

Chapter 8

Switching

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Introduction

This chapter gives an overview of Layer 1 (the physical layer), 2 (the data link layer), and 3 (the network layer) switching, and describes the support for switching and how to configure and operate the switching functions.

The switch, also referred to as a MAC (media access control) bridge, a data link relay, or a Layer 2 switch, can connect multiple Local Area Network (LAN) segments together to form an extended LAN. Stations connected to different LANs can be configured to communicate with one another as if they were on the same LAN. It can also divide one physical LAN into multiple Virtual LANs (VLANs). Stations connected to each other on the same extended LAN can be grouped in separate VLANs, so that a station in one VLAN can communicate directly with other stations in the same VLAN, but must go through higher layer routing protocols to communicate with stations in other VLANs.

The switch operates at the data link layer, transparent to higher layer protocols, transferring frames between the data link layers of the networks to which it is attached. A bridge accesses each physical link according to the rules for that particular network. Access may not always be instant, so a bridge must be capable of storing and forwarding frames. Since the switch can store and forward frames, it can examine and discard or admit frames according to their VLAN tag fields. The switch can also examine the address fields of the frames and forward the frames based on knowledge of which network contains the station with an address matching the frame's destination address. In this way, the switch can act as an intelligent filtering device, redirecting or blocking the movement of frames between networks.

Because the switch may receive frames faster than it can forward them, the switch has Quality of Service (QoS) queues in which frames await transmission according to their priority.

The switch can be used to:

- Increase the physical extent and/or the maximum number of stations on a LAN.

LANs are limited in their physical extent by the signal distortion and propagation delay characteristics of the media. The switch overcomes this limitation by receiving a frame on one LAN and then retransmitting the frame on another LAN, using the normal access methods for each LAN. The physical characteristics of the LAN media also place a practical limit on the number of stations that can be connected to a single LAN segment. The switch overcomes this limitation by joining LAN segments together to form an extended LAN capable of supporting more stations than either of the individual LANs.
- Connect LANs that have a common data link layer protocol but different physical media, for example, Ethernet 10BASET, 100BASET, and 10BASEF.
- Increase the availability of LANs by allowing multiple redundant paths to be physically configured, and selected dynamically, using the Spanning Tree algorithm.
- Reduce the load on a LAN or increase the effective bandwidth of a LAN, by filtering traffic.
- Prioritise the transmission of data with high Quality of Service requirements.

By using Virtual LANs (VLANs), a single physical LAN can be separated into multiple Virtual LANs. VLANs can be used to:

- Further improve LAN performance, as broadcast traffic is limited to LAN segments serving members of the VLAN to which the sender belongs.
- Provide security, as frames are forwarded to those stations belonging to the sender's VLAN, and not to stations in other VLANs on the same physical LAN.
- Reduce the cost of moving or adding stations to function or security based LANs, as this generally requires only a change in the VLAN configuration.

Switch Ports

The term *port* is used frequently in switch terminology. Each port in a switch is associated with one of the physical interfaces on the switch. Each port is uniquely identified by a port number. The switch supports a number of features at the physical level that allows it to be connected in a variety of physical networks. This physical layer (Layer 1) versatility includes:

- Enabling and disabling Ethernet ports.
- Autonegotiation of port speed and duplex mode for all 10/100 Ethernet ports and copper gigabit ports.
- Manual setting of port speed and duplex mode for all 10/100 Ethernet ports and copper gigabit ports.
- Port trunking.
- Packet storm protection.
- Port mirroring.
- Support for SNMP management.
- Link triggers for fibre ports.

Enabling and Disabling Switch Ports

By default, all switch ports are enabled. An enabled port is available to receive and transmit packets. Its operational status and administrative status in the Interfaces MIB is up.

Enabling ports To enable a switch port, use the commands:

```
enable switch port={port-list|all} [other options]
```

A switch port that has been disabled by the Port Security feature ("[Port Security](#)" on page 8-13) cannot be enabled using the **enable switch port** command. Instead, use the [set switch port command on page 8-108](#) and set **learn=0**.

