switch(config)# class-map c1
Switch(config-cmap)# match access-group 140
Switch(config-cmap)# exit
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# police rate 1500000  burst 500000
Switch(config-pmap-c)# exit
```

Related Commands

Command	Description
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
show policy-map	Displays information about the policy map.

police (two rates)

To configure traffic policing using two rates, the committed information rate (CIR) and the peak information rate (PIR), use the **police** command in policy-map configuration mode. To remove two-rate traffic policing from the configuration, use the **no** form of this command.

police cir *cir* [**bc** *conform-burst*] **pir** *pir* [**be** *peak-burst*] [**conform-action** *action* [**exceed-action** *action* [**violate-action** *action*]]]

no police cir *cir* [**bc** *conform-burst*] **pir** *pir* [**be** *peak-burst*] [**conform-action** *action* [**exceed-action** *action* [**violate-action** *action*]]]

Syntax Description

cir	Committed information rate (CIR) at which the first token bucket is updated.
cir	Specifies the CIR value in bits per second. The value is a number from 32,000 to 32,000,000,000.
bc	(Optional) Conform burst (bc) size used by the first token bucket for policing.
conform-burst	(Optional) Specifies the bc value in bytes. The value is a number from 64 to 2,596,929,536.
pir	Peak information rate (PIR) at which the second token bucket is updated.
pir	Specifies the PIR value in bits per second. The value is a number from 32,000 to 32,000,000,000.
be	(Optional) Peak burst (be) size used by the second token bucket for policing.
peak-burst	(Optional) Specifies the peak burst (be) size in bytes. The value is a number from 64 to 2,596,929,536.
conform-action	(Optional) Action to take on packets that conform to the CIR and PIR.
exceed-action	(Optional) Action to take on packets that conform to the PIR but not the CIR.
violate-action	(Optional) Action to take on packets exceed the PIR.
action	(Optional) Action to take on packets. Specify one of the following keywords: • **drop**—Drops the packet. • **set-cos-transmit** new-ios—Sets the class of services (CoS) value to a new value and send the packet. The range is 0 to 7. • **set-dscp-transmit** *new-dscp*—Sets the IP differentiated services code point (DSCP) value and sends the packet with the new IP DSCP value setting. • **set-prec-transmit** *new-prec*—Sets the IP precedence and sends the packet with the new IP precedence value setting. • **transmit**—Sends the packet with no alteration.

Command Default

This command is disabled by default.

Command Modes

Policy-map configuration mode

Command History

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

Usage Guidelines

Refer to RFC 2698-Two Rate Three Color Marker.

Two-rate traffic policing uses two token buckets—Tc and Tp—for policing traffic at two independent rates. Note the following points about the two token buckets:

- The Tc token bucket is updated at the CIR value each time a packet arrives at the two-rate policer. The Tc token bucket can contain up to the confirm burst (Bc) value.
- The Tp token bucket is updated at the PIR value each time a packet arrives at the two-rate policer. The Tp token bucket can contain up to the peak burst (Be) value.

Updating Token Buckets

The following scenario illustrates how the token buckets are updated:

A packet of B bytes arrives at time t. The last packet arrived at time t1. The CIR and the PIR token buckets at time t are represented by Tc(t) and Tp(t), respectively. Using these values and in this scenario, the token buckets are updated as follows:

Tc(t) = min(CIR * (t-t1) + Tc(t1), Bc)

Tp(t) = min(PIR * (t-t1) + Tp(t1), Be)

Marking Traffic

The two-rate policer marks packets as either conforming, exceeding, or violating a specified rate. The following points (using a packet of B bytes) illustrate how a packet is marked:

- If B > Tp(t), the packet is marked as violating the specified rate.
- If B > Tc(t), the packet is marked as exceeding the specified rate, and the Tp(t) token bucket is updated as Tp(t) = Tp(t) – B.

Otherwise, the packet is marked as conforming to the specified rate, and both token buckets—Tc(t) and Tp(t)—are updated as follows:

Tp(t) = Tp(t) – B

Tc(t) = Tc(t) – B

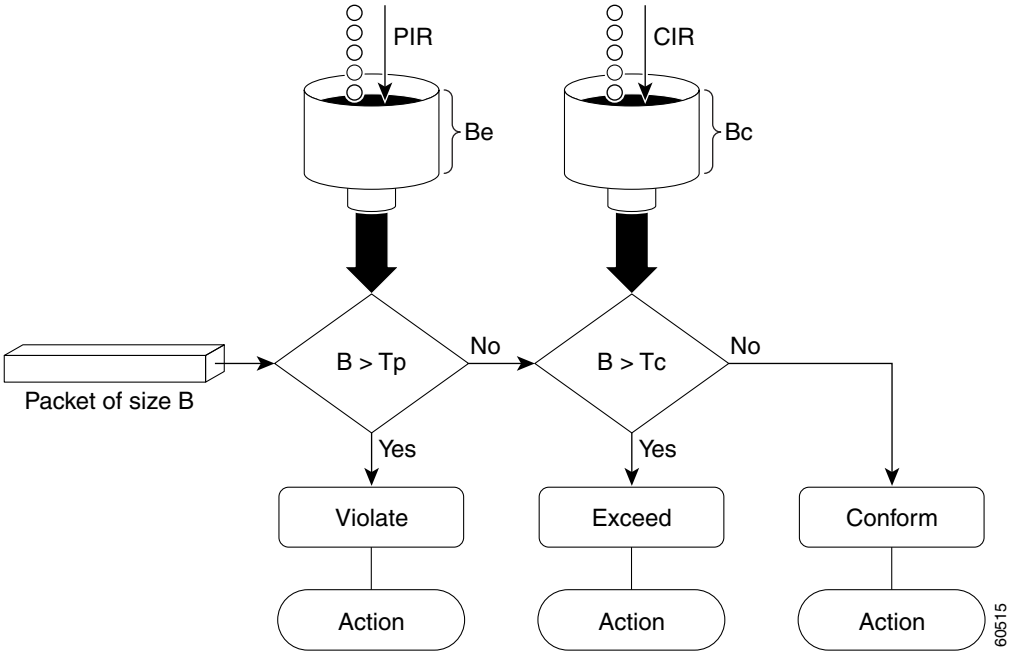
For example, if the CIR is 100 kbps, the PIR is 200 kbps, and a data stream with a rate of 250 kbps arrives at the two-rate policer, the packet would be marked as follows:

- 100 kbps would be marked as conforming to the rate.
- 100 kbps would be marked as exceeding the rate.
- 50 kbps would be marked as violating the rate.

Marking Packets and Assigning Actions Flowchart

The flowchart in Figure 2-1 illustrates how the two-rate policer marks packets and assigns a corresponding action (that is, violate, exceed, or conform) to the packet.

Figure 2-1 Marking Packets and Assigning Actions with the Two-Rate Policer



Examples

This example shows how to configure two-rate traffic policing on a class to limit traffic to an average committed rate of 500 kbps and a peak rate of 1 Mbps:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# class-map police
Switch(config-cmap)# match access-group 101
Switch(config-cmap)# policy-map policy1
Switch(config-pmap)# class police
Switch(config-pmap-c)# police cir 500000 bc 10000 pir 1000000 be 10000 conform-action
transmit exceed-action set-prec-transmit 2 violate-action drop
Switch(config-pmap-c)# interface gigabitethernet 6/1
Switch(config-if)# service-policy output policy1
Switch(config-if)# end
Switch# show policy-map policy1

 Policy Map policy1
  Class police
   police cir 500000 conform-burst 10000 pir 1000000 peak-burst 10000 conform-action
transmit exceed-action set-prec-transmit 2 violate-action drop
Switch#
```

Traffic marked as conforming to the average committed rate (500 kbps) will be sent as is. Traffic marked as exceeding 500 kbps, but not exceeding 1 Mbps, will be marked with IP Precedence 2 and then sent. All traffic marked as exceeding 1 Mbps will be dropped. The burst parameters are set to 10000 bytes.

In the following example, 1.25 Mbps of traffic is sent (“offered”) to a policer class:

```
Switch# show policy-map interface gigabitethernet 6/1

 GigabitEthernet6/1

  Service-policy output: policy1

   Class-map: police (match all)
    148803 packets, 36605538 bytes
    30 second offered rate 1249000 bps, drop rate 249000 bps
    Match: access-group 101
    police:
     cir 500000 bps, conform-burst 10000, pir 1000000, peak-burst 100000
     conformed 59538 packets, 14646348 bytes; action: transmit
     exceeded 59538 packets, 14646348 bytes; action: set-prec-transmit 2
     violated 29731 packets, 7313826 bytes; action: drop
     conformed 499000 bps, exceed 500000 bps violate 249000 bps

   Class-map: class-default (match-any)
    19 packets, 1990 bytes
    30 seconds offered rate 0 bps, drop rate 0 bps
    Match: any
Switch#
```

The two-rate policer marks 500 kbps of traffic as conforming, 500 kbps of traffic as exceeding, and 250 kbps of traffic as violating the specified rate. Packets marked as conforming to the rate will be sent as is, and packets marked as exceeding the rate will be marked with IP Precedence 2 and then sent. Packets marked as violating the rate are dropped.

policy-map

To create or modify a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode, use the **policy-map** global configuration command. To delete an existing policy map and to return to global configuration mode, use the **no** form of this command.

policy-map *policy-map-name*

no policy-map *policy-map-name*

Syntax Description

policy-map-name	Name of the policy map.

Defaults

No policy maps are defined.

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(40)SG	Added support for the Supervisor Engine 6-E and Catalyst 4900M chassis.

Usage Guidelines

Before configuring policies for classes whose match criteria are defined in a class map, use the **policy-map** command to specify the name of the policy map to be created or modified. After you enter the **policy-map** command, the switch enters policy-map configuration mode. You can configure or modify the class policies for that policy map and decide how to treat the classified traffic.

These configuration commands are available in policy-map configuration mode:

- **class—**Defines the classification match criteria for the specified class map. For more information, see the "class" section on page 2-67.
- **description—**Describes the policy map (up to 200 characters).
- **exit—**Exits policy-map configuration mode and returns you to global configuration mode.
- **no—**Removes a previously defined policy map.

To return to global configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

You can configure class policies in a policy map only if the classes have match criteria defined for them. To configure the match criteria for a class, use the **class-map** global configuration and **match** class-map configuration commands.

Examples

This example shows how to create a policy map called policy1. When attached to the ingress direction, it matches all the inbound traffic defined in class1, sets the IP DSCP to 10, and polices the traffic at an average rate of 1 Mbps and bursts at 20 KB. Traffic exceeding the profile is marked down to a DSCP value obtained from the policed-DSCP map and then sent. This policer action is applicable on all Catalyst 4500 supervisor engines except the Supervisor Engine 6-E and Catalyst 4900M chassis.

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

This example shows how to configure multiple classes in a policy map called policymap2 on a Supervisor Engine 6-E:

```
Switch# configure terminal
Switch(config)# policy-map policymap2
Switch(config-pmap)# class class1
Switch(config-pmap-c)# police 100000 20000 exceed-action
Switch(config-pmap-c)# set-dscp-transmit cs3
Switch(config-pmap-c)# set-cos-transmit 3
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class2
Switch(config-pmap-c)# police cir 32000 pir 64000 conform-action transmit exceed-action
Switch(config-pmap-c)# set-dscp-transmit cs3 violate-action drop
Switch(config-pmap-c)# exit
Switch(config-pmap)# class class3
Switch(config-pmap-c)# set dscp cs3
Switch(config-pmap-c)# exit
Switch#
```

This example shows how to delete the policy map called policymap2:

```
Switch# configure terminal
Switch(config)# no policy-map policymap2
Switch#
```

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

Related Commands

Command	Description
class	Specifies the name of the class whose traffic policy you want to create or change.
class-map	Creates a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode.
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
service-policy (interface configuration)	Attaches a policy map to an interface or applies different QoS policies on VLANs that an interface belongs to.
show policy-map	Displays information about the policy map.

port-channel load-balance

To set the load-distribution method among the ports in the bundle, use the **port-channel load-balance** command. To reset the load distribution to the default, use the **no** form of this command.

port-channel load-balance *method*

no port-channel load-balance

Syntax Description

method	Specifies the load distribution method. See the "Usage Guidelines" section for more information.

Defaults

Load distribution on the source XOR destination IP address is enabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

The following values are valid for the load-distribution method:

- **dst-ip**—Load distribution on the destination IP address
- **dst-mac**—Load distribution on the destination MAC address
- **dst-port**—Load distribution on the destination TCP/UDP port
- **src-dst-ip**—Load distribution on the source XOR destination IP address
- **src-dst-mac**—Load distribution on the source XOR destination MAC address
- **src-dst-port**—Load distribution on the source XOR destination TCP/UDP port
- **src-ip**—Load distribution on the source IP address
- **src-mac**—Load distribution on the source MAC address
- **src-port**—Load distribution on the source port

Examples

This example shows how to set the load-distribution method to the destination IP address:

```
Switch(config)# port-channel load-balance dst-ip
Switch(config)#
```

This example shows how to set the load-distribution method to the source XOR destination IP address:

```
Switch(config)# port-channel load-balance src-dst-port
Switch(config)#
```

Related Commands

Command	Description
interface port-channel	Accesses or creates a port-channel interface.
show etherchannel	Displays EtherChannel information for a channel.

port-channel standalone-disable

To disable the EtherChannel standalone option in a port channel, use the **port-channel standalone-disable** command in interface configuration mode. To enable this option, use the no form of this command.

port-channel standalone-disable

no port-channel standalone-disable

Syntax Description

This command has no arguments or keywords.

Defaults

The standalone option is disabled.

Command Modes

Interface configuration mode

Command History

Release	Modification
15.0(2)SG1	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

This command can only be used when the port channel protocol type is Link Aggregation Control Protocol (LACP). It allows you to change the current behavior when a physical port cannot bundle with an LACP EtherChannel.

Examples

The following example shows how to enable the EtherChannel standalone option in a port channel:

```
Switch(config-if)# no port-channel standalone-disable
```

Related Commands

Command	Description
show etherchannel	Displays EtherChannel information for a channel.

port-security mac-address

To configure a secure address on an interface for a specific VLAN or VLAN range, use the **port-security mac-address** command.

port-security mac-address *mac_address*

Syntax Description

mac_address	The MAC-address that needs to be secured.

Command Modes

VLAN-range interface submode

Command History

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

Usage Guidelines

Layer 2 interfaces can be part of multiple VLANs (for example, a typical trunk port). In conjunction with the **vlan** command, you can use the **port-security mac-address** command to specify different addresses on different VLANs.

Examples

This example shows how to configure the secure address 1.1.1 on interface Gigabit Ethernet 1/1 for VLANs 2-3:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# vlan 2-3
Switch(config-if-vlan-range)# port-security mac-address 1.1.1
Switch(config-if-vlan-range)# end
Switch#
```

Related Commands

Command	Description
port-security mac-address sticky	Configures a sticky address on an interface for a specific VLAN or VLAN range.
port-security maximum	Configures the maximum number of addresses on an interface for a specific VLAN or VLAN range.

port-security mac-address sticky

To configure a sticky address on an interface for a specific VLAN or VLAN range, use the **port-security mac-address sticky** command.

port-security mac-address sticky *mac_address*

Syntax Description

mac_address	The MAC-address that needs to be secured.

Command Modes

VLAN-range interface submode

Command History

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

Usage Guidelines

The Sticky feature must be enabled on an interface before you can configure the **port-security mac-address sticky** command.

Usage Guidelines

Layer 2 interfaces can be part of multiple VLANs (for example, a typical trunk port). In conjunction with the **vlan** command, you can use the **port-security mac-address sticky** command to specify different sticky addresses on different VLANs.

The Sticky feature must be enabled on an interface before you can configure the **port-security mac-address sticky** command.

Sticky MAC addresses are addresses that persist across switch reboots and link flaps.

Examples

This example shows how to configure the sticky address 1.1.1 on interface Gigabit Ethernet 1/1 for VLANs 2-3:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# vlan 2-3
Switch(config-if-vlan-range)# port-security mac-address sticky 1.1.1
Switch(config-if-vlan-range)# end
Switch#
```

Related Commands

Command	Description
port-security mac-address	Configures a secure address on an interface for a specific VLAN or VLAN range.
port-security maximum	Configures the maximum number of addresses on an interface for a specific VLAN or VLAN range.

port-security maximum

To configure the maximum number of addresses on an interface for a specific VLAN or VLAN range, use the **port-security maximum** command.

port-security maximum *max_value*

Syntax Description

max_value	The maximum number of MAC-addresses.

Command Modes

VLAN-range interface submode

Command History

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

Usage Guidelines

Layer 2 interfaces can be part of multiple VLANs (for example, a typical trunk port). In conjunction with the **vlan** command, you can use the **port-security maximum** command to specify the maximum number of secure addresses on different VLANs.

If a specific VLAN on a port is not configured with a maximum value, the maximum configured for the port is used for that VLAN. In this situation, the maximum number of addresses that can be secured on this VLAN is limited to the maximum value configured on the port.

Each VLAN can be configured with a maximum count that is greater than the value configured on the port. Also, the sum total of the maximum configured values for all the VLANs can exceed the maximum configured for the port. In either of these situations, the number of MAC addresses secured on each VLAN is limited to the lesser of the VLAN configuration maximum and the port configuration maximum.