Resetting ports Resetting Ethernet ports at the hardware level discards all frames queued for reception or transmission on the port, restarts autonegotiation of port speed and duplex mode, and resets port counters. To reset ports, use the command:

```
reset switch port={port-list|all}
```

To reset port counters without resetting the ports, use the command:

```
reset switch port={port-list|all} counter
```

Disabling ports A disabled port is not available to receive and transmit packets. It does not send or receive any frames and its administrative status in the Interfaces MIB is **down**.

You can disable base switch ports at the hardware or software level. Disabling a port at the hardware level has the same effect as physically removing the cable. Disabling a port at the software level only takes the link down in software.

We recommend disabling ports at the hardware level. This ensures that the port at the other end of the link realises that the port is down. To do this, use the command:

```
disable switch port={port-list|all} link=disable
```

Uplink module ports can only be disabled at the software level. To disable a port at the software level, use the command:

```
disable switch port={port-list|all}
```

The following table further describes the options.

If you...	by using...	then...	and Status is...	and Link State is...
disable a port at the hardware level	disable switch port= <i>port-number</i> link=disable	port hardware and software link functionality both turn off	DISABLED	Down
disable a port at the software level (take the link down in software)	disable switch port= <i>port-number</i>	software link functionality turns off but port hardware stays on	DISABLED	Up
bring the link up in software without re-enabling the port	disable switch port= <i>port-number</i> link=enable	software link functionality stays off but port hardware turns on	DISABLED	Up
enable a port	enable switch port= <i>port-number</i>	port hardware and software link functionality both turn on	ENABLED	Up

Displaying information

To display information about switch ports, use the command:

```
show switch port [= {port-list|all}]
```

Figure 8-1, Figure 8-2 and Figure 8-3 show the possible combinations of status and link state for a port.

Figure 8-1: Output of the **show switch port** command when the port is enabled

```
Switch Port Information
-----
Port ..... 13
Description ..... -
Status ..... ENABLED
Link State ..... Up
.
.
.
```

Figure 8-2: Output of the **show switch port** command when the port is disabled at the software level

```
Switch Port Information
-----
Port ..... 13
Description ..... -
Status ..... DISABLED
Link State ..... Up
.
.
.
```

Figure 8-3: Output of the **show switch port** command when the port is disabled at the hardware level

```
Switch Port Information
-----
Port ..... 13
Description ..... -
Status ..... DISABLED
Link State ..... Down
.
.
.
```

Resetting ports at the hardware level discards all frames queued for reception or transmission on the port, and restarts autonegotiation of port speed and duplex mode. Ports are reset using the command:

```
reset switch port={port-list|all} [counter]
```

To display information about switch ports, use the command:

```
show switch port[={port-list|all}]
```

Speed and Duplex Mode

Duplex mode Ports can operate in full duplex or half duplex mode depending on the type of port it is. When in full duplex mode, a port transmits and receives data simultaneously. When in half duplex mode, the port transmits or receives but not both at the same time.

You can set a port to use either of these options, or allow it to autonegotiate the duplex mode with the device at the other end of the link.

Speed options The switch supports ports with the following speed options:

- RJ-45 base ports: 10 or 100Mbps
- RJ-45 copper uplink modules: 10, 100 or 1000Mbps
- SFP uplink modules: 1000Mbps

You can set a port to use one of these speed options, or allow it to autonegotiate the speed with the device at the other end of the link.

Autonegotiation

Autonegotiation lets the port adjust its speed and duplex mode to accommodate the device connected to it. When the port connects to another autonegotiating device, they negotiate the highest possible speed and duplex mode for both of them.

By default, all ports autonegotiate. Setting the port to a fixed speed and duplex mode may be necessary when connecting to a device that cannot autonegotiate.

Configuring speed and duplex

To set the speed and duplex mode, use the command:

```
set switch port={port-list|all} [speed={autonegotiate|
10Mauto|10Mhalf|10Mfull|10Mhauto|10Mfauto|100Mauto|
100Mhalf|100Mfull|100Mhauto|100Mfauto|1000Mhalf|
1000Mfull|1000Mhauto|1000Mfauto}] [other-parameters]
```

The **speed** parameter combines speed, duplex mode, and autonegotiation support in a single setting. Options are in the following categories:

- autonegotiate—the **autonegotiate** option. If you specify this option, the port negotiates both speed and duplex mode. This is the default.
- fixed modes—options that do not contain “auto”, such as **100Mfull**. If you specify one of these options, the port operates at that speed and duplex setting instead of autonegotiating with its link partner. For example, **100Mfull** means that the port transmits data at 100 Mbps full duplex mode.
- autonegotiate fixed speed and duplex mode—options that contain a speed and duplex mode and “auto”, such as **100Mfauto**. If you specify one of these options, the port enters into autonegotiation with its link partner, but advertises that speed and duplex mode as the only mode it supports. For example, **100Mfauto** means that the port advertises that it can only support 100Mbps full duplex mode and **100Mhauto** means that it only advertises 100Mbps half duplex mode.
- autonegotiate fixed speed—the **10Mauto** and **100Mauto** options. If you specify one of these options, the port enters into autonegotiation with its link partner, and negotiates the duplex mode but advertises that speed as the only speed it supports. For example, **100Mauto** means that the port advertises both half and full duplex mode at the one specified speed.

Make sure that the configuration of the switch matches the configuration of the device at the other end of the link. In particular, avoid having one end autonegotiate if the other end is fixed. For example, if you set one end of a link to **autonegotiate** and other to **100Mfull**, the autonegotiating end cannot determine that the fixed end is full duplex capable. Therefore, the autonegotiating end selects 100Mbps half-duplex operation. Using **100Mfauto** at the “fixed” end of the link would allow the autonegotiating end to autonegotiate 100Mbps full-duplex mode. This gains the benefits of autonegotiation while forcing operation at the desired speed.

Also, if you override a port’s autonegotiation by setting it to a fixed speed and duplex mode, automatic MDI/MDI-X detection is also overridden. The port defaults to MDI-X.

To display current speed and duplex mode settings, use the [show switch port command on page 8-137](#).

To activate autonegotiation at any time on ports that are set to autonegotiate, use the [activate switch port command on page 8-49](#).

Port types and speed For different types of port, the valid options are shown in the following table.

Speed	10/100 copper ports	10/100/1000 copper uplinks	SFP uplinks
10Mhalf	Yes	Yes	-
10Mfull	Yes	Yes	-
100Mhalf	Yes	Yes	-
100Mfull	Yes	Yes	-
1000Mhalf	-	Yes	-
1000Mfull	-	Yes	Yes
10Mauto	Yes	Yes	-
10Mhauto	Yes	Yes	-
10Mfauto	Yes	Yes	-
100Mauto	Yes	Yes	-
100Mhauto	Yes	Yes	-
100Mfauto	Yes	Yes	-
1000Mhauto	-	Yes	-
1000Mfauto	-	Yes	Yes
autonegotiate	Yes	Yes	Yes

Switch Instances on 48-Port Switches

The AT-8648T/2SP has two switch instances, known as instance “0” and “1”. Ports 1 to 24 and the uplink port 49 are on instance 0. Ports 25 to 48 and the uplink port 50 are on instance 1.

There are minor restrictions on 48-port switches for some features, such as port trunking, private vlans, protected vlans, and classifier-based packet filters. See the related sections for more information:

- [“Port Trunking” on page 8-10](#)
- [“Filter Modes in 48-Port Switches” on page 8-37](#)

Port Trunking

Port trunking, also known as *port bundling* or *link aggregation*, allows a number of ports to be configured to join together to make a single logical connection of higher bandwidth. This can be used where a higher performance link is required, and makes links even more reliable. Port trunking must be configured on both ends of the link, or network loops may result.

The switch supports static 802.3ad link aggregation, and is also compatible with third party devices that do not support static 802.3ad link aggregation.

The switch supports up to 6 trunk groups, of up to 8 switch ports each. The two gigabit Ethernet ports can also be grouped together to form a trunk group. On 48-port switches, avoid having a trunk group that spans multiple switch instances. It is not possible for a trunk group to include both 10/100 Ethernet and gigabit Ethernet ports. Ports in the trunk group do not have to be contiguous.