Examples

This example shows how to configure a maximum number of addresses (5) on interface Gigabit Ethernet 1/1 for VLANs 2-3:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface g1/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# vlan 2-3
Switch(config-if-vlan-range)# port-security maximum 5
Switch(config-if-vlan-range)# exit
Switch#
```

Related Commands

Command	Description
port-security mac-address	Configures a secure address on an interface for a specific VLAN or VLAN range.
port-security mac-address sticky	Configures a sticky address on an interface for a specific VLAN or VLAN range.

power dc input

To configure the power DC input parameters on the switch, use the **power dc input** command. To return to the default power settings, use the **no** form of this command.

power dc input *watts*

no power dc input

Syntax Description

watts	Sets the total capacity of the external DC source in watts; valid values are from 300 to 8500.

Defaults

DC power input is 2500 W.

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(11)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.1(13)EW	Support for **dc input** was added.

Usage Guidelines

If your interface is not capable of supporting Power over Ethernet, you will receive this message:

```
Power over Ethernet not supported on interface Admin
```

Examples

This example shows how to set the total capacity of the external DC power source to 5000 W:

```
Switch(config)# power dc input 5000
Switch(config)#
```

Related Commands

Command	Description
show power	Displays information about the power status.

power efficient-ethernet auto

To enable EEE, use the **power efficient-ethernet auto** command. To disable EEE, use the **no** form of this command.

power efficient-ethernet auto

no power efficient-ethernet auto

Syntax Description

This command has no arguments or keywords.

Defaults

EEE is disabled

Command Modes

Global configuration mode

Command History

Release	Modification
Release IOS XE 3.4.0SG and IOS 15.1(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

EEE is supported on WS-X4748-UPOE+E and WS-X4748-RJ45-E.

EEE defines support for physical layer devices (PHYs) to operate in Low Power Idle (LPI) mode. When enabled, EEE supports QUIET times during low link utilization allowing both sides of a link to disable portions of each PHY's operating circuitry and save power. This functionality is provided per port and is not enabled by default. To avoid issues with EEE functionality on any port during run-time, Cisco provides the **power efficient-ethernet auto** command to enable or disable EEE.

Because EEE relies on Auto Negotiation pulse to determine whether to activate EEE, the port must initially enable auto negotiation. Furthermore, EEE is the correct action provided the speed is auto 100M, auto 1000M, or auto 100M and 1000M. 10M (either auto or forced mode) does not require EEE for power saving.

Examples

This example shows how to enable EEE:

```
Switch# config t
Switch(config)# interface gigabitethernet 1/1
Switch(config-if)# power efficient-ethernet auto
Switch(config-if)# exit
```

power inline

To set the inline-power state for the inline-power-capable interfaces, use the **power inline** command. To return to the default values, use the **no** form of this command.

power inline {**auto** [**max** *milliwatt*] | **never** | **static** [**max** *milliwatt*] | **consumption** *milliwatt*}

no power inline

Syntax Description

auto	Sets the Power over Ethernet state to auto mode for inline-power-capable interfaces.
max *milliwatt*	(Optional) Sets the maximum power that the equipment can consume; valid range is from 2000 to 15400 mW for classic modules. For the WS-X4648-RJ45V-E, the maximum is 20000. For the WS-X4648-RJ45V+E, the maximum is 30000.
never	Disables both the detection and power for the inline-power capable interfaces.
static	Allocates power statically.
consumption *milliwatt*	Sets power allocation per interface; valid range is from 4000 to 15400 for classic modules. Any non-default value disables automatic adjustment of power allocation.

Defaults

The default settings are as follows:

- Auto mode for Power over Ethernet is set.
- Maximum mW mode is set to 15400. For the WS-X4648-RJ45V-E, the maximum mW is set to 20000. For the WS-X4648-RJ45V+E, the maximum mW is set to 30000.
- Default allocation is set to 15400.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.1(11)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.1(19)EW	Support added for static power allocation.
12.1(20)EW	Support added for Power over Ethernet.
12.2(44)SG	Maximum supported wattage increased beyond 15400 for the WS-X4648-RJ45V-E and the WS-X4648-RJ45V+E.

Usage Guidelines

If your interface is not capable of supporting Power over Ethernet, you will receive this message:

```
Power over Ethernet not supported on interface Admin
```

Examples

This example shows how to set the inline-power detection and power for the inline-power-capable interfaces:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 4/1
Switch(config-if)# power inline auto
Switch(config-if)# end
Switch#
```

This example shows how to disable the inline-power detection and power for the inline-power-capable interfaces:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 4/1
Switch(config-if)# power inline never
Switch(config-if)# end
Switch#
```

This example shows how to set the permanent Power over Ethernet allocation to 8000 mW for Fast Ethernet interface 4/1 regardless what is mandated either by the 802.3af class of the discovered device or by any CDP packet that is received from the powered device:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 4/1
Switch(config-if)# power inline consumption 8000
Switch(config-if)# end
Switch#
```

This example shows how to pre-allocate Power over Ethernet to 16500 mW for Gigabit Ethernet interface 2/1 regardless of what is mandated either by the 802.3af class of the discovered device or by any CDP packet that is received from the powered device:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet 2/1
Switch(config-if)# power inline static max 16500
Switch(config-if)# end
Switch#
```

Related Commands

Command	Description
show power	Displays information about the power status.

power inline consumption

To set the default power that is allocated to an interface for all the inline-power-capable interfaces on the switch, use the **power inline consumption** command. To return to the default values, use the **no** form of this command.

power inline consumption default *milliwatts*

no power inline consumption default

Syntax Description

default	Specifies the switch to use the default allocation.
milliwatts	Sets the default power allocation in milliwatts; the valid range is from 4000 to 15400. Any non-default value disables automatic adjustment of power allocation.

Defaults

Milliwatt mode is set to 15400.

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(11)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.1(20)EW	Support added for Power over Ethernet.

Usage Guidelines

The **inline power consumption** command overrides the power allocated to the port through IEEE/Cisco phone discovery and CDP/LLDP power negotiation. To guarantee safe operation of the system, ensure that the value configured here is no less than the actual power requirement of the attached device. If the power drawn by the inline powered devices exceeds the capability of the power supply, it could trip the power supply.

If your interface is not capable of supporting Power over Ethernet, you will receive this message:

```
Power over Ethernet not supported on interface Admin
```

Examples

This example shows how to set the Power over Ethernet allocation to use 8000 mW, regardless of any CDP packet that is received from the powered device:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# power inline consumption default 8000
Switch(config)# end
Switch#
```

Related Commands

Command	Description
power inline	Sets the inline-power state for the inline-power-capable interfaces.
show power	Displays information about the power status.

power inline logging global

To enable console messages that show when a PoE device has been detected and to show when a PoE device has been removed, use the **power inline logging global** command.

power inline logging global

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Global configuration mode

Command History

Release	Modification
15.0(2)SG2	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Be aware of the potential for console flooding if this command is used on a switch connected to several PoE devices.

Examples

This example shows how to globally enable PoE status messaging on each interface:

To enable PoE event logging, you use the **logging event poe-status global** command:

```
Switch# conf terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# power inline logging global
Switch(config)# int gigabitEthernet 5/5
Switch(config-if)# shut
Switch(config-if)#
*Oct 17 12:02:48.407: %ILPOWER-5-IEEE_DISCONNECT: Interface Gi5/5: PD removed
Switch(config-if)# no shut
Switch(config-if)#
*Oct 17 12:02:54.915: %ILPOWER-7-DETECT: Interface Gi5/5: Power Device detected: IEEE PD
```

Related Commands

Command	Description
logging event link-status global (global configuration)	Changes the default switch-wide global link-status event messaging settings.

power inline police

To configure Power over Ethernet policing on a particular interface, use the **power inline police** command. The **no** form of the command disables PoE policing on an interface.

power inline police [**action**] [**errdisable | log**]

no power inline police [**action**] [**errdisable | log**]

Syntax Description

action	(Optional) Specifies the action to take on the port when a PoE policing fault occurs (the device consumes more power than it's allocated).
errdisable	(Optional) Enables PoE policing on the interface and places the port in an errdisable state when a PoE policing fault occurs.
log	(Optional) Enables PoE policing on the interface and, if a PoE policing fault occurs, shuts, restarts the port, and logs an error message.

Defaults

PoE policing is disabled.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

If a port is in the errdisable state because of a PoE policing fault, enter the **shut** command followed by a **no shut** on the interface to make the port operational again.

You can also configure inline-power errdisable autorecovery so that an errdisabled interface is automatically revived when the errdisable autorecovery timer expires.

Examples

This example shows how to enable PoE policing and configure a policing action:

```
Switch(config)# int gigabitEthernet 2/1
Switch(config-if)# power inline police
Switch(config-if)# do show power inline police gigabitEthernet 2/1
Available:421(w)  Used:39(w)  Remaining:382(w)

Interface Admin  Oper       Admin      Oper       Cutoff Oper
          State  State      Police     Police     Power  Power
--------- ------ ---------- ---------- ---------- ------ -----
Gi2/1     auto   on         errdisable ok         17.4   7.6


Switch(config-if)# power inline police action log
Available:421(w)  Used:39(w)  Remaining:382(w)
```

```
Interface Admin  Oper       Admin      Oper       Cutoff Oper
          State  State      Police     Police     Power  Power
--------- ------ ---------- ---------- ---------- ------ -----
Gi2/1     auto   on         log        ok         17.4   9.6
```

Related Commands

Command	Description
errdisable recovery	Enables errdisable autorecovery; the port automatically restarts itself after going to the errdisable state after its errdisable autorecovery timer expires.
show power inline police	Displays the PoE policing status of an interface, module, or chassis.

power redundancy-mode

To configure the power settings for the chassis, use the **power redundancy-mode** command. To return to the default setting, use the **default** form of this command.

power redundancy-mode {**redundant** | **combined**}

default power redundancy-mode

Syntax Description

redundant	Configures the switch to redundant power management mode.
combined	Configures the switch to combined power management mode.

Defaults

Redundant power management mode

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(12c)EW	Support for this command was introduced on the Catalyst 4500 series switch. (Catalyst 4500 series switches only: 4503, 4506, and 4507).

Usage Guidelines

The two power supplies must be the same type and wattage.

Caution If you have power supplies with different types or wattages installed in your switch, the switch will not recognize one of the power supplies. A switch set to redundant mode will not have power redundancy. A switch set to combined mode will use only one power supply.

In redundant mode, the power from a single power supply must provide enough power to support the switch configuration.

Table 2-9 lists the maximum available power for chassis and Power over Ethernet for each power supply.

Table 2-9 Available Power

Power Supply	Redundant Mode (W)	Combined Mode (W)
1000 W AC	System[1] = 1000	System = 1667
	Inline = 0	Inline = 0
2800 W AC	System = 1360	System = 2473
	Inline = 1400	Inline = 2333

1. The system power includes power for the supervisor engines, all modules, and the fan tray.

Examples

This example shows how to set the power management mode to combined:

```
Switch(config)# power redundancy-mode combined
Switch(config)#
```

Related Commands

Command	Description
show power	Displays information about the power status.

pppoe intermediate-agent (global)

To enable the PPPoE Intermediate Agent feature on a switch, use the **pppoe intermediate-agent** global configuration command. To disable the feature, use the **no** form of this command.

pppoe intermediate-agent

no pppoe intermediate-agent

Syntax Description

This command has no arguments or keywords.

Defaults

disabled

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

You must enable PPPoE Intermediate Agent globally on a switch before you can use PPPoE Intermediate Agent on an interface or interface VLAN.

Examples

This example shows how to enable PPPoE Intermediate Agent on a switch:

```
Switch(config)# pppoe intermediate-agent
```

This example shows how to disable PPPoE Intermediate Agent on a switch:

```
Switch(config)# no pppoe intermediate-agent
```

Related Commands

Command	Description
pppoe intermediate-agent (global)	Sets the access node identifier, generic error message, and identifier string for a switch.

pppoe intermediate-agent (interface)

Note This command takes effect only if you enable the **pppoe intermediate-agent** global command.

To enable the PPPoE Intermediate Agent feature on an interface, use the **pppoe intermediate-agent** command. To disable the feature, use the **no** form of this command.

pppoe intermediate-agent

no pppoe intermediate-agent

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled on all interfaces.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

PPPoE Intermediate Agent is enabled on an interface provided the PPPoE Intermediate Agent is enabled both on the switch and the interface.

Examples

This example shows how to enable the PPPoE Intermediate Agent on an interface:

```
Switch(config-if)# pppoe intermediate-agent
```

This example shows how to disable the PPPoE Intermediate Agent on an interface:

```
Switch(config-if)# no pppoe intermediate-agent
```

Related Commands

Command	Description
pppoe intermediate-agent format-type (interface)	Sets circuit ID or remote ID for an interface.
pppoe intermediate-agent limit rate	Limits the rate of the PPPoE Discovery packets coming on an interface.

Command	Description
pppoe intermediate-agent trust	Sets the trust configuration of an interface.
pppoe intermediate-agent vendor-tag strip	Enables vendor-tag stripping on PPPoE Discovery packets from PPPoE Server (or BRAS).

pppoe intermediate-agent (interface vlan-range)

Note This command takes effect only if you enable the **pppoe intermediate-agent** global command.

To enable PPPoE Intermediate Agent on an interface VLAN range, use the **pppoe intermediate-agent** global command. To disable the feature, use the **no** form of this command.

pppoe intermediate-agent

no pppoe intermediate-agent

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled on all VLANs on all interfaces

Command Modes

Interface vlan-range configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Although this command takes effect irrespective of the **pppoe intermediate-agent** (interface configuration mode) command, you must enable the **pppoe intermediate-agent** (global configuration mode) command.

Examples

This example shows how to enable PPPoE Intermediate Agent on a range of VLANs:

```
Switch(config-if)# vlan-range 167-368
Switch(config-if-vlan-range)# pppoe intermediate-agent
```

This example shows how to disable PPPoE Intermediate Agent on a single VLAN:

```
Switch(config-if)# vlan-range 268
Switch(config-if-vlan-range)# no pppoe intermediate-agent
```

Related Commands

Command	Description
pppoe intermediate-agent (interface)	Enables the PPPoE Intermediate Agent feature on an interface.

pppoe intermediate-agent format-type (global)

To set the access node identifier, generic error message, and identifier string for the switch, use the **pppoe intermediate-agent format-type (global)** command. To disable the feature, use the **no** form of this command:

pppoe intermediate-agent format-type access-node-identifier string *string*

pppoe intermediate-agent format-type generic-error-message string *string*

pppoe intermediate-agent format-type identifier-string string *string* **option {sp|sv|pv|spv} delimiter {**,|.|;|/|#**}**

no pppoe intermediate-agent format-type {**access-node-identifier | generic-error-message | identifier-string**}

Syntax Description

access-node-identifier string *string*	ASCII string literal value for the access-node-identifier.
generic-error-message string *string*	ASCII string literal value for the generic-error-message.
identifier-string string *string*	ASCII string literal value for the identifier-string.
option {**sp**|**sv**|**pv**|**spv**}	Options: **sp** = slot + port **sv** = slot + VLAN **pv** = port + VLAN **spv** = slot + port + VLAN
delimiter {,|.|;|/|#}	Delimiter between slot/port/VLAN portions of **option**.

Defaults

access-node-identifier has a default value of 0.0.0.0.

generic-error-message, **identifier-string**, **option**, and **delimiter** have no default values.

Command Modes

Global configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Use the **access-node-identifier** and **identifier-string** commands to enable the switch to generate the circuit-id parameters automatically.

The **no** form of **identifier-string** command unsets the option and delimiter.

Use the **generic-error-message** command to set an error message notifying the sender that the PPPoE Discovery packet was too large.

Examples

This example shows how to set an access-node-identifier:

```
Switch(config)# pppoe intermediate-agent format-type access-node-identifier string
switch-abc-123
```

This example shows how to unset a generic-error-message:

```
Switch(config)# no pppoe intermediate-agent format-type generic-error-message
```

Related Commands

Command	Description
show pppoe intermediate-agent interface	Displays the PPPoE Intermediate Agent configuration and statistics (packet counters).

pppoe intermediate-agent format-type (interface)

Note This command takes effect only if you enable the **pppoe intermediate-agent** interface configuration command.

To set circuit-id or remote-id for an interface, use the **pppoe intermediate-agent format-type** command. To unset the parameters, use the **no** form of this command.

pppoe intermediate-agent format-type {**circuit-id** | **remote-id**} **string** *string*

no pppoe intermediate-agent format-type {**circuit-id** | **remote-id**} **string** *string*

Syntax Description

circuit-id string *string*	ASCII string literal value for circuit-id.
remote-id string *string*	ASCII string literal value for remote-id.

Defaults

No default values for circuit-id and remote-id.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Use the **pppoe intermediate-agent format-type** command to set interface-specific circuit-id and remote-id values. If an interface-specific circuit-id is not set, the system's automatic generated circuit-id value is used.

Examples

This example shows how to set remote-id for an interface:

```
Switch(config-if)# pppoe intermediate-agent format-type remote-id string user5551983
```

This example shows how to unset circuit-id for an interface:

```
Switch(config)# no pppoe intermediate-agent format-type circuit-id
```

Related Commands

Command	Description
pppoe intermediate-agent (interface)	Enables the PPPoE Intermediate Agent feature on an interface.
pppoe intermediate-agent (interface vlan-range)	Sets the circuit-id or remote-id for an interface vlan-range.

pppoe intermediate-agent format-type (interface vlan-range)

Note This command takes effect only if you enable the **pppoe intermediate-agent** interface vlan-range configuration mode command.

To set circuit-id or remote-id for an interface vlan-range, use the **pppoe intermediate-agent format-type** interface vlan-range mode command. To unset the parameters, use the **no** form of this command.

pppoe intermediate-agent format-type {**circuit-id** | **remote-id**} **string** *string*

no pppoe intermediate-agent format-type {**circuit-id** | **remote-id**} **string** *string*

Syntax Description

circuit-id string *string*	ASCII string literal value to be set for circuit-id.
remote-id string *string*	ASCII string literal value to be set for remote-id.

Defaults

No default values for circuit-id and remote-id.

Command Modes

Interface vlan-range configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Use these commands to set circuit-id or remote-id on an interface vlan-range. If the circuit-id is not set, the system's automatically generated circuit-id is used.

Examples

This example shows how to set remote-id on an interface VLAN:

```
Switch(config-if)# vlan-range 268
Switch(config-if-vlan-range)#
pppoe intermediate-agent format-type remote-id string user5551983-cabletv
```

This example shows how to unset circuit-id on an interface vlan-range:

```
Switch(config-if)# vlan-range 167-368
Switch(config-if-vlan-range)# no pppoe intermediate-agent format-type circuit-id
```

Related Commands

Command	Description
pppoe intermediate-agent (interface vlan-range)	Enables PPPoE Intermediate Agent on an interface VLAN range.

pppoe intermediate-agent limit rate

To limit the rate of the PPPoE Discovery packets arriving on an interface, use the **pppoe intermediate-agent limit rate** command. To disable the feature, use the **no** form of this command.

pppoe intermediate-agent limit rate *number*

no pppoe intermediate-agent limit rate *number*

Syntax Description

number	Specifies the threshold rate of PPPoE Discovery packets received on this interface in packets-per-second.

Defaults

This command has no default settings.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

If this command is used and the PPPoE Discovery packets that are received exceeds the rate set, the interface will be error-disabled (shutdown).

Examples

This example shows how to set a rate limit for an interface:

```
Switch(config-if)# pppoe intermediate-agent limit rate 50
```

This example shows how to disable rate limiting for an interface:

```
Switch(config-if)# no pppoe intermediate-agent limit rate
```

Related Commands

Command	Description
pppoe intermediate-agent (interface)	Enables the PPPoE Intermediate Agent feature on an interface

pppoe intermediate-agent trust

To set the trust configuration of an interface, use the **pppoe intermediate-agent trust** global command. To unset the trust parameter, use the **no** form of this command.

pppoe intermediate-agent trust

no pppoe intermediate-agent trust

Syntax Description

This command has no arguments or keywords.

Defaults

All interfaces are untrusted.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

At least one trusted interface must be present on the switch for PPPoE Intermediate Agent feature to work.

Set the interface connecting the switch to the PPPoE Server (or BRAS) as trusted.

Examples

This example shows how to set an interface as trusted:

```
Switch(config-if)# pppoe intermediate-agent trust
```

This example shows how to disable the trust configuration for an interface:

```
Switch(config-if)# no pppoe intermediate-agent trust
```

Related Commands

Command	Description
pppoe intermediate-agent vendor-tag strip	Enables vendor-tag stripping on PPPoE Discovery packets from a PPPoE Server (or BRAS).

pppoe intermediate-agent vendor-tag strip

Note This command takes effect only if you enable the **pppoe intermediate-agent** interface configuration command and the **pppoe intermediate-agent trust** command.