To create or destroy port trunk groups on the switch, use the commands:

```
create switch trunk=trunk [port=port-list] [select={macsrc|
macdest|macboth|ipsrc|ipdest|ipboth}] [speed={10M|100M|
1000M}]

destroy switch trunk=trunk
```

Port trunk groups can be destroyed on the switch only when no ports belong to them.

All the ports in a trunk group must have the same VLAN configuration; they must belong to the same VLANs and have the same tagging status. All ports in a trunk group must be added to VLANs together, and can only be deleted from a VLAN as a group. Similarly, if the tagged or untagged status of the ports is changed, it must be changed for all ports in the trunk group at the same time. Also all ports in a trunk group that have the same private VLAN configuration must belong to the same port group.

The members of a trunk group can be specified when it is created, and ports can be added to or removed from a trunk group by using the commands:

```
add switch trunk=trunk port=port-list

delete switch trunk=trunk port={port-list|all}
```

Ports in a trunk group are set to autonegotiate at the trunk speed at full duplex. When a port is added to a trunk group, the speed setting for the group overrides the speed setting previously configured for the port. When a port is removed from a trunk group, the port returns to its previously configured speed and duplex mode settings.

The speed of the trunk group can either be specified when it is created or set by using the command:

```
set switch trunk=trunk [select={macsrc|macdest|macboth|ipsrc|
ipdest|ipboth}] [speed={10M|100M|1000M}]
```

To display information about trunks on the switch, use the command:

```
show switch stp [=trunk]
```

To display the VLANs to which the ports in the trunk groups belong, use the command:

```
show vlan [=all]
```

Link Aggregation Control Protocol (LACP)

The implementation of the Link Aggregation Control Protocol (LACP) follows the IEEE Standard 802.3-2002, *CSMA/CD access method and physical layer specifications*.

LACP operates where systems are connected over multiple communications links. Once LACP has been initially configured and enabled, it automatically creates trunk groups and assigns appropriate links to their membership. LACP continues to monitor these groups and dynamically adds or removes links to them as network changes occur.

LACP achieves this by determining the following:

- which ports are under LACP control
- whether each port is in *LACP active* or *LACP passive* mode
- which system has the highest LACP priority
- the LACP priority of ports
- whether the periodic timeout is fast or slow

Aggregation criteria

For individual links to be formed into an aggregated group they must meet the following criteria:

- originate on the same device
- terminate on the same device
- be members of the same VLANs
- have the same data rate
- share the same admin port key (assigned by using the [add lacp port command on page 8-50](#)).
- be operating in full duplex mode

The hardware must also be capable and have the capacity to handle the number of links to be aggregated.

Aggregated group identification

In order to identify particular aggregated groups, each group is assigned a link aggregation identifier called a *lag ID*. The lag ID comprises the following components for both the local system (called the Actor) followed by their equivalent components for the remote system (called the Partner):

- *system priority* - set by the [set lacp priority command on page 8-97](#).
- *system identifier* - the MAC address of the system
- *port key* - An identifier - created by the LACP software
- *port priority* - set by the [add lacp port command on page 8-50](#).
- *port number* - determined by the device connection

The lag ID can be displayed for each aggregated link by entering the [show lacp trunk command on page 8-121](#)

Packet Storm Protection

Packet storm protection sets limits on the reception rate of broadcast, multicast, and destination lookup failure packets. By default, packet storm protection is disabled. You can enable packet storm protection and set each of the limits by using the command:

```
set switch port=port-list [bclimit={none|limit}]  
[dlflimit={none|limit}] [mclimit={none|limit}]
```

You can display the current packet storm protection settings by using the command:

```
show switch port
```

For 10/100Mbps ports, you can set packet storm protection limits on the following groups of ports:

- ports 1–8
- ports 9–16
- ports 17–24
- ports 25–32
- ports 33–40
- ports 41–48

For gigabit ports, including uplink ports, you can set limits on individual ports.

You can set only one limit for each group of 10/100Mbps ports or an individual gigabit port. If you set a limit for two or more packet types, it must be the same value. For example, you can set both the broadcast (**bclimit**) and multicast (**mclimit**) limits to 200, but you cannot set the broadcast limit to 200 and the multicast limit to another value.