To enable vendor-tag stripping on PPPoE Discovery packets from PPPoE Server (or BRAS), use the **pppoe intermediate-agent vendor-tag strip** command. To disable this setting, use the **no** form of this command.

pppoe intermediate-agent vendor-tag strip

no pppoe intermediate-agent vendor-tag strip

Syntax Description

This command has no arguments or keywords.

Defaults

vendor-tag stripping is turned off.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.2(50)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

This command has no effect on untrusted interfaces.

Use this command on a PPPoE Intermediate Agent trusted interface to strip off the vendor-specific tags in PPPoE Discovery packets that arrive downstream from the PPPoE Server (or BRAS), if any.

Examples

This example shows how to set vendor-tag stripping on an interface:

```
Switch(config-if)# pppoe intermediate-agent vendor-tag strip
```

This example shows how to disable vendor-tag stripping on an interface:

```
Switch(config-if)# no pppoe intermediate-agent vendor-tag strip
```

Related Commands

Command	Description
pppoe intermediate-agent (interface)	Enables the PPPoE Intermediate Agent feature on an interface.
pppoe intermediate-agent trust	Sets the trust configuration of an interface.

priority

To enable the strict priority queue (low-latency queueing [LLQ]) and to give priority to a class of traffic belonging to a policy map attached to a physical port, use the **priority** policy-map class configuration command. To return to the default setting, use the **no** form of this command.

priority

no priority

Syntax Description

This command has no arguments or keywords.

Defaults

The strict priority queue is disabled.

Command Modes

Policy-map class configuration mode

Command History

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

Usage Guidelines

Use the **priority** command only in a policy map attached to a physical port. You can use this command only in class-level classes, you cannot use this command in class class-default.

This command configures LLQ and provides strict-priority queueing. Strict-priority queueing enables delay-sensitive data, such as voice, to be sent before packets in other queues are sent. The priority queue is serviced first until it is empty.

You cannot use the **bandwidth**, **dbl**, and the **shape** policy-map class configuration commands with the **priority** policy-map class configuration command in the same class within the same policy map. However, you can use these commands in the same policy map.

You can use police or set class configuration commands with the priority police-map class configuration command.

If the priority queuing class is not rate limited, you cannot use the bandwidth command, you can use the bandwidth remaining percent command instead.

Examples

This example shows how to enable the LLQ for the policy map called policy1:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# policy-map policy1
Switch(config-pmap)# class voice
Switch(config-pmap-c)# priority
```

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

Related Commands

Command	Description
bandwidth	Specifies or modifies the minimum bandwidth provided to a class belonging to a policy map attached to a physical port.
class	Specifies the name of the class whose traffic policy you want to create or change.
dbl	Enables dynamic buffer limiting for traffic hitting this class.
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
service-policy (policy-map class)	Creates a service policy that is a quality of service (QoS) policy within a policy map.
shape (class-based queueing)	Enables traffic shaping a class of traffic in a policy map attached to a physical port.
show policy-map	Displays information about the policy map.

private-vlan

To configure private VLANs and the association between a private VLAN and a secondary VLAN, use the **private-vlan** command. To return to the default value, use the **no** form of this command.

private-vlan {**isolated** | **community** | **twoway-community** | **primary**}

private-vlan association *secondary-vlan-list* [{**add** *secondary-vlan-list*} | {**remove** *secondary-vlan-list*}]

no private-vlan {**isolated** | **community** | **twoway-community** | **primary**}

no private-vlan association

Syntax Description

isolated	Designates the VLAN as an isolated private VLAN.
community	Designates the VLAN as the community private VLAN.
twoway-community	Designates the VLAN as a host port that belongs to a twoway-community secondary VLAN
primary	Designates the VLAN as the primary private VLAN.
association	Creates an association between a secondary VLAN and a primary VLAN.
secondary-vlan-list	Specifies the number of the secondary VLAN. The list can contain only one isolated VLAN ID; it can also contain multiple community or twoway-community VLAN IDs
add	(Optional) Associates a secondary VLAN to a primary VLAN.
remove	(Optional) Clears the association between a secondary VLAN and a primary VLAN.

Defaults

Private VLANs are not configured.

Command Modes

VLAN configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.1(12c)EW	Support for extended addressing was added.
12.2(20)EW	Support for community VLAN was added.
15.0(2)SG	Support for twoway-community was introduced.

Usage Guidelines

You cannot configure VLAN 1 or VLANs 1001 to 1005 as private VLANs.

VTP does not support private VLANs. You must configure private VLANs on each device where you want private VLAN ports.

The *secondary_vlan_list* parameter cannot contain spaces; it can contain multiple comma-separated items. Each item can be a single private VLAN ID or a range of private VLAN IDs separated by hyphens.

The *secondary_vlan_list* parameter can contain multiple community VLAN IDs.

The *secondary_vlan_list* parameter can contain only one isolated VLAN ID. A private VLAN is defined as a set of private ports characterized by a common set of VLAN number pairs: each pair is made up of at least two special unidirectional VLANs and is used by isolated ports or by a community of ports to communicate with the switches.

An isolated VLAN is a VLAN that is used by the isolated ports to communicate with the promiscuous ports. The isolated VLAN traffic is blocked on all other private ports in the same VLAN and can be received only by the standard trunking ports and the promiscuous ports that are assigned to the corresponding primary VLAN.

A community VLAN is the VLAN that carries the traffic among the community ports and from the community ports to the promiscuous ports on the corresponding primary VLAN. A community VLAN is not allowed on a private VLAN trunk.

A promiscuous port is a private port that is assigned to a primary VLAN.

A primary VLAN is a VLAN that is used to convey the traffic from the switches to the customer end stations on the private ports.

You can specify only one isolated *vlan-id* value, while multiple community VLANs are allowed. You can only associate isolated and community VLANs to one VLAN. The associated VLAN list may not contain primary VLANs. Similarly, a VLAN that is already associated to a primary VLAN cannot be configured as a primary VLAN.

The **private-vlan** commands do not take effect until you exit the config-VLAN submode.

If you delete either the primary or secondary VLAN, the ports that are associated with the VLAN become inactive.

Refer to the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide* for additional configuration guidelines.

Examples

This example shows how to configure VLAN 202 as a primary VLAN and verify the configuration:

```
Switch# configure terminal
Switch(config)# vlan 202
Switch(config-vlan)# private-vlan primary
Switch(config-vlan)# end
Switch# show vlan private-vlan
Primary Secondary Type              Interfaces
------- --------- ----------------- ------------------------------------------
202               primary
```

This example shows how to configure VLAN 303 as a community VLAN and verify the configuration:

```
Switch# configure terminal
Switch(config)# vlan 303
Switch(config-vlan)# private-vlan community
Switch(config-vlan)# end
Switch# show vlan private-vlan

Primary Secondary Type              Interfaces
------- --------- ----------------- ------------------------------------------
202               primary
        303       community
```

This example shows how to configure VLAN 440 as an isolated VLAN and verify the configuration:

```
Switch# configure terminal
Switch(config)# vlan 440
Switch(config-vlan)# private-vlan isolated
Switch(config-vlan)# end
Switch# show vlan private-vlan

Primary Secondary Type              Interfaces
------- --------- ----------------- ------------------------------------------
202               primary
        303       community
        440       isolated
```

This example shows how to create a private VLAN relationship among the primary VLAN 14, the isolated VLAN 19, and community VLANs 20 and 21:

```
Switch(config)# vlan 19
Switch(config-vlan) # private-vlan isolated
Switch(config)# vlan 14
Switch(config-vlan)# private-vlan primary
Switch(config-vlan)# private-vlan association 19
```

This example shows how to remove a private VLAN relationship and delete the primary VLAN. The associated secondary VLANs are not deleted.

```
Switch(config-vlan)# no private-vlan 14
Switch(config-vlan)#
```

This example shows how to configure VLAN 550 as a twoway-community VLAN and verify the configuration:

```
Switch# configure terminal
Switch(config)# vlan 550
Switch(config-vlan)# private-vlan twoway-community
Switch(config-vlan)# end
Switch# show vlan private-vlan

Primary Secondary Type              Interfaces
------- --------- ----------------- ------------------------------------------
202               primary
        303       community
        440       isolated
         550   twoway-community
```

This example shows how to associate community VLANs 303 through 307 and 309 and isolated VLAN 440 with primary VLAN 202 and verify the configuration:

```
Switch# configure terminal
Switch(config)# vlan 202
Switch(config-vlan)# private-vlan association 303-307,309,440
Switch(config-vlan)# end
Switch# show vlan private-vlan

Primary Secondary Type              Interfaces
------- --------- ----------------- ------------------------------------------
202     303       community
202     304       community
202     305       community
202     306       community
202     307       community
202     309       community
202     440       isolated
        308       community
```

Note The secondary VLAN 308 has no associated primary VLAN.

This example shows how to remove an isolated VLAN from the private VLAN association:

```
Switch(config)# vlan 14
Switch(config-vlan)# private-vlan association remove 18
Switch(config-vlan)#
```

This example shows how to configure interface FastEthernet 5/1 as a PVLAN host port and verify the configuration:

```
Switch# configure terminal
Switch(config)# interface fastethernet 5/1
Switch(config-if)# switchport mode private-vlan host
Switch(config-if)# switchport private-vlan host-association 202 440
Switch(config-if)# end

Switch# show interfaces fastethernet 5/1 switchport
Name: Fa5/1
Switchport: Enabled
Administrative Mode: private-vlan host
Operational Mode: private-vlan host
Administrative Trunking Encapsulation: negotiate
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Voice VLAN: none
Appliance trust: none
Administrative Private Vlan
  Host Association: 202 (VLAN0202) 440 (VLAN0440)
  Promiscuous Mapping: none
  Trunk encapsulation : dot1q
  Trunk vlans:
Operational private-vlan(s):
  202 (VLAN0202) 440 (VLAN0440)
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
```

Related Commands

Command	Description
show vlan	Displays VLAN information.
show vlan private-vlan	Displays private VLAN information.

private-vlan mapping

To create a mapping between the primary and the secondary VLANs so that both share the same primary VLAN SVI, use the **private-vlan mapping** command. To remove all PVLAN mappings from an SVI, use the **no** form of this command.

private-vlan mapping *primary-vlan-id* {[*secondary-vlan-list* | {**add** *secondary-vlan-list*} | {**remove** *secondary-vlan-list*}]}

no private-vlan mapping

Syntax Description

primary-vlan-id	VLAN ID of the primary VLAN of the PVLAN relationship.
secondary-vlan-list	(Optional) VLAN ID of the secondary VLANs to map to the primary VLAN.
add	(Optional) Maps the secondary VLAN to the primary VLAN.
remove	(Optional) Removes the mapping between the secondary VLAN and the primary VLAN.

Defaults

All PVLAN mappings are removed.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

The *secondary_vlan_list* parameter cannot contain spaces. It can contain multiple, comma-separated items. Each item can be a single PVLAN ID or a range of PVLAN IDs separated by hyphens.

This command is valid in the interface configuration mode of the primary VLAN.

The SVI of the primary VLAN is created at Layer 3.

The traffic that is received on the secondary VLAN is routed by the SVI of the primary VLAN.

The SVIs of the existing secondary VLANs do not function and are considered down after this command is entered.

A secondary SVI can be mapped to only one primary SVI. If the configured PVLANs association is different from what is specified in this command (if the specified *primary-vlan-id* is configured as a secondary VLAN), all the SVIs that are specified in this command are brought down.

If you configure a mapping between two VLANs that do not have a valid Layer 2 association, the mapping configuration does not take effect.

Examples

This example shows how to map the interface of VLAN 20 to the SVI of VLAN 18:

```
Switch(config)# interface vlan 18
Switch(config-if)# private-vlan mapping 18 20
Switch(config-if)#
```

This example shows how to permit the routing of the secondary VLAN ingress traffic from PVLANs 303 through 307, 309, and 440 and how to verify the configuration:

```
Switch# config terminal
Switch(config)# interface vlan 202
Switch(config-if)# private-vlan mapping add 303-307,309,440
Switch(config-if)# end
Switch# show interfaces private-vlan mapping
Interface Secondary VLAN Type
--------- -------------- -----------------
vlan202   303            isolated
vlan202   304            isolated
vlan202   305            isolated
vlan202   306            isolated
vlan202   307            isolated
vlan202   309            isolated
vlan202   440            isolated
Switch#
```

This example shows the displayed message that you will see if the VLAN that you are adding is already mapped to the SVI of VLAN 18. You must delete the mapping from the SVI of VLAN 18 first.

```
Switch(config)# interface vlan 19
Switch(config-if)# private-vlan mapping 19 add 21
    Command rejected: The interface for VLAN 21 is already mapped as s secondary.
Switch(config-if)#
```

This example shows how to remove all PVLAN mappings from the SVI of VLAN 19:

```
Switch(config)# interface vlan 19
Switch(config-if)# no private-vlan mapping
Switch(config-if)#


Switch# configure terminal
Switch(config)# interface vlan 202
Switch(config-if)# private-vlan mapping add 303-307,309,440
Switch(config-if)# end
Switch# show interfaces private-vlan mapping
Interface Secondary VLAN Type
--------- -------------- -----------------
vlan202   303            community
vlan202   304            community
vlan202   305            community
vlan202   306            community
vlan202   307            community
vlan202   309            community
vlan202   440            isolated

Switch#
```

Related Commands

Command	Description
show interfaces private-vlan mapping	Displays PVLAN mapping information for VLAN SVIs.
show vlan	Displays VLAN information.
show vlan private-vlan	Displays private VLAN information.

private-vlan synchronize

To map the secondary VLANs to the same instance as the primary VLAN, use the **private-vlan synchronize** command.

private-vlan synchronize

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default settings.

Command Modes

MST configuration mode

Command History

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

Usage Guidelines

If you do not map the VLANs to the same instance as the associated primary VLAN when you exit the MST configuration submode, a warning message displays and lists the secondary VLANs that are not mapped to the same instance as the associated primary VLAN. The **private-vlan synchronize** command automatically maps all secondary VLANs to the same instance as the associated primary VLANs.

Examples

This example shows how to initialize PVLAN synchronization:

```
Switch(config-mst)# private-vlan synchronize
Switch(config-mst)#
```

This example assumes that a primary VLAN 2 and a secondary VLAN 3 are associated to VLAN 2, and that all VLANs are mapped to the CIST instance 1. This example also shows the output if you try to change the mapping for the primary VLAN 2 only:

```
Switch(config)# spanning-tree mst configuration
Switch(config-mst)# instance 1 vlan 2
Switch(config-mst)# exit
These secondary vlans are not mapped to the same instance as their primary:
->3
Switch(config)#
```

Related Commands

Command	Description
show spanning-tree mst	Displays MST protocol information.

profile

To enter profile call-home configuration submode, use the **profile** command in call-home configuration mode, use the **profile** command.

profile *profile_name*

Syntax Description

profile_name	Specifies the profile name.

Defaults

This command has no default settings.

Command Modes

cfg-call-home

Command History

Release	Modification
12.2(52)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

When you enter the **profile** *profile_name* command in call-home mode, the prompt changes to Switch(cfg-call-home-profile)#, and you have access to the following profile configuration commands:

- **active**
- **destination address**
- **destination message-size-limit bytes**
- **destination preferred-msg-format**
- **destination transport-method**
- **end**
- **exit**
- **subscribe-to-alert-group all**
- **subscribe-to-alert-group configuration**
- **subscribe-to-alert-group diagnostic**
- **subscribe-to-alert-group environment**
- **subscribe-to-alert-group inventory**
- **subscribe-to-alert-group syslog**

Examples

This example shows how to create and configure a user-defined call-home profile:

```
Switch(config)# call-home
Switch(cfg-call-home)# profile cisco
Switch(cfg-call-home-profile)# destination transport-method http
Switch(cfg-call-home-profile)# destination address http
https://172.17.46.17/its/service/oddce/services/DDCEService
Switch(cfg-call-home-profile)# subscribe-to-alert-group configuration
Switch(cfg-call-home-profile)# subscribe-to-alert-group diagnostic severity normal
Switch(cfg-call-home-profile)# subscribe-to-alert-group environment severity notification
Switch(cfg-call-home-profile)# subscribe-to-alert-group syslog severity notification
pattern "UPDOWN"
Switch(cfg-call-home-profile)# subscribe-to-alert-group inventory periodic daily 21:12
```

Related Commands

Command	Description
destination address	Configures the destination e-mail address or URL to which Call Home messages will be sent.
destination message-size-limit bytes	Configures a maximum destination message size for the destination profile.
destination preferred-msg-format	Configures a preferred message format.
destination transport-method	Enables the message transport method.
subscribe-to-alert-group all	Subscribes to all available alert groups.
subscribe-to-alert-group configuration	Subscribes this destination profile to the Configuration alert group.
subscribe-to-alert-group diagnostic	Subscribes this destination profile to the Diagnostic alert group.
subscribe-to-alert-group environment	Subscribes this destination profile to the Environment alert group.
subscribe-to-alert-group inventory	Subscribes this destination profile to the Inventory alert group.
subscribe-to-alert-group syslog	Subscribes this destination profile to the Syslog alert group.

qos (global configuration mode)

To globally enable QoS functionality on the switch, use the **qos** command. To globally disable QoS functionality, use the **no** form of this command.

qos

no qos

Syntax Description

This command has no arguments or keywords.

Defaults

QoS functionality is disabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and the Catalyst 4900M chassis. On the Supervisor Engine 6-E and Catalyst 4900M chassis QoS is always enabled without being configured.

If QoS functionality is globally enabled, it is enabled on all interfaces, except on the interfaces where QoS has been disabled. If QoS functionality is globally disabled, all traffic is passed in QoS pass-through mode.

Examples

This example shows how to enable QoS functionality globally on the switch:

```
Switch(config)# qos
Switch(config)#
```

Related Commands

Command	Description
qos (interface configuration mode)	Enables QoS functionality on an interface.
show qos	Displays QoS information.

qos (interface configuration mode)

To enable QoS functionality on an interface, use the **qos** command. To disable QoS functionality on an interface, use the **no** form of this command.

qos

no qos

Syntax Description

This command has no arguments or keywords.

Defaults

QoS is enabled.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and the Catalyst 4900M chassis. On the Supervisor Engine 6-E and Catalyst 4900M chassis, attaching a service policy implicitly enables QoS on the supervisor engine and detaching a service policy implicitly disables QoS on the supervisor engine.

If QoS functionality is globally disabled, it is also disabled on all interfaces.

Examples

This example shows how to enable QoS functionality on an interface:

```
Switch(config-if)# qos
Switch(config-if)#
```

Related Commands

Command	Description
qos (global configuration mode)	Enables QoS functionality on the switch.
qos (interface configuration mode)	Enables QoS functionality on an interface.
show qos	Displays QoS information.

qos account layer-all encapsulation

Note This command is not supported on Supervisor Engine V-10GE and earlier supervisor engines.

To account for Layer 1 header length of 20 bytes in QoS policing features, use the **qos account layer-all encapsulation** command. To disable the use of additional bytes, use the **no** form of this command.

qos account layer-all encapsulation

no qos account layer-all encapsulation

Syntax Description

This command has no arguments or keywords.

Defaults

On Supervisor Engine 6-E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948E, policers account only for the Layer 2 header length in policing features. In contrast, shapers account for header length as well as IPG in rate calculations.

On Supervisor Engine V-10GE and earlier supervisor engines, policer or shaping computations involve only IP payload information. To include Layer 2 lengths and any overhead, use the **qos account layer2 encapsulation** command. For non-IP packets, the Layer 2 length specified in the Layer 2 Header is used for policing computation. To specify additional Layer 2 encapsulation length while policing IP packets, use the **qos account layer2 encapsulation** command.

Command Modes

Global configuration

Command History

Release	Modification
15.0(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Supervisor Engine 6-E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948E use the **qos account layer-all encapsulation** command to account for Layer 1 header of 20 bytes (preamble + IPG) and Layer 2 header in policing features. When this command is configured, policer statistics (in bytes) observed in the output of the **show policy-map interface** command reflect the Layer 1 header length as well (20 bytes per packet).

Examples

This example shows how to shows how to include IPG in policing:

```
Switch)# config t
Switch(config)# qos account layer-all encapsulation
Switch(config)# end
Switch#
```

Related Commands

Command	Description
show policy-map interface	Displays policer statistics on a specific interface.

qos account layer2 encapsulation

To include additional bytes to be accounted by the QoS features, use the **qos account layer2 encapsulation** command. To disable the use of additional bytes, use the **no** form of this command.

qos account layer2 encapsulation {**arpa** | **dot1q** | **isl** | **length** *len*}

no qos account layer2 encapsulation {**arpa** | **dot1q** | **isl** | **length** *len*}

Syntax Description

arpa	Specifies the account length of the Ethernet ARPA-encapsulated packet (18 bytes).
dot1q	Specifies the account length of the 802.1Q-encapsulated packet (22 bytes).
isl	Specifies the account length of the ISL-encapsulated packet (48 bytes).
length *len*	Specifies the a dditional packet length to account for; the valid range is from 0 to 64 bytes.

Defaults

On Supervisor Engine V-10GE and earlier supervisor engines,, only the length that is specified in the IP header for the IP packets and the length that is specified in the Ethernet header for non-IP packets are included.

On Supervisor Engine 6E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948-E, the length that is specified in the Ethernet header is considered for both IP and non-IP packets. The Layer 2 length includes the VLAN tag overhead.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

In the Catalyst 4500 series switch, for Supervisor Engine V-10GE and earlier supervisor engines, the **qos account layer2 encapsulation** command indicates that the policing feature should consider the configured length in addition to the IP length of the packet when policing the IP packets.

Sharing and shaping always use the Ethernet ARPA length.

On Supervisor Engine 6E, Supervisor Engine 6L-E, Catalyst 4900M, and Catalyst 4948-E, shaping and sharing always use Ethernet ARPA length to which 20 bytes of IPv6 overhead is always added for policing. However, only Layer 2 length including VLAN tag overhead is considered.

Note The given length is included when policing all IP packets irrespective of the encapsulation with which it was received. When **qos account layer2 encapsulation isl** is configured, a fixed length of 48 bytes is included when policing all IP packets, not only those IP packets that are received with ISL encapsulation.

Sharing and shaping use the length that is specified in the Layer 2 headers.

Examples

This example shows how to include an additional 18 bytes when policing IP packets:

```
Switch# config terminal
Switch(config)# qos account layer2 encapsulation length 18
Switch (config)# end
Switch#
```

This example shows how to disable the consistent accounting of the Layer 2 encapsulation by the QoS features:

```
Switch# config terminal
Switch(config)# no qos account layer2 encapsulation
Switch (config)# end
Switch #
```

Related Commands

Command	Description
show interfaces	Displays traffic on a specific interface.
switchport	Modifies the switching characteristics of a Layer 2 switch interface.
switchport block	Prevents the unknown multicast or unicast packets from being forwarded.

qos aggregate-policer

To define a named aggregate policer, use the **qos aggregate-policer** command. To delete a named aggregate policer, use the **no** form of this command.

qos aggregate-policer *name rate burst* [**conform-action** {**transmit** | **drop**} | **exceed-action** {**transmit** | **drop** | **policed-dscp-transmit**}]

no qos aggregate-policer *name*

Syntax Description

name	Name of the aggregate policer.
rate	Maximum bits per second; valid values are from 32000 to 32000000000.
burst	Burst bytes; valid values are from 1000 to 512000000.
conform-action	(Optional) Specifies the action to be taken when the rate is not exceeded.
transmit	(Optional) Transmits the package.
drop	(Optional) Drops the packet.
exceed-action	(Optional) Specifies action when the QoS values are exceeded.
policed-dscp-transmit	(Optional) Sends the DSCP per the policed-DSCP map.

Defaults

The default settings are as follows:

- Conform-action transmits
- Exceed-action drops

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

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

This policer can be shared by different policy map classes and on different interfaces.

The Catalyst 4506 switch supports up to 1000 aggregate input policers and 1000 output policers.

The **qos aggregate-policer** command allows you to configure an aggregate flow and a policing rule for that aggregate. When you enter your rate and burst parameters, the range for the average rate is 32 Kbps to 32 Gbps, and the range for the burst size is 1 KB to 512 MB.

A rate can be entered in bits-per-second without a suffix. In addition, the suffixes described in Table 2-10 are allowed.

Table 2-10 Rate Suffix

Suffix	Description
k	1000 bps
m	1,000,000 bps
g	1,000,000,000 bps

Bursts can be entered in bytes without a suffix. In addition, the suffixes shown in Table 2-11 are allowed.

Table 2-11 Burst Suffix

Suffix	Description
k	1000 bytes
m	1,000,000 bytes
g	1,000,000,000 bytes

Note Due to hardware granularity, the rate value is limited, so the burst that you configure might not be the value that is used.

Modifying an existing aggregate rate limit modifies that entry in NVRAM and in the switch if it is currently being used.

When you enter the aggregate policer name, follow these naming conventions:

- Maximum of 31 characters long and may include a-z, A-Z, 0-9, the dash (-), the underscore (_), and the period (.).
- Must start with an alphabetic character and must be unique across all ACLs of all types.
- Aggregate policer names are case sensitive.
- Cannot be a number.
- Must not be a keyword; keywords to avoid are **all**, **default-action**, **map**, **help**, and **editbuffer**.

An aggregate policer can be applied to one or more interfaces. However, if you apply the same policer to the input direction on one interface and to the output direction on a different interface, then you have created the equivalent of two different aggregate policers in the switching engine. Each policer has the same policing parameters, with one policing the ingress traffic on one interface and the other policing the egress traffic on another interface. If you apply an aggregate policer to multiple interfaces in the same direction, only one instance of the policer is created in the switching engine.

You can apply an aggregate policer to a physical interface or to a VLAN. If you apply the same aggregate policer to a physical interface and to a VLAN, then you have created the equivalent of two different aggregate policers in the switching engine. Each policer has the same policing parameters, with one policing the traffic on the configured physical interface and the other policing the traffic on the configured VLAN. If you apply an aggregate policer to only ports or only VLANs, then only one instance of the policer is created in the switching engine.

If you apply a single aggregate policer to the ports and the VLANs in different directions, then you have created the equivalent of four aggregate policers; one for all ports sharing the policer inthe input direction, one for all ports sharing the policer in the output direction, one for all VLANs sharing the policer in the input direction, and one for all VLANs sharing the policer in the output direction.

Examples

This example shows how to configure a QoS aggregate policer to allow a maximum of 100,000 bits per second with a normal burst size of 10,000 bytes, to transmit when these rates are not exceeded, and to drop packets when these rates are exceeded:

```
Switch(config)# qos aggregate-policer micro-one 100000 10000 conform-action transmit exceed-action drop
Switch(config)#
```

Related Commands

Command	Description
show qos aggregate policer	Displays QoS aggregate policer information.

qos control-packets

To enable Layer 2 control packet QoS mode on control packets use the **qos control-packets** global configuration command. Use the **no** form of this command to disable Layer 2 control packet QoS mode on control packets.

qos control-packets {**bpdu-range** | **cdp-vtp** | **eapol** | **sstp** | **protocol-tunnel** | **lldp**}

no qos control-packets {**bpdu-range** | **cdp-vtp** | **eapol** | **sstp** | **protocol-tunnel** | **lldp**}

Syntax Description

bpdu-range	Specifies enabling QoS on BPDU-range packets.
cdp-vtp	Specifies enabling QoS on CDP and VTP packets.
eapol	Specifies enabling QoS on EAPOL packets.
sstp	Specifies enabling QoS on SSTP packets.
protocol-tunnel	Specifies enabling QoS on protocol tunneling packets.
lldp	Specifies enabling QoS on LLDP packets.

Defaults

None

Command Modes

Global configuration1111=

Release	Modification
12.2(40)SG	This command was introduced on the Catalyst Classic series switches and supervisor engines.
12.2(46)SG	This **lldp** keyword was introduced on the Catalyst Classic series switches and supervisor engines.
12.2(54)SG	Support for this command was extended to the Catalyst E-series switches and supervisor engines.
15.0(2)SG1	Support for **eapol** keyword was introduced.

Usage Guidelines

You cannot use this command on Supervisor Engine 6-E and on the Catalyst 4900M chassis.

Table 2-12 lists the ranges of addresses that Layer 2 control packet QoS acts on when you enter the **qos control-packets** command.

Table 2-12 Packet Type and Actionable Address Range

Type of Packet on Which Feature is Enabled	Range of Address
BPDU-range	0180.C200.0000 BPDU 0180.C200.0002 OAM, LACP 0180.C200.0003 EAPOL
CDP-VTP	0100.0CCC.CCCC
EAPOL	Ethertype 0x888E

Table 2-12 Packet Type and Actionable Address Range

Type of Packet on Which Feature is Enabled	Range of Address
SSTP	0100.0CCC.CCCD
LLDP	0180.C200.000E
Protocol-tunnel	0100.0CCD.CDD0

Note If you enter the **qos control-packet** command without specifying any control packet types, the feature is enabled for all types.

When Layer 2 control packet QoS is enabled, you need to configure policies to match the required Layer 2 packets and police them as needed. When the feature is enabled on a particular packet type, MACLs that match the desired control packets are automatically generated, if not already present. The corresponding class maps matching these MACLs are auto-generated as well. You can then use these class maps in the policy maps to police the control packets, applying them as per-port, per-VLAN, or per-port per-VLAN. In addition, you can define MACLs or class maps to match the control packets. The only limitation is that the user-defined class maps must begin with the prefix system-control-packet.

Examples

This example shows how to enable QoS on BDPU packets:

```
Switch# enable
Switch# configuration terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# qos control-packets bpdu-range
Switch(config)#
```

This example shows how to enable QoS on CDP and VTP packets:

```
Switch# enable
Switch# configuration terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# qos control-packets cdp-vtp
Switch(config)#
```

This example shows how to enable QoS on SSTP packets:

```
Switch# enable
Switch# configuration terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# qos control-packets sstp
Switch(config)#
```

This example shows how to enable QoS on LLDP packets:

```
Switch# enable
Switch# configuration terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# qos control-packets lldp
Switch(config)#
```

Related Commands

Command	Description
show policy-map interface	Displays the statistics and configurations of the input and output policies that are attached to an interface.
show running-config	Displays the running-configuration for a switch.

qos cos

To define the default CoS value for an interface, use the **qos cos** command. To remove a prior entry, use the **no** form of this command.

qos cos *cos_value*

no qos cos *cos_value*

Syntax Description

cos_value	Default CoS value for the interface; valid values are from 0 to 7.

Defaults

On non-Supervisor Engines 6-E, the default CoS value is 0.

On Supervisor Engine 6-E and Catalyst 4900M chassis, the default CoS is implicitly set to 1.

Note CoS override is not configured.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

CoS values are configurable on physical LAN ports only.

Examples

This example shows how to configure the default QoS CoS value as 6:

```
Switch(config-if)# qos cos 6
Switch(config-if)#
```

Related Commands

Command	Description
show qos	Displays QoS information.

qos dbl

To enable Dynamic Buffer Limiting (DBL) globally on the switch, use the **qos dbl** command. To disable DBL, use the **no** form of this command.

qos dbl [**buffers** {**aggressive-flow** *buffers*} | **credits** {**aggressive-flow** *credits* | **maximum** *max*} | **dscp-based** {*value* | *value range*} | **exceed-action** {**ecn** | **probability** *percent*} | **flow** {**include** [**layer4-ports**] [**vlan**]}]

no qos dbl [**buffers** {**aggressive-flow** *buffers*} | **credits** {**aggressive-flow** *credits* | **maximum** *max*} | **dscp-based** {*value* | *value range*} | **exceed-action** {**ecn** | **probability** *percent*} | **flow** {**include** [**layer4-ports**] [**vlan**]}]

Syntax Description

buffers	(Optional) Specifies the buffer limit for aggressive flows.
aggressive-flow	(Optional) Specifies the aggressive flow.
buffers	(Optional) Number of buffers for aggressive flows; valid values are from 0 to 255.
credits	(Optional) Specifies the credit limit for aggressive flows and all flows.
credits	(Optional) Number of credits for aggressive flows; valid values are from 0 to 15.
maximum	(Optional) Specifies the maximum credit for all flows.
max	(Optional) Number of credits for all flows; valid values are from 0 to 15.
dscp-based	(Optional) Specifies the packets that belong to the list of internal DSCPs.
value	(Optional) A single DSCP value; valid values are from 0 to 63.
value range	(Optional) A range of DSCP values; valid values are from 0 to 63. Up to 8 command separated DSCP values can be specified.
exceed-action	(Optional) Specifies the packet marking when the limits are exceeded.
ecn	(Optional) Specifies the explicit congestion notification.
probability	(Optional) Specifies the probability of packet marking.
percent	(Optional) Probability number; valid values are from 0 to 100.
flow	(Optional) Specifies the flows for limiting.
include	(Optional) Allows the Layer 4 ports and VLANs to be included in the flows.
layer4-ports	(Optional) Includes the Layer 4 ports in flows.
vlan	(Optional) Includes the VLANs in flows.

Defaults

On non-Supervisor Engines 6-E, the default settings are as follows:

- QoS DBL is disabled.
- Aggressive-flow buffers is set to 2.
- Aggressive-flow credits is set to 2, with a limit of 10.
- Layer 4 ports are included.
- VLANs are included.
- 15 maximum credits are allowed.
- 15% drop probability is set.
- DSCP values are included.

On Supervisor Engines 6-E and Catalyst 4900M chassis, the default DBL values are implicitly set and cannot be changed. The settings are as follows:

- Seven maximum credits allowed.
- Aggressive-flow credits is set to 4.
- Aggressive-flow buffers is set to 4.
- Six percent drop probability is set.
- Hash function for Layer 2 packets uses source and destination MAC addresses as well as transmit VLAN identifiers.
- Hash function for IPv4 and IPv6 packets uses source and destination IP addresses source and destination Layer 4 ports as well as transmit VLAN identifiers.

Command Modes

Global configuration mode

QoS policy-map class configuration

Command History

Release	Modification
12.1(13)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(37)SG	Added support for DSCP-based flow management.

Usage Guidelines

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

Examples

This example shows how to enable DBL globally on the switch:

```
Switch(config)# qos dbl
Global DBL enabled
Switch(config)#
```

This example shows how to enable DBL in the QoS policy-map class configuration mode:

```
Switch(config)# class-map c1
Switch(config-cmap)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# dbl
Switch(config-pmap-c)#
```

This example shows how to selectively enable DBL on DSCP values 1 through 10:

```
Switch# configure t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# qos dbl dscp-based 1-10
Switch(config)# end
Switch# show qos dbl
    DBL flow includes vlan
    DBL flow includes layer4-ports
    DBL does not use ecn to indicate congestion
    DBL exceed-action probability: 15%
    DBL max credits: 15
```

```
    DBL aggressive credit limit: 10
    DBL aggressive buffer limit: 2 packets
    DBL DSCPs with default drop probability:
         1-10
```

This example shows how to selectively disable DBL on DSCP values 1 through 10:

```
Switch# configure t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# no qos dbl dscp-based 1-5, 7
Switch(config)# end
Switch# show qos dbl
    DBL flow includes vlan
    DBL flow includes layer4-ports
    DBL does not use ecn to indicate congestion DBL exceed-action probability: 15% DBL max
    credits: 15 DBL aggressive credit limit: 10 DBL aggressive buffer limit: 2 packets DBL
    DSCPs with default drop probability:
         0,6,8-63
```

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

Related Commands

Command	Description
show qos dbl	Displays QoS Dynamic Buffer Limiting (DBL) information.

qos dscp

To define the default CoS value for an interface, use the **qos dscp** command. To remove a prior entry, use the **no** form of this command.

qos dscp *dscp_value*

no qos dscp *dscp_value*

Syntax Description

dscp_value	Default DSCP value for the interface; valid values are from 0 to 63.

Defaults

On a non-Supervisor Engine 6-E, the default DSCP value is 0.

On a Supervisor Engine 6-E and Catalyst 4900M chassis, the port DSCP value is always set to 0.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

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

Examples

This example shows how to configure the default QoS DSCP value as 6:

```
Switch(config-if)# qos dscp 6
Switch(config-if)#
```

Related Commands

Command	Description
show qos interface	Displays QoS information for an interface.

qos map cos

To define the ingress CoS-to-DSCP mapping for the trusted interfaces, use the **qos map cos to dscp** command. To remove a prior entry, use the **no** form of this command.

Note You cannot remove a single entry from the table.

qos map cos *cos_values* **to dscp** *dscp1*

no qos map cos to dscp

Syntax Description

cos_values	CoS values; list up to eight CoS values separated by spaces.
to dscp	Defines mapping and specifies DSCP value.
dscp1	DSCP value to map to the CoS values; valid values are from 0 to 63.

Defaults

The default CoS-to-DSCP configuration settings are shown in the following table:

CoS	0	1	2	3	4	5	6	7
DSCP	0	8	16	24	32	40	48	56

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. In place of this limited map capability, the Supervisor Engine 6-E and Catalyst 4900M chassis supports the setting of various marking fields in a packet within a policy map. Refer to the **set** command for more details.

The CoS-to-DSCP map is used to map the packet CoS (on the interfaces that are configured to trust CoS) to the internal DSCP value. This map is a table of eight CoS values (0 through 7) and their corresponding DSCP values. The switch has one map.

Examples

This example shows how to configure the ingress CoS-to-DSCP mapping for CoS 0:

```
Switch(config)# qos map cos 0 to dscp 20
Switch(config)#
```

This example shows how to clear the entire CoS-to-DSCP mapping table:

```
Switch(config)# no qos map cos 0 to dscp 20
Switch(config)#
```

Related Commands

Command	Description
qos map dscp	Maps the DSCP values to selected transmit queues and to map the DSCP-to-CoS value.
qos map dscp policed	Sets the mapping of the policed DSCP values to the marked-down DSCP values.
show qos	Displays QoS information.
tablemap (refer to Cisco IOS documentation)	Modifies metric and tag values when the IP routing table is updated with BGP learned routes.

qos map dscp

To map the DSCP values to selected transmit queues and to map the DSCP-to-CoS value, use the **qos map dscp** command. To return to the default value, use the **no** form of this command.

qos map dscp *dscp-values* **to tx-queue** *queue-id*

no qos map dscp *dscp-values* **to cos** *cos-value*

Syntax Description

dscp-values	List of DSCP values to map to the queue ID; valid values are from 0 to 63.
to	Defines mapping.
tx-queue	Specifies a transmit queue.
queue-id	Transmit queue; valid values are from 1 to 4.
cos	Specifies the CoS value.
cos-value	Class of service; valid values are from 1 to 7.

Defaults

The default DSCP-to-CoS configuration settings are shown in the following table:

DSCP	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63
CoS	0	1	2	3	4	5	6	7

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. In place of this command the Supervisor Engine 6-E and Catalyst 4900M chassis uses the **tablemap** command for QoS marking. Please refer to the **tablemap** command for details.

You use the DSCP-to-CoS map to map the final DSCP classification to a final CoS. The CoS map is written into the ISL header or 802.1Q tag of the transmitted packet on trunk interfaces and contains a table of 64 DSCP values and the corresponding CoS values. The switch has one map. You can enter up to eight DSCP values, separated by spaces, for a CoS value.

The DSCP-to-transmit-queue map is used to map the final DSCP classification to a transmit queue. You can enter up to eight DSCP values, separated by spaces, for a transmit queue.

Examples

This example shows how to configure the egress DSCP-to-CoS mapping:

```
Switch(config)# qos map dscp 20 25 to cos 3
Switch(config)#
```

This example shows how to configure the egress DSCP-to-transmit queue:

```
Switch(config)# qos map dscp 20 25 to tx-queue 1
Switch(config)#
```

Related Commands

Command	Description
qos map cos	Defines the ingress CoS-to-DSCP mapping for the trusted interfaces.
show qos interface	Displays queueing information.
show qos	Displays QoS information.
tablemap (refer to Cisco IOS documentation)	Modifies metric and tag values when the IP routing table is updated with BGP learned routes.
tx-queue	Configures the transmit queue parameters for an interface.

qos map dscp policed

To set the mapping of the policed DSCP values to the marked-down DSCP values, use the **qos map dscp policed** command. To remove a prior entry, use the **no** form of this command.

qos map dscp policed *dscp_list* **to dscp** *policed_dscp*

no qos map dscp policed

Syntax Description

dscp_list	DSCP values; valid values are from 0 to 63.
to dscp	Defines mapping.
policed_dscp	Marked-down DSCP values; valid values are from 0 to 63.

Defaults

Mapping of DSCP values is disabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. Various policer types are supported on the Supervisor Engine 6-E and Catalyst 4900M chassis that supports explicit QoS marking of DSCP, precedence, and CoS fields. Refer to the **police** command for details.

The DSCP-to-policed-DSCP map determines the marked-down DSCP value that is applied to the out-of-profile flows. The switch has one map.

You can enter up to eight DSCP values, separated by spaces.

You can enter only one policed DSCP value.

Note To avoid out-of-sequence packets, configure the DSCP-to-policed-DSCP map so that marked-down packets remain in the same queue as in-profile traffic.

Examples

This example shows how to map multiple DSCPs to a single policed-DSCP value:

```
Switch(config)# qos map dscp policed 20 25 43 to dscp 4
Switch(config)#
```

Related Commands

Command	Description
qos map cos	Defines the ingress CoS-to-DSCP mapping for the trusted interfaces.
qos map dscp	Maps the DSCP values to selected transmit queues and to map the DSCP-to-CoS value.
show qos	Displays QoS information.

qos rewrite ip dscp

To enable DSCP rewrite for IP packets, use the **qos rewrite ip dscp** command. To disable IP DSCP rewrite, use the **no** form of this command.

qos rewrite ip dscp

no qos rewrite ip dscp

Syntax Description

This command has no arguments or keywords.

Defaults

IP DSCP rewrite is enabled.

Command Modes

Global configuration mode

Command History

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

Usage Guidelines

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

If you disable IP DSCP rewrite and enable QoS globally, the following events occur:

- The ToS byte on the IP packet is not modified.
- Marked and marked-down DSCP values are used for queueing.
- The internally derived DSCP (as per the trust configuration on the interface or VLAN policy) is used for transmit queue and Layer 2 CoS determination. The DSCP is not rewritten on the IP packet header.

If you disable QoS, the CoS and DSCP of the incoming packet are preserved and are not rewritten.

Examples

This example shows how to disable IP DSCP rewrite:

```
Switch(config)# no qos rewrite ip dscp
Switch(config)#
```

Related Commands

Command	Description
qos (global configuration mode)	Enables QoS functionality on the switch.
show qos	Displays QoS information.

qos trust

To set the trusted state of an interface (for example, whether the packets arriving at an interface are trusted to carry the correct CoS, ToS, and DSCP classifications), use the **qos trust** command. To set an interface to the untrusted state, use the **no** form of this command.

qos trust {**cos** | *device cisco-phone* | **dscp** | **extend** [**cos** *priority*]}

no qos trust {**cos** | *device cisco-phone* | **dscp** | **extend** [**cos** *priority*]}

Syntax Description

cos	Specifies that the CoS bits in incoming frames are trusted and derives the internal DSCP value from the CoS bits.
device cisco-phone	Specifies the Cisco IP phone as the trust device for a port.
dscp	Specifies that the ToS bits in the incoming packets contain a DSCP value.
extend	Specifies to extend the trust to Port VLAN ID (PVID) packets coming from the PC.
cos *priority*	(Optional) Specifies that the CoS priority value is set to PVID packets; valid values are from 0 to 7.

Defaults

The default settings are as follows:

- If global QoS is enabled, trust is disabled on the port.
- If global QoS is disabled, trust DSCP is enabled on the port.
- The CoS priority level is 0.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.1(11)EW	Support for extending trust for voice was added.
12.1(19)EW	Support for trust device Cisco IP phone was added.

Usage Guidelines

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

You can only configure the trusted state on physical LAN interfaces.

By default, the trust state of an interface when QoS is enabled is untrusted; when QoS is disabled on the interface, the trust state is reset to trust DSCP.

When the interface trust state is **qos trust cos**, the transmit CoS is always the incoming packet CoS (or the default CoS for the interface, if the packet is not tagged).

When the interface trust state is not **qos trust dscp**, the security and QoS ACL classification will always use the interface DSCP and not the incoming packet DSCP.

Trusted boundary should not be configured on the ports that are part of an EtherChannel (that is, a port channel).

Examples

This example shows how to set the trusted state of an interface to CoS:

```
Switch(config-if)# qos trust cos
Switch(config-if)#
```

This example shows how to set the trusted state of an interface to DSCP:

```
Switch(config-if)# qos trust dscp
Switch(config-if)#
```

This example shows how to set the PVID CoS level to 6:

```
Switch(config-if)# qos trust extend cos 6
Switch(config-if)#
```

This example shows how to set the Cisco phone as the trust device:

```
Switch(config-if)# qos trust device cisco-phone
Switch(config-if)#
```

Related Commands

Command	Description
qos cos	Defines the default CoS value for an interface.
qos vlan-based	Defines per-VLAN QoS for a Layer 2 interface.
show qos interface	Displays QoS information for an interface.

qos vlan-based

To enable per-VLAN QoS for a Layer 2 interface, use the **qos vlan-based** command. To disable per-VLAN QoS for a Layer 2 interface, use the **no** form of this command.

qos vlan-based

no qos vlan-based

Syntax Description

This command has no arguments or keywords.

Defaults

Per-VLAN QoS is disabled.

Command Modes

Interface configuration mode

Command History

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

Usage Guidelines

This command is not supported on the Supervisor Engine 6-E and Catalyst 4900M chassis. On the Supervisor Engine 6-E and Catalyst 4900M chassis various QoS marking and policing actions at the interface and VLAN level are appropriately merged. For details, refer to the *Catalyst 4500 Series Switch Configuration Guide*.

In VLAN-based mode, the policy map that is attached to the Layer 2 interface is ignored, and QoS is driven by the policy map that is attached to the corresponding VLAN interface.

Per-VLAN QoS can be configured only on the Layer 2 interfaces.

If no input QoS policy is attached to a Layer 2 interface, then the input QoS policy that is attached to the VLAN (on which the packet is received), if any, is used even if the port is not configured as VLAN based.

If you do not want this default, attach a placeholder input QoS policy to the Layer 2 interface.

Similarly, if no output QoS policy is attached to a Layer 2 interface, then the output QoS policy that is attached to the VLAN (on which the packet is transmitted), if any, is used even if the port is not configured as VLAN based.

If you do not want this default, attach a placeholder output QoS policy to the Layer 2 interface.

Layer 3 interfaces are always in interface-based mode. Layer 3 VLAN interfaces are always in VLAN-based mode.

Examples

This example shows how to enable per-VLAN QoS for a Layer 2 interface:

```
Switch(config-if)# qos vlan-based
Switch(config-if)#
```

Related Commands

Command	Description
qos cos	Defines the default CoS value for an interface.
show qos interface	Displays QoS information for an interface.

queue-limit

To specify or modify the maximum number of packets the queue can hold for a class policy configured in a policy map, use the **queue-limit** command. To remove the queue packet limit from a class, use the **no** form of this command.

queue-limit *number-of-packets*

no queue-limit *number-of-packets*

Syntax Description

number-of-packets	Number of packets that the queue for this class can accumulate; valid range is 16 to 8184. This number must be a multiple of 8.

Defaults

By default, each physical interface on a Catalyst 4500 switch has a default queue based on the number of slots in a chassis and the number of ports on the linecards.

Command Modes

QoS policy-map class configuration mode

Command History

Release	Modification
12.2(44)SG	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

This class-based queuing (CBQ) command applies only to the Supervisor Engine 6-E as part of the MQC support on the Catalyst 4500 Supervisor Engine.

By default, each physical interface on a Catalyst 4500 switch comes up with a default queue. The size of this queue is based on the number of slots in a chassis as well as the number of ports on the line card in each slot. The switch supports 512K queue entries of which 100 K are set aside as a common sharable pool. The remaining 412 K entries are equally distributed among the slots. Each slot further divides its allocated queue entries equally among its ports.

CBQ creates a queue for every class for which a class map is defined. Packets satisfying the match criterion for a class accumulate in the queue reserved for the class until they are sent, which occurs when the queue is serviced by the fair queuing process. When the maximum packet threshold you defined for the class is reached, queuing of any further packets to the class queue causes tail drop or, if DBL is configured for the class policy, packet drop to take effect.

Note The queue-limit command is supported only after you first configure a scheduling action, such as bandwidth, shape, or priority, except when you configure queue-limit in the class-default class of an output QoS policy-map.s

Examples

This example shows how to configure a policy-map called policy11 to contain policy for a class called acl203. Policy for this class is set so that the queue reserved for it has a maximum packet limit of 40:

```
Switch# configure terminal
Switch (config)# policy-map policy11
Switch (config-pmap)# class acl203
Switch (config-pmap-c)# bandwidth 2000
Switch (config-pmap-c)# queue-limit 40
Switch (config-pmap-c)# end
Switch#
```

Related Commands

Command	Description
bandwidth	Specifies or modifies the minimum bandwidth provided to a class belonging to a policy map attached to a physical port.
class	Specifies the name of the class whose traffic policy you want to create or change.
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
shape (class-based queueing)	Enables traffic shaping a class of traffic in a policy map attached to a physical port.

redundancy

To enter the redundancy configuration mode, use the **redundancy** command in the global configuration mode.

redundancy

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default settings.

Command Modes

Global configuration mode

Command History

Release	Modification
12.1(12c)EW	Support for this command was introduced on the Catalyst 4500 series switch (Catalyst 4507R and 4510R only).

Usage Guidelines

The redundancy configuration mode is used to enter the main CPU submode.

To enter the main CPU submode, use the **main-cpu** command in the redundancy configuration mode.

The main CPU submode is used to manually synchronize the configurations on the two supervisor engines.

From the main CPU submode, use the **auto-sync** command to enable automatic synchronization of the configuration files in NVRAM.

Use the **no** command to disable redundancy. If you disable redundancy, then reenable redundancy, the switch returns to default redundancy settings.

Use the **exit** command to exit the redundancy configuration mode.

Examples

This example shows how to enter redundancy mode:

```
Switch(config)# redundancy
Switch(config-red)#
```

This example shows how to enter the main CPU submode:

```
Switch(config)# redundancy
Switch(config-red)# main-cpu
Switch(config-r-mc)#
```

Related Commands

Command	Description
auto-sync	Enables automatic synchronization of the configuration files in NVRAM.
main-cpu	Enters the main CPU submode and manually synchronize the configurations on the two supervisor engines.

redundancy config-sync mismatched-commands

To move the active supervisor engine into the Mismatched Command List (MCL) and resets the standby supervisor engine, use the **redundancy config-sync mismatched-commands** command.

If your active and standby supervisors engines are running different versions of Cisco IOS, some of their CLIs will not be compatible. If such commands are already present in the running configuration of the active supervisor engine and the syntax-check for the command fails at the standby supervisor engine while it is booting, you must move the active supervisor engine into the Mismatched Command List (MCL).

redundancy config-sync {**ignore** | **validate**} **mismatched-commands**

Syntax Description

ignore	Ignore the mismatched command list.
validate	Revalidate the mismatched command list with the modified running-configuration.

Defaults

This command has no default settings.

Command Modes

Privileged EXEC mode

Command History

Release	Modification
12.2(31)SGA	This command was introduced on the Catalyst 4500 series switch.
12.2(44)SG	Updated command name from **issu config-sync** to **redundancy config-sync**.

Usage Guidelines

The following is a log entry example for mismatched commands:

```
00:06:31: Config Sync: Bulk-sync failure due to Servicing Incompatibility. Please check
full list of mismatched commands via:
  show redundancy config-sync failures mcl
00:06:31: Config Sync: Starting lines from MCL file:
interface GigabitEthernet7/7
 ! <submode> "interface"
- ip address 11.0.0.1 255.0.0.0
 ! </submode> "interface"
```

To display all mismatched commands, use the **show redundancy config-sync failures mcl** command.

To clean the MCL, remove all mismatched commands from the active supervisor engine's running configuration, revalidate the MCL with a modified running configuration using the **redundancy config-sync validate mismatched-commands** command, then reload the standby supervisor engine.

You could also ignore the MCL by entering the **redundancy config-sync ignore mismatched-commands** command and reloading the standby supervisor engine; the system changes to SSO mode.

Note If you ignore the mismatched commands, the *out-of-sync* configuration at the active supervisor engine and the standby supervisor engine still exists.

You can verify the ignored MCL with the **show redundancy config-sync ignored mcl** command.

If SSO mode cannot be established between the active and standby supervisor engines because of an incompatibility in the configuration file, a mismatched command list (MCL) is generated at the active supervisor engine and a reload into RPR mode is forced for the standby supervisor engine. Subsequent attempts to establish SSO, after removing the offending configuration and rebooting the standby supervisor engine with the exact same image, might cause the C4K_REDUNDANCY-2-IOS_VERSION_CHECK_FAIL and ISSU-3-PEER_IMAGE_INCOMPATIBLE messages to appear because the peer image is listed as incompatible. If the configuration problem can be corrected, you can clear the peer image from the incompatible list with the **redundancy config-sync ignore mismatched-commands** EXEC command while the peer is in a standby cold (RPR) state. This action allows the standy supervisor engine to boot in standby hot (SSO) state when it reloads.

Examples

This example shows how to validate removal of entries from the MCL:

```
Switch# redundancy config-sync validate mismatched-commands
Switch#
```

Related Commands

Command	Description
show redundancy config-sync	Displays an ISSU config-sync failure or the ignored mismatched command list (MCL).

redundancy force-switchover

To force a switchover from the active to the standby supervisor engine, use the **redundancy force-switchover** command.

redundancy force-switchover

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default settings.

Command Modes

Privileged EXEC mode

Command History

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

Usage Guidelines

Before using this command, refer to the "Performing a Software Upgrade" section of the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide* for additional information.

The **redundancy force-switchover** command conducts a manual switchover to the redundant supervisor engine. The redundant supervisor engine becomes the new active supervisor engine running the Cisco IOS image. The modules are reset.

The old active supervisor engine reboots with the new image and becomes the standby supervisor engine.

Examples

This example shows how to switch over manually from the active to the standby supervisor engine:

```
Switch# redundancy force-switchover
Switch#
```

Related Commands

Command	Description
redundancy	Enters the redundancy configuration mode.
show redundancy	Displays redundancy facility information.

redundancy reload

To force a reload of one or both supervisor engines, use the **redundancy reload** command.

redundancy reload {**peer** | **shelf**}

Syntax Description

peer	Reloads the peer unit.
shelf	Reboots both supervisor engines.

Defaults

This command has no default settings.

Command Modes

Privileged EXEC mode

Command History

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

Usage Guidelines

Before using this command, refer to the "Performing a Software Upgrade" section of the *Catalyst 4500 Series Switch Cisco IOS Software Configuration Guide* for additional information.

The **redundancy reload shelf** command conducts a reboot of both supervisor engines. The modules are reset.

Examples

This example shows how to manually reload one or both supervisor engines:

```
Switch# redundancy reload shelf
Switch#
```

Related Commands

Command	Description
redundancy	Enters the redundancy configuration mode.
show redundancy	Displays redundancy facility information.

remote login module

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

remote login module *mod*

Syntax Description

mod	Target module for the command.

Defaults

This command has no default settings.

Command Modes

Privileged EXEC mode

Command History

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

Usage Guidelines

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

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

When you execute the **remote login module** *mod* command, the prompt changes to Gateway#

The **remote login module** command is identical to the **session module** *mod* and the **attach module** *mod* commands.

Examples

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

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

Gateway>
```

Related Commands

Command	Description
attach module	Remotely connects to a specific module.
session module	Logs in to the standby supervisor engine using a virtual console.

remote-span

To convert a VLAN into an RSPAN VLAN, use the **remote-span** command. To convert an RSPAN VLAN to a VLAN, use the **no** form of this command.

remote-span

no remote-span

Syntax Description

This command has no arguments or keywords.

Defaults

RSPAN is disabled.

Command Modes

VLAN configuration mode

Command History

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

Examples

This example shows how to convert a VLAN into an RSPAN VLAN:

```
Switch# config terminal
Switch(config)# vlan 20
Switch(config-vlan)# remote-span
Switch(config-vlan)# end
Switch#
```

Related Commands

Command	Description
monitor session	Enables the SPAN sessions on interfaces or VLANs.

renew ip dhcp snooping database

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

renew ip dhcp snooping database [**validation none**] [**url**]

Syntax Description

validation none	(Optional) Specifies that the checksum associated with the contents of the file specified by the URL is not verified.
url	(Optional) Specifies the file from which the read is performed.

Defaults

This command has no default settings.

Command Modes

Privileged EXEC mode

Command History

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

Usage Guidelines

If the URL is not provided, the switch tries to read the file from the configured URL.