Port Mirroring

Port mirroring allows traffic being received and transmitted on a switch port to be sent to another switch port, the mirror port, usually to capture data with a protocol analyser. The mirror port is the only switch port that belongs to no VLANs, and therefore does not participate in any other switching. Before the mirror port can be set, it must be removed from all VLANs except the default VLAN. The port cannot be part of a trunk group. Mirroring four or more ports may significantly reduce switch performance.

To set a mirror port (and remove it from the default VLAN) use the command:

```
set switch mirror={none|port}
```

If another port was previously set as the mirror port, this command returns the previous mirror port to the default VLAN as an untagged port. Return this port to any VLANs to which it should belong, by using the **add vlan port** command, or set it as a tagged port using the **set vlan port** command if required.

Either traffic received on a port or traffic transmitted by the port, or both, can be mirrored. To set a source port whose traffic is to be sent to a mirror port, use the command:

```
set switch port={port-list|all} mirror={none|rx|tx|both}
```

To send packets that match particular criteria to the mirror port, first create a filter match by using the command:

```
add switch l3filter match
```

Then create a filter entry with the **action** parameter set to **sendmirror** by using the command:

```
add switch l3filter=filter-id entry action=sendmirror.
```

By default, when mirroring is disabled, no mirror port is set and no source ports are set to be mirrored. Mirroring functions when a switch mirror port is set to a valid port. When mirroring is enabled and the switch mirror port is set to **none**, then mirroring can be disabled by using the commands:

```
enable switch mirror
```

```
disable switch mirror
```

The **show switch port** and **show switch** commands display the switch and port mirroring settings.

Port Security

The port security feature allows control over the stations connected to each switch port, by MAC address. If enabled on a port, the switch learns MAC addresses up to a user-defined limit from 1 to 256, then locks out all other MAC addresses. One of the following options can be specified for the action taken when an unknown MAC address is detected on a locked port:

- Discard the packet and take no further action,
- Discard the packet and notify management with an SNMP trap,
- Discard the packet, notify management with an SNMP trap and disable the port.

To enable port security on a port, set the limit for learned MAC addresses to a value greater than zero, and specify the action to take for unknown MAC addresses on a locked port. To disable port security on a port, set the limit for learned MAC addresses to zero or **none**. Port security can be enabled or disabled on a port by using the command:

```
set switch port={port-list|all} learn={none|0|1..256}
[intrusionaction={discard|trap|disable}]
```

If **intrusionaction** is set to **trap** or **disable**, a list of MAC addresses for devices that are active on a port, but which are not allowed or learned for the port, can be displayed (Figure 8-28 on page 8-144) by using the command:

```
show switch port={port-list|all} intrusion
```

If a port is disabled by the Port Security function, use the **set switch port** command on page 8-108 and set **learn=0**.

A switch port can be manually locked before it reaches the learning limit by using the command:

```
activate switch port={port-list|all} lock
```

Addresses can be manually added to a port locked list up to a total of 256 MAC addresses, and the learning limit can be extended to accommodate them. Use the command:

```
add switch filter action={forward|discard} destaddress=macadd
port=port [entry=entry] [learn] [vlan={vlan-name|1..4094}]
```

Learned addresses on locked ports can be saved as part of the switch configuration, so that they become part of the configuration after a power cycle. Use the command:

```
create config=filename
```

If the configuration is not saved when there is a locked list for a port, the learning process begins again after the switch is restarted.

Virtual Local Area Networks (VLANs)

A Virtual LAN (VLAN) is a logical, software-defined subnetwork. It allows similar devices on the network to be grouped together into one broadcast domain, regardless of their physical location in the network. Multiple VLANs can be used to group workstations, servers, stacks, and other network equipment connected to the switch, according to similar data and security requirements.

Decoupling logical broadcast domains from the physical wiring topology offers several advantages, including the ability to:

- Move devices and people with minimal, or no, reconfiguration
- Change a device's broadcast domain and access to resources without physically moving the device, by software reconfiguration or by moving its cable from one switch port to another
- Isolate parts of the network from other parts by placing them in different VLANs
- Share servers and other network resources without losing data isolation or security
- Direct broadcast traffic to only those devices that need to receive it thereby reducing traffic across the network
- Connect 802.1q-compatible switches together through one port on each switch

Devices that are members of the same VLAN exchange data with each other through the switch's switching capabilities. To exchange data between devices in separate VLANs, the switch's routing capabilities are used. The switch passes VLAN status information, indicating whether a VLAN is up or down, to the Internet Protocol (IP) module. IP uses this information to determine route availability.