Examples

This example shows how to renew the DHCP binding database while bypassing the CRC checks:

```
Switch# renew ip dhcp snooping database validation none
Switch#
```

Related Commands

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

rep admin vlan

Use the **rep admin vlan** global configuration command to configure a Resilient Ethernet Protocol (REP) administrative VLAN for REP to transmit hardware flood layer (HFL) messages. Use the **no** form of this command to return to the default configuration with VLAN 1 as the administrative VLAN.

rep admin vlan *vlan-id*

no rep admin vlan

Syntax Description

vlan-id	The VLAN ID range is from 1 to 4094. The default is VLAN 1; the range to configure is 2 to 4094.

Defaults

The administrative VLAN is VLAN 1.

Command Modes

Global configuration

Command History

Release	Modification
12.2(44)SG	This command was introduced.

Usage Guidelines

If the VLAN does not already exist, this command does not create the VLAN.

To avoid the delay introduced by relaying messages in software for link-failure or VLAN-blocking notification during load balancing, REP floods packets at the hardware flood layer (HFL) to a regular multicast address. These messages are flooded to the whole network, not just the REP segment. Switches that do not belong to the segment treat them as data traffic. Configuring an administrative VLAN for the whole domain can control flooding of these messages.

If no REP administrative VLAN is configured, the default is VLAN 1.

There can be only one administrative VLAN on a switch and on a segment.

The administrative VLAN cannot be the RSPAN VLAN.

Examples

This example shows how to configure VLAN 100 as the REP administrative VLAN:

```
Switch(config)# rep admin vlan 100
```

You can verify your settings by entering the **show interface rep detail** privileged EXEC command.

Related Commands

Command	Description
show interfaces rep detail	Displays detailed REP configuration and status for all interfaces or the specified interface, including the administrative VLAN.

rep block port

Use the **rep block port** interface configuration command on the REP primary edge port to configure Resilient Ethernet Protocol (REP) VLAN load balancing. Use the **no** form of this command to return to the default configuration.

rep block port {id *port-id* **|** *neighbor_offset* **| preferred} vlan {*vlan-list* | all}**

no rep block port {id *port-id* **|** *neighbor_offset* **| preferred}**

Syntax Description

id *port-id*	Identify the VLAN blocking alternate port by entering the unique port ID that is automatically generated when REP is enabled. The REP port ID is a 16-character hexadecimal value. You can view the port ID for an interface by entering the **show interface** *interface-id* **rep detail** command.
neighbor_offset	Identify the VLAN blocking alternate port by entering the offset number of a neighbor. The range is –256 to +256; a value of 0 is invalid. The primary edge port has an offset number of 1; positive numbers above 1 identify downstream neighbors of the primary edge port. Negative numbers identify the secondary edge port (offset number -1) and its downstream neighbors.
preferred	Identify the VLAN blocking alternate port as the segment port on which you entered the **rep segment** *segment-id* **preferred** interface configuration command. **Note** Entering the **preferred** keyword does not ensure that the preferred port is the alternate port; it gives it preference over other similar ports.
vlan	Identify the VLANs to be blocked.
vlan-list	Enter a VLAN ID from 1 to 4094 or a range or sequence of VLANs (such as 1-3, 22, 41-44) of VLANs to be blocked.
all	Enter to block all VLANs.

Defaults

The default behavior after you enter the **rep preempt segment** privileged EXEC command (for manual preemption) is to block all VLANs at the primary edge port. This behavior remains until you configure the **rep block port** command.

If the primary edge port cannot determine which port is to be the alternate port, the default action is no preemption and no VLAN load balancing.

Command Modes

Interface configuration

Command History

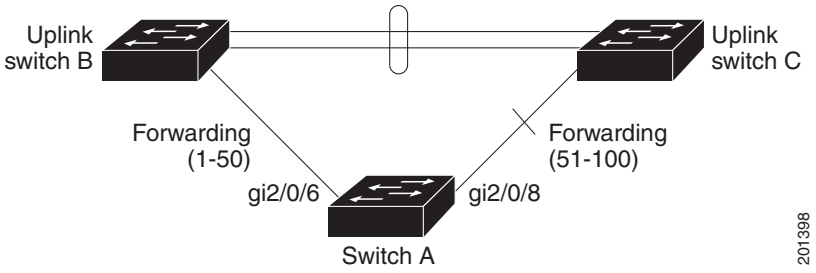
Release	Modification
12.2(44)SG	This command was introduced.

Usage Guidelines

You must enter this command on the REP primary edge port.

When you select an alternate port by entering an offset number, this number identifies the downstream neighbor port of an edge port. The primary edge port has an offset number of 1; positive numbers above 1 identify downstream neighbors of the primary edge port. Negative numbers identify the secondary edge port (offset number -1) and its downstream neighbors. See Neighbor Offset Numbers in a REP SegmentFigure 2-2.

Figure 2-2 Neighbor Offset Numbers in a REP Segment



Note You would never enter an offset value of 1 because that is the offset number of the primary edge port itself.

If you have configured a preempt delay time by entering the **rep preempt delay** *seconds* interface configuration command and a link failure and recovery occurs, VLAN load balancing begins after the configured preemption time period elapses without another link failure. The alternate port specified in the load-balancing configuration blocks the configured VLANs and unblocks all other segment ports. If the primary edge port cannot determine the alternate port for VLAN balancing, the default action is no preemption.

Each port in a segment has a unique port ID. The port ID format is similar to the one used by the spanning tree algorithm: a port number (unique on the bridge) associated to a MAC address (unique in the network). To determine the port ID of a port, enter the **show interface** *interface-id* **rep detail** privileged EXEC command.

There is no limit to the number of times that you can enter the **rep block port id** *port-id* **vlan** *vlan-list* interface configuration command. You can block an unlimited number, range, or sequence of VLANs.

When you use the **rep block port id** *port-id* **vlan** *vlan-list* interface configuration command on a REP primary edge port to block a VLAN list and then use the same command to block another VLAN list on the same port, the second VLAN list does not replace the first VLAN list but is appended to the first VLAN list.

When you use the **rep block port id** *port-id* **vlan** *vlan-list* interface configuration command on a REP primary edge port to block a VLAN list on one port and then use the same command to block another VLAN list on another port, the original port number and VLAN list are overwritten.

Examples

This example shows how to configure REP VLAN load balancing on the Switch B primary edge port (Gigabit Ethernet port 1/0/1) and to configure Gigabit Ethernet port 1/1 of Switch A as the alternate port to block VLANs 1 to 100. The alternate port is identified by its port ID, shown in bold in the output of the **show interface rep detail** command for the Switch A port.

```
Switch A# show interface gigabitethernet1/1 rep detail
GigabitEthernet1/1 REP enabled
Segment-id: 2 (Segment)
PortID: 0080001647FB1780
Preferred flag: No
Operational Link Status: TWO_WAY
Current Key: 007F001647FB17800EEE
Port Role: Open
Blocked Vlan: <empty>
Admin-vlan: 1
Preempt Delay Timer: 35 sec
Load-balancing block port: none
Load-balancing block vlan: none
STCN Propagate to:
PDU/TLV statistics:
LSL PDU rx: 107122, tx: 192493

Switch B# config t
Switch (config)# interface gigabitethernet1/0/1
Switch (config-if)# rep block port id 0080001647FB1780 vlan 1-100
Switch (config-if)# exit
```

This example shows how to configure VLAN load balancing by using a neighbor offset number and how to verify the configuration by entering the **show interfaces rep detail** privileged EXEC command:

```
Switch# config t
Switch (config)# interface gigabitethernet1/1
Switch (config-if)# rep block port 6 vlan 1-110
Switch (config-if)# end

Switch# show interface GigabitEthernet1/1 rep detail
GigabitEthernet1/1 REP enabled
Segment-id: 2 (Segment)
PortID: 0080001647FB1780
Preferred flag: No
Operational Link Status: TWO_WAY
Current Key: 007F001647FB178009C3
Port Role: Open
Blocked Vlan: <empty>
Admin-vlan: 3
Preempt Delay Timer: 35 sec
Load-balancing block port: 6
Load-balancing block vlan: 1-110
STCN Propagate to: none
LSL PDU rx: 1466780, tx: 3056637
HFL PDU rx: 2, tx: 0
BPA TLV rx: 1, tx: 2119695
BPA (STCN, LSL) TLV rx: 0, tx: 0
BPA (STCN, HFL) TLV rx: 0, tx: 0
EPA-ELECTION TLV rx: 757406, tx: 757400
EPA-COMMAND TLV rx: 1, tx: 1
EPA-INFO TLV rx: 178326, tx: 178323
```

Related Commands

Command	Description
rep preempt delay	Configures a waiting period after a segment port failure and recovery before REP VLAN load balancing is triggered.
rep preempt segment	Manually starts REP VLAN load balancing on a segment.
show interfaces rep detail	Displays REP detailed configuration and status for all interfaces or the specified interface, including the administrative VLAN.

rep lsl-age-timer

Use the **rep lsl-age-timer** interface configuration command on a Resilient Ethernet Protocol (REP) port to configure the Link Status Layer (LSL) age timer for the time period that the REP interface remains up without receiving a hello from the REP neighbor. Use the **no** form of this command to return to the default time.

rep lsl-age timer *value*

no rep lsl-age timer

Syntax Description

value	The age-out time in milliseconds. The range is from 120 to 10000 ms in 40-ms increments. The default is 5000 ms (5 seconds).

Defaults

The REP link shuts down if it does not receive a hello message from a neighbor within 5000 ms.

Command Modes

Interface configuration

Command History

Release	Modification
12.2(44)SG	This command was introduced.

Usage Guidelines

The LSL hello timer is set to the age-timer value divided by 3 so that there should be at least two LSL hellos sent during the LSL age-timer period. If no hellos are received within that time, the REP link shuts down.

In Cisco IOS Release 12.2(52)SE, the LSL age-timer range changed from 3000 to 10000 ms in 500-ms increments to 120 to 10000 ms in 40-ms increments. If the REP neighbor device is not running Cisco IOS Release 12.2(52)SE or later, you must use the shorter time range because the device does not accept values out of the earlier range.

EtherChannel port channel interfaces do not support LSL age-timer values less than 1000 ms. If you try to configure a value less than 1000 ms on a port channel, you receive an error message and the command is rejected.

Examples

This example shows how to configure the REP LSL age timer on a REP link to 7000 ms:

```
Switch(config)# interface GigabitEthernet1/1
Switch(config-if)# rep lsl-age-timer 7000
Switch(config-if)# exit
```

You can verify the configured ageout time by entering the **show interfaces rep detail** privileged EXEC command.

Related Commands

Command	Description
show interfaces rep [**detail**]	Displays REP configuration and status for all interfaces or the specified interface, including the configured LSL age-out timer value.

rep preempt delay

Use the **rep preempt delay** interface configuration command on the REP primary edge port to configure a waiting period after a segment port failure and recovery before Resilient Ethernet Protocol (REP) VLAN load balancing is triggered. Use the **no** form of this command to remove the configured delay.

rep preempt delay *seconds*

no rep preempt delay

Syntax Description

seconds	Set the number of seconds to delay REP preemption. The range is 15 to 300.

Defaults

No preemption delay is set. If you do not enter the **rep preempt delay** command, the default is manual preemption with no delay.

Command Modes

Interface configuration

Command History

Release	Modification
12.2(44)SG	This command was introduced.

Usage Guidelines

You must enter this command on the REP primary edge port.

You must enter this command and configure a preempt time delay if you want VLAN load balancing to automatically trigger after a link failure and recovery.

If VLAN load balancing is configured, after a segment port failure and recovery, the REP primary edge port starts a delay timer before VLAN load balancing occurs. Note that the timer restarts after each link failure. When the timer expires, the REP primary edge alerts the alternate port to perform VLAN load balancing (configured by using the **rep block port** interface configuration command) and prepares the segment for the new topology. The configured VLAN list is blocked at the alternate port, and all other VLANs are blocked at the primary edge port.

Do not configure VLAN load balancing on an interface that carries Ethernet over multiprotocol label switching (EoMPLS) traffic. VLAN load balancing across the REP ring might cause some of the EoMPLS traffic to not be forwarded.

Examples

This example shows how to configure REP preemption time delay of 100 seconds on the primary edge port:

```
Switch(config)# interface gigabitethernet1/0/1
Switch(config-if)# rep preempt delay 100
Switch(config-if)# exit
```

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

Related Commands

Command	Description
rep block port	Configures VLAN load balancing.
show interfaces rep [**detail**]	Displays REP configuration and status for all interfaces or the specified interface.

rep preempt segment

Use the **rep preempt segment** privileged EXEC command to manually start Resilient Ethernet Protocol (REP) VLAN load balancing on a segment.

rep preempt segment *segment_id*

Syntax Description

segment-id	ID of the REP segment. The range is from 1 to 1024.

Defaults

Manual preemption is the default behavior.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(44)SG	This command was introduced.

Usage Guidelines

When you enter the **rep preempt segment** *segment-id* command, a confirmation message appears before the command is executed because preemption can cause network disruption.

Enter this command on the switch on the segment that has the primary edge port.

If you do not configure VLAN load balancing, entering this command results in the default behavior—the primary edge port blocks all VLANs.

You configure VLAN load balancing by entering the **rep block port** {**id** *port-id* | *neighbor_offset* | **preferred**} **vlan** {*vlan-list* | **all**} interface configuration command on the REP primary edge port before you manually start preemption.

There is not a **no** version of this command.

Examples

This example shows how to manually trigger REP preemption on segment 100 with the confirmation message:

```
Switch)# rep preempt segment 100
The command will cause a momentary traffic disruption.
Do you still want to continue? [confirm]
```

Related Commands

Command	Description
rep block port	Configures VLAN load balancing.
show interfaces rep [**detail**]	Displays REP configuration and status for all interfaces or the specified interface.

rep segment

Use the **rep segment** interface configuration command to enable Resilient Ethernet Protocol (REP) on the interface and to assign a segment ID to it. Use the **no** form of this command to disable REP on the interface.

rep segment *segment-id* [**edge** [**no-neighbor**] [**primary**]] [**preferred**]

no rep segment

Syntax Description

segment-id	Assign a segment ID to the interface. The range is from 1 to 1024.
edge	(Optional) Identify the interface as one of the two REP edge ports. Entering the **edge** keyword without the **primary** keyword configures the port as the secondary edge port.
no-neighbor	(Optional) Configure a segment edge with no external REP neighbor.
primary	(Optional) On an edge port, specify that the port is the primary edge port. A segment has only one primary edge port. If you configure two ports in a segment as the primary edge port, for example ports on different switches, the REP selects one of them to serve as the segment primary edge port.
preferred	(Optional) Specify that the port is the preferred alternate port or the preferred port for VLAN load balancing. **Note** Configuring a port as preferred does not guarantee that it becomes the alternate port; it merely gives it a slight edge among equal contenders. The alternate port is usually a previously failed port.

Defaults

REP is disabled on the interface.

When REP is enabled on an interface, the default is for the port to be a regular segment port.

Command Modes

Interface configuration

Command History

Release	Modification
12.2(44)SG	This command was introduced.
15(02)SG	The **no-neighbor** keyword was added.

Usage Guidelines

REP ports must be Layer 2 trunk ports. A non-ES REP port can be either an IEEE 802.1Q trunk port or an ISL trunk port.

REP ports should not be configured as one of these port types:

- SPAN destination port
- Private VLAN port

- Tunnel port
- Access port

You must configure two edge ports on each REP segment, a primary edge port and a port to act as a secondary edge port. If you configure two ports in a segment as the primary edge port, for example ports on different switches, the configuration is allowed, but the REP selects one of them to serve as the segment primary edge port.

REP is supported on EtherChannels, but not on an individual port that belongs to an EtherChannel.

- REP ports follow these rules:
  - There is no limit to the number of REP ports on a switch; however, only two ports on a switch can belong to the same REP segment.
  - If only one port on a switch is configured in a segment, the port should be an edge port.
  - If two ports on a switch belong to the same segment, they must be both edge ports, both regular segment ports, or one regular port and one edge no-neighbor port. An edge port and regular segment port on a switch cannot belong to the same segment.
  - If two ports on a switch belong to the same segment and one is configured as an edge port and one as a regular segment port (a misconfiguration), the edge port is treated as a regular segment port.

If you configure two ports in a segment as the primary edge port, for example ports on different switches, the REP selects one of them to serve as the segment primary edge port. Enter the **show rep topology** privileged EXEC command on a port in the segment to verify which port is the segment primary edge port.

REP interfaces come up in a blocked state and remain in a blocked state until notified that it is safe to unblock. You need to be aware of this to avoid sudden connection losses.

You should configure REP only in networks with redundancy. Configuring REP in a network without redundancy causes loss of connectivity.

In networks where ports on a neighboring switch do not support REP, you can configure the non-REP facing ports as edge no-neighbor ports. These ports inherit all properties of edge ports and you can configure them as any other edge port, including to send STP or REP topology change notices to the aggregation switch. In this case, the STP topology change notice (TCN) that is sent is a multiple spanning-tree (MST) STP message.

Examples

This example shows how to enable REP on a regular (nonedge) segment port:

```
Switch (config)# interface gigabitethernet1/0/1
Switch (config-if)# rep segment 100
```

This example shows how to enable REP on a port and identify the port as the REP primary edge port:

```
Switch (config)# interface gigabitethernet1/1
Switch (config-if)# rep segment 100 edge primary
```

This example shows how to configure the same configuration when the interface has no external REP neighbor:

```
Switch# configure terminal
Switch (config)# interface gigabitethernet1/1
Switch (config-if)# rep segment 100 edge no-neighbor primary
```

This example shows how to enable REP on a port and identify the port as the REP secondary edge port:

```
Switch (config)# interface GigabitEthernet1/1
Switch (config-if)# rep segment 100 edge
```

You can verify your settings by entering the **show interfaces rep** privileged EXEC command. To verify which port in the segment is the primary edge port, enter the **show rep topology** privileged EXEC command.

Related Commands

Command	Description
show interfaces rep [**detail**]	Displays REP configuration and status for all interfaces or the specified interface.
show rep topology [**detail**]	Displays information about all ports in the segment, including which one was configured and selected as the primary edge port.

rep stcn

Use the **rep stcn** interface configuration command on a Resilient Ethernet Protocol (REP) edge port to configure the port to send REP segment topology change notifications (STCNs) to another interface, to other segments, or to Spanning Tree Protocol (STP) networks. Use the **no** form of this command to disable the sending of STCNs to the interface, segment, or STP network.

rep stcn {**interface** *interface-id* | **segment** *id-list* | **stp**}

no rep stcn {**interface** | **segment** | **stp**}

Syntax Description

interface *interface-id*	Identify a physical interface or port channel to receive STCNs.
segment *id-list*	Identify one REP segment or list of segments to receive STCNs. The range is 1 to 1024. You can also configure a sequence of segments (for example 3-5, 77, 100).
stp	Send STCNs to an STP network.

Defaults

Transmission of STCNs to other interfaces, segments, or STP networks is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
12.2(44)SG	This command was introduced.

Usage Guidelines

Enter this command on a segment edge port.

You use this command to notify other portions of the Layer 2 network of topology changes that occur in the local REP segment. This removes obsolete entries in the Layer 2 forwarding table in other parts of the network, which allows faster network convergence.

Examples

This example shows how to configure a REP edge port to send STCNs to segments 25 to 50:

```
Switch (config)# interface GigabitEthernet1/1
Switch (config-if)# rep stcn segment 25-50
Switch (config-if)# exit
```

You can verify your settings by entering the **show interfaces rep detail** privileged EXEC command.

Related Commands

Command	Description
show interfaces rep [**detail**]	Displays REP configuration and status for all interfaces or the specified interface.

reset

To leave the proposed new VLAN database but remain in VLAN configuration mode and reset the proposed new database to be identical to the VLAN database currently implemented, use the **reset** command.

reset

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default settings.

Command Modes

VLAN configuration mode

Command History

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

Examples

This example shows how to reset the proposed new VLAN database to the current VLAN database:

```
Switch(vlan-config)# reset
RESET completed.
Switch(vlan-config)#
```

revision

To set the MST configuration revision number, use the **revision** command. To return to the default settings, use the **no** form of this command.

revision *version*

no revision

Syntax Description

version	Configuration revision number; valid values are from 0 to 65535.

Defaults

Revision version is set to 0.

Command Modes

MST configuration mode

Command History

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

Usage Guidelines

If two Catalyst 4500 series switches have the same configuration but have different configuration revision numbers, they are considered to be part of two different regions.

Caution Be careful when using the **revision** command to set the MST configuration revision number because a mistake can put the switch in a different region.

Examples

This example shows how to set the configuration revision number:

```
Switch(config-mst)# revision 5
Switch(config-mst)#
```

Related Commands

Command	Description
instance	Maps a VLAN or a set of VLANs to an MST instance.
name	Sets the MST region name.
show spanning-tree mst	Displays MST protocol information.
spanning-tree mst configuration	Enters the MST configuration submode.

sampler (netflow-lite monitor submode)

To activate sampling on an interface in netflow-lite monitor submode, use the **sampler** command. To delete a sampler, use the **no** form of this command.

sampler *sampler-name*

no sampler *sampler-name*

Syntax Description

sampler-name	Specifies a sampler.

Defaults

None

Command Modes

netflow-lite exporter submode

Command History

Release	Modification
15.0(2)SG	Support for this command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

You can enter this command under the physical port interface mode, port channel interface, or config VLAN mode.

Examples

The following example shows how to configure a monitor on a port interface Gigabit 1/3:

```
Switch# config terminal
Switch(config)# int GigabitEthernet1/3
Switch(config-if)# netflow-lite monitor 1
Switch(config-netflow-lite-monitor)# sampler sampler1
Switch(config-netflow-lite-monitor)# average-packet-size 128
Switch(config-netflow-lite-monitor)# exporter exporter1
Switch(config-netflow-lite-monitor)# exit
Switch(config-if)# exit
Switch(config)# exit
Switch# show netflow-lite monitor 1 interface gi1/3
Interface GigabitEthernet1/3:
  Netflow-lite  Monitor-1:
    Sampler:              sampler1
    Exporter:             exporter1
    Average Packet Size:  128
  Statistics:
    Packets exported:     0
    Packets observed:     0
    Packets dropped:      0
```

You can verify your settings with the **show netflow-lite sampler** privileged EXEC command.

Related Commands

Command	Description
average-packet-size (netflow-lite monitor submode)	Specifies the average packet size at the observation point.
exporter (netflow-lite monitor submode)	Assigns an exporter in netflow-lite monitor submode.

service-policy (interface configuration)

To attach a policy map to an interface or to apply different QoS policies on VLANs that an interface belongs to, use the **service-policy** command. To remove a policy map from an interface, use the **no** form of this command.

service-policy {**input** | **output**} *policy-map name*

no service-policy {**input** | **output**} *policy-map name*

Syntax Description

input	Specifies the input policy maps.
output	Specifies the output policy maps.
policy-map name	Name of a previously configured policy map.

Defaults

A policy map is not attached to an interface or a VLAN.

Command Modes

Interface configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(25)EWA	Support for applying different QoS policies on VLANs was introduced.

Usage Guidelines

Layer 2 interfaces can be part of multiple VLANs (for example, a typical trunk port). In conjunction with the **vlan-range** command, you can use the **service-policy** command to specify different QoS policies on different VLANs.

Note This capability is restricted to Layer 2 interfaces.

Non-Supervisor Engine 6-E

You cannot apply a policy map under an interface and a VLAN range at the same time.

To attach a service policy to a VLAN an SVI must be created for the VLAN and the policy must be applied to the SVI.

Supervisor Engine 6-E and Catalyst 4900M chassis

You can apply a service policy under an interface as well as a VLAN range at the same time. However, this is allowed only when the interface policy has only queuing actions whereas a VLAN has only non-queueing actions (QoS marking and/or policing) actions.

To attach a service policy to a VLAN, the VLAN configuration mode has to be used.

Examples

This example shows how to attach a policy map to Fast Ethernet interface 5/20:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 5/20
Switch(config-if)# service-policy input pmap1
Switch(config-if)# end
```

This example shows how to apply policy map p1 for traffic in VLANs 20 and 400, and policy map p2 for traffic in VLANs 300 through 301:

```
Switch# configure terminal
Switch(config)# interface gigabitEthernet 6/1
Switch(config-if)# switchport trunk encapsulation dot1q
Switch(config-if)# switchport mode trunk
Switch(config-if)# vlan-range 20,400
Switch(config-if-vlan-range)# service-policy input p1
Switch(config-if-vlan-range)# exit
Switch(config-if)# vlan-range 300-301
Switch(config-if-vlan-range)# service-policy output p2
Switch(config-if-vlan-range)# end
Switch# show policy-map interface gigabitEthernet 6/1 vlan 20
 GigabitEthernet6/1 vlan 20

  Service-policy input: p1

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes

Switch# show policy-map interface gigabitEthernet 6/1
 GigabitEthernet6/1 vlan 20

  Service-policy input: p1

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes

 GigabitEthernet6/1 vlan 300

  Service-policy output: p2

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes

 GigabitEthernet6/1 vlan 301

  Service-policy output: p2

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
```

```
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes

 GigabitEthernet6/1 vlan 400

  Service-policy input: p1

    Class-map: class-default (match-any)
      0 packets
      Match: any
        0 packets
      police: Per-interface
        Conform: 0 bytes Exceed: 0 bytes
```

This example shows how to attach a policy map to a VLAN using an SVI on a non-Supervisor Engine 6-E:

```
Switch# configure terminal
Switch(config)#interface vlan 10
Switch(config-if)#service-policy out policy-vlan
Switch(config-if)#end
Switch#
```

This example shows how to attach a policy map to a VLAN using a Supervisor Engine 6-E:

```
Switch# configure terminal
Switch(config)#vlan configuration 20
Switch(config-vlan-config)#service-policy out policy-vlan
Switch(config-vlan-config)#end
Switch#
```

Related Commands

Command	Description
class-map	Creates a class map to be used for matching packets to the class whose name you specify and to enter class-map configuration mode.
policy-map	Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
service-policy (interface configuration)	Attaches a policy map to an interface.
show policy-map interface vlan	Displays the QoS policy-map information applied to a specific VLAN on an interface.

service-policy (policy-map class)

To create a service policy that is a quality of service (QoS) policy within a policy map (called a hierarchical service policy), use the **service-policy** policy-map class configuration command. To disable the service policy within a policy map, use the **no** form of this command.

service-policy *policy-map-name*

no service-policy *policy-map-name*

Syntax Description

policy-map-name	Name of the policy map.

Defaults

No service policies maps are defined.

Command Modes

Policy-map class configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(40)SG	Added support for Supervisor Engine 6-E and Catalyst 4900M chassis.

Usage Guidelines

Use the **service-policy** command only in a hierarchical policy map attached to a physical port. This command is valid in policy maps at level two of the hierarchy.

You can create a hierarchy by having the parent policy map specify marking and/or policing actions and having the child policy map specify the queueing actions.

If you enter this command in policy-map class configuration mode, you return to policy-map configuration mode by using the **exit** command. To return to privileged EXEC mode, use the **end** command.

Examples

This example shows how to create a hierarchical service policy in the service policy called “parent”:

```
Switch# configure terminal
Switch(config)# policy-map child
Switch(config-pmap)# class voice
Switch(config-pmap-c)# priority
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# policy-map parent
Switch(config-pmap)# class class1
Switch(config-pmap-c)# police 32k
Switch(config-pmap-c)# service-policy child
Switch#
```

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

Related Commands

Command	Description
bandwidth	Creates a signaling class structure that can be referred to by its name.
class	Specifies the name of the class whose traffic policy you want to create or change.
dbl	Enables active queue management on a transmit queue used by a class of traffic.
policy-map	Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
priority	Enables the strict priority queue (low-latency queueing [LLQ]) and to give priority to a class of traffic belonging to a policy map attached to a physical port.
random-detect (refer to Cisco IOS documentation)	Enables Weighted Random Early Detection (WRED) or distributed WRED (DWRED).
shape (class-based queueing)	Enables traffic shaping a class of traffic in a policy map attached to a physical port.
show policy-map	Displays information about the policy map.

service-policy input (control-plane)

To attach a policy map to a control plane for aggregate control plane services, use the **service-policy input** command. Use the **no** form of this command to remove a service policy from a control plane.

service-policy input *policy-map-name*

Syntax Description

input	Applies the specified service policy to the packets that are entering the control plane.
policy-map-name	Name of a service policy map (created using the **policy-map** command) to be attached.

Defaults

No service policy is specified.

Command Modes

Control-plane configuration mode

Command History

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

Usage Guidelines

In this release, the only policy-map accepted on the control-plane is system-cpp-policy. It is already attached to the control-plane at start up. If not (due to some error conditions), it is recommended to use the **global macro system-cpp** command to attach it to the control-plane. The system-cpp-policy created by the system contains system predefined classes. For these predefined classes, you can change the policing parameters but you should not make any other change to the classes.

You can define your own class-maps and append them to the end of the system-cpp-policy policy-map.

Examples

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

```
Switch(config)# access-list 140 deny tcp host 10.1.1.1 any eq telnet
! Allow 10.1.1.2 trusted host traffic.
Switch(config)# access-list 140 deny tcp host 10.1.1.2 any eq telnet
! Rate limit all other Telnet traffic.
Switch(config)# access-list 140 permit tcp any any eq telnet
! Define class-map "telnet-class."
Switch(config)# class-map telnet-class
Switch(config-cmap)# match access-group 140
Switch(config-cmap)# exit
Switch(config)# policy-map control-plane-policy
Switch(config-pmap)# class telnet-class
Switch(config-pmap-c)# police 80000 conform transmit exceed drop
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
! Define aggregate control plane service for the active Route Processor.
```

```
Switch(config)# control-plane
Switch(config-cp)# service-policy input control-plane-policy
Switch(config-cp)# exit
```

Related Commands

Command	Description
control-plane	Enters control-plane configuration mode.
macro global apply system-cpp	Applies the control plane policing default template to the switch.
policy-map	Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
show policy-map control-plane	Displays the configuration either of a class or of all classes for the policy map of a control plane.

session module

Note This command is only supported in SSO mode and does not work in RPR mode.

To log in to the standby supervisor engine using a virtual console, use the **session module** configuration command.

session module *mod*

Syntax Description

mod	Target module for the command.

Defaults

This command has no default settings.

Command Modes

Privileged EXEC mode

Command History

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

Usage Guidelines

Catalyst 4500 series switches can be configured with two supervisor engines to provide redundancy. When the switch is powered, one of the supervisor engines becomes active and remains active until a switchover occurs. The other supervisor engine remains in standby mode.

Each supervisor engine has its own console port. Access to the standby supervisor engine is possible only through the console port of the standby supervisor engine. Therefore, you must connect to the standby console to access, monitor or debug the standby supervisor.

The virtual console for the standby supervisor engine enables you to access the standby console from the active supervisor engine without requiring a physical connection to the standby console. It uses IPC over EOBC to communicate with the standby supervisor engine and emulates the standby console on the active supervisor engine. Only one active standby console session is active at any time.

The virtual console for the standby supervisor engine allows users who are logged onto the active supervisor engine to remotely execute show commands on the standby supervisor engine and view the results on the active supervisor engine. Virtual console is available only from the active supervisor engine.

You can access the standby virtual console from the active supervisor engine with the **attach module**, **session module**, or **remote login** commands on the active supervisor engine. You must be in privilege EXEC mode (level 15) to run these commands to access the standby console.

Note The **session module** command is identical to the **attach module** *mod* and the **remote login module** *mod* commands.

Once you enter the standby virtual console, the terminal prompt automatically changes to <hostname>-standby-console#, where *hostname* is the configured name of the switch. The prompt is restored back to the original prompt when you exit the virtual console.

You exit the virtual console with the **exit** or **quit** commands. When the inactivity period of the terminal on the active supervisor engine where you logged in exceeds the configured idle time, you are automatically logged out of the terminal on the active supervisor engine. In such a case, the virtual console session is also terminated. Virtual console session is also automatically terminated when the standby is rebooted. After the standby boots up, you need to create another virtual console session.

The following limitations apply to the standby virtual console:

- All commands on the virtual console run to completion. It does not provide the auto-more feature; it behaves as if the **terminal length 0** command has been executed. It is also non-interactive. Therefore, a running command cannot be interrupted or aborted by any key sequence on the active supervisor engine. If a command produces considerable output, the virtual console displays it on the supervisor screen.
- The virtual console is non-interactive. Because the virtual console does not detect the interactive nature of a command, any command that requires user interaction causes the virtual console to wait until the RPC timer aborts the command.
- The virtual console timer is set to 60 seconds. The virtual console returns to its prompt after 60 seconds. During this time, you cannot abort the command from the keyboard. You must wait for the timer to expire before you continue.
- You cannot use virtual console to view debug and syslog messages that are being displayed on the standby supervisor engine. The virtual console only displays the output of commands that are executed from the virtual console. Other information that is displayed on the real standby console does not appear on the virtual console.

Examples

To log in to the standby supervisor engine using a virtual console, do the following:

```
Switch# session module 2
Connecting to standby virtual console
Type "exit" or "quit" to end this session

Switch-standby-console# exit
Switch#
```

If the standby console is not enabled, the following message appears:

```
Switch-standby-console#
Standby console disabled.
Valid commands are: exit, logout
```

Related Commands

Command	Description
attach module	Remotely connects to a specific module.
remote login module	Remotely connects to a specific module.

set

To mark IP traffic by setting a class of service (CoS), a Differentiated Services Code Point (DSCP), or IP-precedence in the packet, use the **set** policy-map class configuration command. To remove the traffic classification, use the **no** form of this command.

set {**cos** *new-cos* | [**ip**] {**dscp** *new-dscp* | **precedence** *new-precedence*} | **qos group** *value*}

no set cos *new-cos* | **ip** {**dscp** *new-dscp* | **precedence** *new-precedence*} | **qos group** *value*}

Syntax Description

cos *new-cos*	New CoS value assigned to the classified traffic. The range is 0 to 7.
ip dscp *new-dscp*	New DSCP value assigned to the classified traffic. The range is 0 to 63. You also can enter a mnemonic name for a commonly used value. The specified value sets the type of service (ToS) traffic class byte in the IPv4/IPv6 packet header.
ip precedence *new-precedence*	New IP-precedence value assigned to the classified traffic. The range is 0 to 7. You also can enter a mnemonic name for a commonly used value. The specified value sets the precedence bit in the IP header.
qos group *value*	Internal QoS group assigned to a classified packet on ingress to an interface.

Defaults

No marking is enabled on packets.

Command Modes

Policy-map class configuration mode

Command History

Release	Modification
12.1(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(40)SG	Added support for Supervisor Engine 6-E and Catalyst 4900M chassis.

Usage Guidelines

You can use the **set** command only in class-level classes.

The **set dscp** *new-dscp* and the **set precedence** *new-precedence* commands are the same as the **set ip dscp** *new-dscp* and the **set ip precedence** *new-precedence* commands.

For the **set dscp** *new-dscp* or the **set precedence** *new-precedence* command, you can enter a mnemonic name for a commonly used value. For example, you can enter the **set dscp af11** command, which is the as same entering the **set dscp 10** command. You can enter the **set precedence critical** command, which is the same as entering the **set precedence 5** command. For a list of supported mnemonics, enter the **set dscp ?** or the **set precedence ?** command to see the command-line help strings.

You can configure the **set cos** *new-cos*, **set dscp** *new-dscp*, or **set precedence** *new-precedence* command in an ingress and an egress policy map attached to an interface or VLAN.

To return to policy-map configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

Examples

This example shows how to create a policy map called p1 with CoS values assigned to different traffic types. Class maps for voice and video-data have already been created.

```
Switch# configure terminal
Switch(config)# policy-map p1
Switch(config-pmap)# class voice
Switch(config-pmap-c)# set cos 1
Switch(config-pmap)# exit
Switch(config-pmap)# class video-data
Switch(config-pmap-c)# set cos 2
Switch(config-pmap)# exit
Switch#
```

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

Related Commands

Command	Description
class	Specifies the name of the class whose traffic policy you want to create or change.
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
show policy-map	Displays information about the policy map.
trust	Defines a trust state for traffic classified through the **class** policy-map configuration command.

set cos

To set the Layer 2 class of service (CoS) value of a packet, use the **set cos** command in policy-map class configuration mode. To remove a specific CoS value setting, use the **no** form of this command.

set cos {*cos-value* | *from-field* [**table** *table-map-name*]}

no set cos {*cos-value* | *from-field* [**table** *table-map-name*]}

Syntax Description

cos-value	Specific IEEE 802.1Q CoS value from 0 to 7.
from-field	Specific packet-marking category to be used to set the CoS value of the packet. If you are using a table map for mapping and converting packet-marking values, this establishes the "map from" packet-marking category. Packet-marking category keywords are as follows: • **precedence** • **dscp** • **cos** • **qos group**
table	(Optional) Indicates that the values set in a specified table map will be used to set the CoS value.
table-map-name	(Optional) Name of the table map used to specify the CoS value. The table map name can be a maximum of 64 alphanumeric characters.

Command Default

No CoS value is set for the outgoing packet.

Command Modes

Policy-map class configuration mode

Command History

Release	Modification
12.2(40)SG	Support for this command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6-E and Catalyst 4900M chassis.

Usage Guidelines

The **set cos** command can be used in an ingress as well as an egress policy map attached to an interface or VLAN.

You can use this command to specify the "from-field" packet-marking category to be used for mapping and setting the CoS value. The "from-field" packet-marking categories are as follows:

- Precedence
- Differentiated services code point (DSCP)
- Cost of Service (CoS)
- Quality of Service (QoS) group

If you specify a "from-field" category but do not specify the **table** keyword and the applicable *table-map-name* argument, the default action will be to copy the value associated with the "from-field" category as the CoS value. For instance, if you configure the **set cos precedence** command, the precedence value will be copied and used as the CoS value.

You can do the same for the DSCP marking category. That is, you can configure the **set cos dscp** command, and the DSCP value will be copied and used as the CoS value.

Note If you configure the **set cos dscp** command, only the *first three bits* (the class selector bits) of the DSCP field are used.

Note If you configure the **set cos qos group** command, only the three least significant bits of the qos group field are used.

Examples

This example shows how to configure a policy map called cos-set and assign different CoS values for different types of traffic. This example assumes that the class maps called voice and video-data have already been created.