The switch has a maximum of 255 VLANs, ranging from a VLAN identifier (VID) of 1 to 4094.

When the switch is first powered up, a "default" VLAN is created and all ports are added to it. In this initial unconfigured state, the switch broadcasts all the packets it receives to the default VLAN. This VLAN has a VID of 1 and an interface name of `vlan1`. It cannot be deleted, and ports can be removed from it only when they also belong to at least one other VLAN. When all devices on the physical LAN belong to the same logical LAN (same broadcast domain), the default settings are acceptable and no additional VLAN configuration is necessary.

Dynamic VLAN Assignment

Dynamic VLAN assignment allows a supplicant to be placed into a specific VLAN based on information returned from the RADIUS server during authentication. This limits the network access of a supplicant to a specific VLAN that is tied to their authentication, and prevents supplicants from connecting to VLANs for which they are not authorised. A port's VLAN assignment is determined by the first supplicant to be authenticated on the port.

VLAN assignment is enabled or disabled using the **vlanassignment** parameter of a number of port authentication commands. For more information, see [Chapter 25, Port Authentication](#).

The Configured and Actual fields of the **show vlan** command show which ports are configured for the VLAN and which have been dynamically assigned to the VLAN.

Radius attributes The RADIUS server provides information to the authenticator using RADIUS tunnel attributes, as defined in RFC 2868, *RADIUS Attributes for Tunnel Protocol Support*. The tunnel attributes that must be configured for VLAN assignment are:

- **Tunnel-Type**
The protocol to be used for the tunnel specified by Tunnel-Private-Group-Id. VLAN (13) is the only supported value.
- **Tunnel-Medium-Type**
The transport medium to be used for the tunnel specified by Tunnel-Private-Group-Id. 802 (6) is the only supported value.
- **Tunnel-Private-Group-ID**
The ID of the tunnel the authenticated user should use. This must be the name or ID number of a VLAN on the switch.

These tunnel attributes are included in the Access-Accept message from the RADIUS server to the Authenticator.

Single-host mode In single host mode, VLAN assignment is as follows:

- If authentication fails, the supplicant is denied access to the port. The port is placed in its configured access VLAN, that is, the VLAN it was set up for in the **add vlan** command.
- If the RADIUS server supplies valid VLAN information, the port is placed in the specified VLAN after configuration.
- If the RADIUS server supplies invalid VLAN information, the port is returned to the Unauthorised state, and placed in its configured access VLAN.
- If the RADIUS server supplies no VLAN information, the port is placed in its configured access VLAN after successful authentication.
- If port authentication is disabled on the port, the port is returned to its configured access VLAN.
- When the port is in the Force Authorized, Force Unauthorized or the Unauthorized state, it is placed in its configured access VLAN.

While the port is in a RADIUS server assigned VLAN, changes to the port's configured access VLAN do not take effect until the port leaves the assigned VLAN. This can occur if:

- the last authentication session on the port expires
- the link goes down
- port authentication is disabled on the port
- port authentication is disabled on the system

Multi-supPLICANT mode VLAN assignment can be run in multi-supPLICANT mode, if the multi-supPLICANT mode is enabled. In multi-supPLICANT mode, the behaviour is dictated by which supPLICANT is authenticated first.

If the multi-supPLICANT mode is enabled on a port authentication port, the behaviour of the first authenticated supPLICANT is the same as that of a supPLICANT in single-supPLICANT mode. For all further supPLICANTS, the **securevlan** parameter specifies the action that is taken when authenticating any supPLICANTS after the first supPLICANT has authenticated. There are two possible actions:

- **securevlan=on**
Only those supPLICANTS with a VLAN that is the same as that of the first authenticated supPLICANT are authenticated. This is the default, and is the more secure action.
- **securevlan=off**
All further authenticated supPLICANTS are placed in the same VLAN as the first authenticated supPLICANT. This action is less secure.