```
Switch# configure terminal
Switch(config)# policy-map cos-set
Switch(config-pmap)# class voice
Switch(config-pmap-c)# set cos 1
Switch(config-pmap-c)# exit
Switch(config-pmap)# class video-data
Switch(config-pmap-c)# set cos 2
Switch(config-pmap-c)# end
Switch#
```

This example shows how to configure a policy map called policy-cos and to use the values defined in a table map called table-map1. The table map called table-map1 was created earlier with the **table-map** (value mapping) command. For more information about the **table-map** (value mapping) command, see the **table-map** (value mapping) command page.

This example shows how the setting of the CoS value is based on the precedence value defined in table-map1:

```
Switch# configure terminal
Switch(config)# policy-map policy-cos
Switch(config-pmap)# class class-default
Switch(config-pmap-c)# set cos precedence table table-map1
Switch(config-pmap-c)# end
Switch#
```

Related Commands

Command	Description
match (class-map configuration)	Defines the match criteria for a class map.
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
service-policy (policy-map class)	Creates a service policy that is a quality of service (QoS) policy within a policy map.

Command	Description
set dscp	Marks a packet by setting the differentiated services code point (DSCP) value in the type of service (ToS) byte.
set precedence	Sets the precedence value in the packet header.
show policy-map	Displays information about the policy map.

set dscp

To mark a packet by setting the differentiated services code point (DSCP) value in the type of service (ToS) byte, use the **set dscp** command in policy-map class configuration mode. To remove a previously set DSCP value, use the **no** form of this command.

set [**ip**] **dscp** {*dscp-value* | *from-field* [**table** *table-map-name*]}

no set [**ip**] **dscp** {*dscp-value* | *from-field* [**table** *table-map-name*]

Syntax Description

ip	(Optional) Specifies that the match is for IPv4 packets only. If not used, the match is on both IPv4 and IPv6 packets.
dscp-value	A number from 0 to 63 that sets the DSCP value. A mnemonic name for commonly used values can also be used.
from-field	Specific packet-marking category to be used to set the DSCP value of the packet. If you are using a table map for mapping and converting packet-marking values, this establishes the "map from" packet-marking category. Packet-marking category keywords are as follows: • **cos** • **qos-group** • **dscp** • **precedence**
table	(Optional) Used in conjunction with the *from-field* argument. Indicates that the values set in a specified table map will be used to set the DSCP value.
table-map-name	(Optional) Used in conjunction with the **table** keyword. Name of the table map used to specify the DSCP value. The name can be a maximum of 64 alphanumeric characters.

Command Default

Disabled

Command Modes

Policy-map class configuration mode

Command History

Release	Modification
12.2(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(40)SG	Added support for 'from-field' for policy-map configured on a Supervisor Engine 6-E.

Usage Guidelines

Once the DSCP bit is set, other quality of service (QoS) features can then operate on the bit settings.

DSCP and Precedence Values Are Mutually Exclusive

The **set dscp** command cannot be used with the **set precedence** command to mark the *same* packet. The two values, DSCP and precedence, are mutually exclusive. A packet can have one value or the other, but not both.

You can use this command to specify the "from-field" packet-marking category to be used for mapping and setting the DSCP value. The "from-field" packet-marking categories are as follows:

- Class of service (CoS)
- QoS group
- Precedence
- Differentiated services code point (DSCP)

If you specify a "from-field" category but do not specify the **table** keyword and the applicable *table-map-nam*e argument, the default action will be to copy the value associated with the "from-field" category as the DSCP value. For instance, if you configure the **set dscp cos** command, the CoS value will be copied and used as the DSCP value.

Note The CoS field is a three-bit field, and the DSCP field is a six-bit field. If you configure the **set dscp cos** command, only the three bits of the CoS field will be used.

If you configure the **set dscp qos-group** command, the QoS group value will be copied and used as the DSCP value.

The valid value range for the DSCP is a number from 0 to 63. The valid value range for the QoS group is a number from 0 to 63.

Set DSCP Values in IPv6 Environments

When this command is used in IPv6 environments, the default match occurs on both IP and IPv6 packets. However, the actual packets set by this function are only those which meet the match criteria of the class-map containing this function.

Set DSCP Values for IPv6 Packets Only

To set DSCP values for IPv6 values only, the **match protocol ipv6** command must also be used. Without that command, the DSCP match defaults to match both IPv4 and IPv6 packets.

Set DSCP Values for IPv4 Packets Only

To set DSCP values for IPv4 packets only, use the **ip** keyword in the **match** command for classification. Without the **ip** keyword, the match occurs on both IPv4 and IPv6 packets.

Examples

Packet-marking Values and Table Map

In the following example, the policy map called policy1 is created to use the packet-marking values defined in a table map called table-map1. The table map was created earlier with the **table-map** (value mapping) command. For more information about the **table-map** (value mapping) command, see the table-map (value mapping) command page.

This example shows how the DSCP value is set according to the CoS value defined in the table map called table-map1.

```
Switch# configure terminal
Switch(config)# policy-map policy1
Switch(config-pmap)# class class-default
Switch(config-pmap-c)# set dscp cos table table-map1
Switch(config-pmap-c)# end
Switch#
```

Related Commands

Command	Description
match (class-map configuration)	Defines the match criteria for a class map.
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
service-policy (policy-map class)	Creates a service policy that is a quality of service (QoS) policy within a policy map.
set cos	Sets IP traffic by setting a class of service (CoS).
set precedence	Sets the precedence value in the packet header.
show policy-map	Displays information about the policy map.
show policy-map interface	Displays the statistics and configurations of the input and output policies that are attached to an interface.
table-map (value mapping) (refer to Cisco IOS documentation)	Modifies metric and tag values when the IP routing table is updated with BGP learned routes.

set precedence

To set the precedence value in the packet header, use the **set precedence** command in policy-map class configuration mode. To remove the precedence value, use the **no** form of this command.

set precedence {*precedence-value* | *from-field* [**table** *table-map-name*]}

no set precedence {*precedence-value* | *from-field* [**table** *table-map-name*]}

Syntax Description

precedence-value	A number from 0 to 7 that sets the precedence bit in the packet header.
from-field	Specific packet-marking category to be used to set the precedence value of the packet. If you are using a table map for mapping and converting packet-marking values, this argument value establishes the "map from" packet-marking category. Packet-marking category keywords are as follows: • **cos** • **qos-group** • **dscp** • **precedence**
table	(Optional) Indicates that the values set in a specified table map will be used to set the precedence value.
table-map-name	(Optional) Name of the table map used to specify a precedence value based on the class of service (CoS) value. The name can be a maximum of 64 alphanumeric characters.

Command Default

Disabled

Command Modes

Policy-map class configuration mode

Command History

Release	Modification
12.2(8a)EW	Support for this command was introduced on the Catalyst 4500 series switch.
12.2(40)SG	Added support for 'from-field' for policy-map configured on a Supervisor Engine 6-E.

Usage Guidelines

Command Compatibility

The **set precedence** command cannot be used with the **set dscp** command to mark the *same* packet. The two values, DSCP and precedence, are mutually exclusive. A packet can be one value or the other, but not both.

You can use this command to specify the "from-field" packet-marking category to be used for mapping and setting the precedence value. The "from-field" packet-marking categories are as follows:

- CoS
- QoS group
- DSCP
- Precedence

If you specify a "from-field" category but do not specify the **table** keyword and the applicable *table-map-nam*e argument, the default action will be to copy the value associated with the "from-field" category as the precedence value. For instance, if you configure the **set precedence cos** command, the CoS value will be copied and used as the precedence value.

You can do the same for the QoS group-marking category. That is, you can configure the **set precedence qos-group** command, and the QoS group value will be copied and used as the precedence value.

The valid value range for the precedence value is a number from 0 to 7. The valid value range for the QoS group is a number from 0 to 63. Therefore, when configuring the **set precedence qos-group** command the three least significant bits of qos-group are copied to precedence.

Precedence Values in IPv6 Environments

When this command is used in IPv6 environments it can set the value in both IPv4 and IPv6 packets. However, the actual packets set by this function are only those that meet the match criteria of the class-map containing this function.

Setting Precedence Values for IPv6 Packets Only

To set the precedence values for IPv6 packets only, the **match protocol ipv6** command must also be used in the class-map that classified packets for this action. Without the **match protocol ipv6** command, the class-map may classify both IPv6 and IPv4 packets, (depending on other match criteria) and the **set precedence** command will act upon both types of packets.

Setting Precedence Values for IPv4 Packets Only

To set the precedence values for IPv4 packets only, use a command involving the **ip** keyword like the **match ip precedence** or **match ip dscp** command or include the **match protocol ip** command along with the others in the class map. Without the additional **ip** keyword, the class-map may match both IPv6 and IPv4 packets (depending on the other match criteria) and the **set precedence** or **set dscp** command may act upon both types of packets.

Examples

In the following example, the policy map named policy-cos is created to use the values defined in a table map named table-map1. The table map named table-map1 was created earlier with the **table-map** (value mapping) command. For more information about the **table-map** (value mapping) command, see the **table-map** (value mapping) command page.

This example shows how the precedence value is set according to the CoS value defined in table-map1.

```
Switch# configure terminal
Switch(config)# policy-map policy-cos
Switch(config-pmap)# class class-default
Switch(config-pmap-c)# set precedence cos table table-map1
Switch(config-pmap-c)# end
Switch#
```

Related Commands

Command	Description
match (class-map configuration)	Defines the match criteria for a class map.
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
service-policy (policy-map class)	Creates a service policy that is a quality of service (QoS) policy within a policy map.
set cos	Sets IP traffic by setting a class of service (CoS).
set dscp	Marks a packet by setting the differentiated services code point (DSCP) value in the type of service (ToS) byte.
set qos-group	Sets a quality of service (QoS) group identifier (ID) that can be used later to classify packets.
set precedence	Sets the precedence value in the packet header.
show policy-map	Displays information about the policy map.
show policy-map interface	Displays the statistics and configurations of the input and output policies that are attached to an interface.
table-map (value mapping) (refer to Cisco IOS documentation)	Modifies metric and tag values when the IP routing table is updated with BGP learned routes.

set qos-group

To set a quality of service (QoS) group identifier (ID) that can be used later to classify packets, use the **set qos-group** command in policy-map class configuration mode. To remove the group ID, use the **no** form of this command.

set qos-group *group-id*

no set qos-group *group-id*

Syntax Description

group-id	Group ID number in the range from 0 to 63.

Command Default

The group ID is set to 0.

Command Modes

Policy-map class configuration mode

Command History

Release	Modification
12.2(40)SG	Support for this command was introduced on the Catalyst 4500 series switch using a Supervisor Engine 6-E and Catalyst 4900M chassis.

Usage Guidelines

The **set qos-group** command allows you to associate a group ID with a packet. This association is made through a service-policy attached to an interface or VLAN in the input direction. The group ID can be later used in the output direction to apply QoS service policies to the packet.

Examples

This example shows how to set the qos-group to 5:

```
Switch# configure terminal
Switch(config)# policy-map p1
Switch(config-pmap)# class c1
Switch(config-pmap-c)# set qos
Switch(config-pmap-c)# set qos-group 5
Switch(config-pmap-c)# end
Switch#
```

Related Commands

Command	Description
match (class-map configuration)	Defines the match criteria for a class map.
policy-map	Creates or modifies a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
service-policy (policy-map class)	Creates a service policy that is a quality of service (QoS) policy within a policy map.
show policy-map	Displays information about the policy map.
show policy-map interface	Displays the statistics and configurations of the input and output policies that are attached to an interface.

shape (class-based queueing)

To enable traffic shaping a class of traffic in a policy map attached to a physical port, use the **shape average** policy-map class command. Traffic shaping limits the data transmission rate. To return to the default setting, use the **no** form of this command.

shape average {*rate*} [**bps** | **kbps** | **mbps** | **gbps**]

shape average percent {*percent_value*}

no shape average

Syntax Description

rate	Specifies an average rate for traffic shaping; the range is 16000 to 10000000000. Post-fix notation (k, m, and g) is optional and a decimal point is allowed.
bps	(Optional) Specifies a rate in bits per seconds.
kbps	(Optional) Specifies a rate in kilobytes per seconds.
mbps	(Optional) Specifies a rate in megabits per seconds.
gbps	(Optional) Specifies a rate in gigabits per seconds.
percent	Specifies a percentage of bandwidth for traffic shaping.
percent_value	(Optional) Specifies a percentage of the bandwidth used for traffic shaping; valid values are from 1 to 100 percent.

Defaults

Average-rate traffic shaping is disabled.

Command Modes

Policy-map class configuration mode

Command History

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

Usage Guidelines

Use the **shape** command only in a policy map attached to a physical port. This command is valid in policy maps at any level of the hierarchy.

Shaping is the process of delaying out-of-profile packets in queues so that they conform to a specified profile. Shaping is distinct from policing. Policing drops packets that exceed a configured threshold, but shaping buffers packets so that traffic remains within the threshold. Shaping offers greater smoothness in handling traffic than policing.

You cannot use the **bandwidth**, **dbl**, and the **shape** policy-map class configuration commands with the **priority** policy-map class configuration command in the same class within the same policy map. However, you can use these commands in the same policy map.

To return to policy-map configuration mode, use the **exit** command. To return to privileged EXEC mode, use the **end** command.

Examples

This example shows how to limit the specified traffic class to a data transmission rate of 256 kbps:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# policy-map policy1
Switch(config-pmap)# class class1
Switch(config-pmap-c)# shape average 256000
Switch(config-pmap-c)# exit
Switch(config-pmap)# exit
Switch(config)# interface gigabitethernet1/1
Switch(config-if)# service-policy output policy1
Switch(config-if)# end
```

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

Related Commands

Command	Description
bandwidth	Creates a signaling class structure that can be referred to by its name.
class	Specifies the name of the class whose traffic policy you want to create or change.
dbl	Enables active queue management on a transmit queue used by a class of traffic.
policy-map	Creates a policy map that can be attached to multiple ports to specify a service policy and to enter policy-map configuration mode.
service-policy (policy-map class)	Creates a service policy that is a quality of service (QoS) policy within a policy map.
show policy-map	Displays information about the policy map.

shape (interface configuration)

To specify traffic shaping on an interface, use the **shape** command. To remove traffic shaping, use the **no** form of this command

shape [**rate**] [**percent**]

no shape [**rate**] [**percent**]

Syntax Description

rate	(Optional) Specifies an average rate for traffic shaping; the range is 16000 to 1000000000. Post-fix notation (k, m, and g) is optional and a decimal point is allowed.
percent	(Optional) Specifies a percent of bandwidth for traffic shaping.

Defaults

Default is no traffic shaping.

Command Modes

Interface transmit queue configuration mode

Command History

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

Usage Guidelines

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

Traffic shaping is available on all the ports, and it sets an upper limit on the bandwidth.

When the high shape rates are configured on the Catalyst 4500 Supervisor Engine II-Plus-10GE (WS-X4013+10GE), the Catalyst 4500 Supervisor Engine V (WS-X4516), and the Catalyst 4500 Supervisor Engine V-10GE (WS-X4516-10GE), the shaped traffic rate may not be achieved in situations that involve contention and unusual packet size distributions. On the ports that are multiplexed through a Stub ASIC and connected to the backplane gigaports, the shape rates above 7 Mbps may not be achieved under worst-case conditions. On ports that are connected directly to the backplane gigaports, or the supervisor engine gigaports, the shape rates above 50 Mbps may not be achieved under worst-case conditions.

Some examples of ports that are connected directly to the backplane are as follows:

- Uplink ports on Supervisor Engine II+, II+10GE, III, IV, V, and V-10GE
- Ports on the WS-X4306-GB module
- The two 1000BASE-X ports on the WS-X4232-GB-RJ module
- The first two ports on the WS-X4418-GB module
- The two 1000BASE-X ports on the WS-X4412-2GB-TX module

All ports on the 24-port modules and the 48-port modules are multiplexed through a Stub ASIC. Some examples of ports multiplexed through a Stub ASIC are as follows:

- 10/100 ports on the WS-X4148-RJ45 module
- 10/100/1000 ports on the WS-X4124-GB-RJ45 module
- 10/100/1000 ports on the WS-X4448-GB-RJ45 module

Examples

This example shows how to configure a maximum bandwidth (70 percent) for the interface fa3/1:

```
Switch(config)# interface fastethernet3/1
Switch(config-if)# tx-queue 3
Switch(config-if-tx-queue)# shape 70m
Switch(config-if-tx-queue)#
```

shell trigger

Use the **shell trigger** global configuration command to create a user defined trigger. Use the **no** form of this command to delete the trigger.

shell trigger *identifier description*

no shell trigger *identifier description*

Syntax Description

identifier	Specifies the event trigger identifier. The identifier should have no spaces or hyphens between words.
description	Specifies the event trigger description text.

Defaults

There are system-defined event triggers:

- CISCO_PHONE_EVENT
- CISCO_SWITCH_EVENT
- CISCO_ROUTER_EVENT
- CISCO_WIRELESS_AP_EVENT
- CISCO_WIRELESS_LIGHTWEIGHT_AP_EVENT
- DMP
- IPVSC

Command Modes

Global configuration

Command History

Release	Modification
12.2(50)SE	This command was introduced on the Catalyst 4500 series switch.

Usage Guidelines

Use this command to create user-defined event triggers in conjunction with the **macro auto execute** global configuration command.

To support dynamic device discovery when using 802.1X authentication, configure the RADIUS authentication server to support the Cisco attribute-value (AV) pair: **auto-smart-port=***event trigger*.

This command is mainly used for 802.1X authentication based triggers provided 802.1X or MAB is supported, enabling you to map new platform strings or device IDs to their respective macros or functions.

Examples

This example shows how to create a user-defined event trigger called RADIUS_MAB_EVENT:

```
Switch# configure terminal
Switch(config)# shell trigger RADIUS_MAB_EVENT MAC_AuthBypass Event
Switch(config)# end
```

Related Commands

Command	Description
macro auto global processing	Enables Auto Smartports on a switch.
macro auto processing	Enable Auto SmartPorts macros on a specific interface.
show shell	Displays information about event triggers and macros.
macro auto device	Simplifies changing the parameters for a built-in functions for a device type.
macro auto execute (builtin function)	Changes built-in function default values or to map user-defined triggers to built-in functions, and to pass the parameter values.
macro auto execute (user-defined function)	Maps a trigger to a user-defined function.
macro auto execute (remotely-defined function)	Maps a trigger to a remotely defined functions.
macro auto processing	Enables Auto SmartPorts macros on a specific interface.
macro auto sticky	Specifies not to remove configurations applied by ASP across link flaps and device removal.