802.1x Guest VLAN

802.1x ports can be configured with a limited access guest VLAN, which is used when no 802.1x host is currently attached to the port. This limited access VLAN is defined using the **guestvlan** parameter.

As soon as a single 802.1x packet is received on the port, it is removed from the guest VLAN, and put into its configured access VLAN in the Unauthenticated state. This effectively disables the guest VLAN on the port until the port's link goes down.

A guest VLAN can only be configured for a port that is running in single-supPLICANT mode.

VLAN Tagging

An Ethernet packet can contain a *VLAN tag* with fields that specify VLAN membership and user priority. The VLAN tag is described in IEEE Standard 802.3ac, and is four octets that can be inserted between the Source Address and the Type/Length fields in the Ethernet packet ([Figure 8-4 on page 8-17](#)). To accommodate the tag, IEEE Standard 802.3ac also increased the maximum allowable length for an Ethernet frame to 1522 octets (the minimum size is 64 octets). IEEE Standard 802.1q specifies how the data in the VLAN tag switches frames. VLAN-aware devices are able to add the VLAN tag to the packet header. VLAN-unaware devices cannot set or read the VLAN tag.

Table 8-1 on page 8-17 lists the meaning and use of the fields in the Ethernet frame. Figure 8-4 on page 8-17 shows the format of VLAN data in an Ethernet frame. Twelve bits of the tag are the VLAN Identifier (VID), which indicates the VLAN to which the packet belongs. Table 8-2 on page 8-17 lists the VLAN Identifier values that have specific meaning.

Table 8-1: Fields in the Ethernet frame for QoS and VLAN switching

Field	Length	Meaning and use
TPID	2 octets	The Tag Protocol Identifier (TPID) is defined by IEEE Standard 802.1q as 0x81-00.
User Priority	3 bits	The User Priority field is the priority tag for the frame, which can be used by the switch to determine the Quality of Service to apply to the frame. The three bit binary number represents eight priority levels, 0 to 7.
CFI	1 bit	The Canonical Format Indicator (CFI flag) indicates whether all MAC address information that may be present in the MAC data carried by the frame is in canonical format.
VID	12 bits	The VLAN Identifier (VID) field uniquely identifies the VLAN to which the frame belongs.

Figure 8-4: Format of user priority and VLAN data in an Ethernet frame

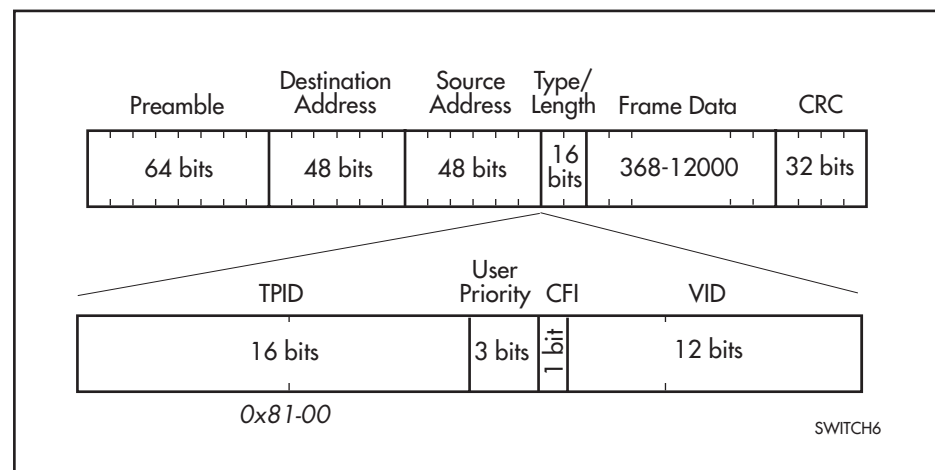


Table 8-2: Reserved VID values

VID value (hex)	Meaning and use of reserved VID values
0	The null VLAN ID. Indicates that the tag header contains only user priority information; no VLAN Identifier is present in the frame. This VID value must not be configured in any forwarding database entry, or used in any management operation. Frames that contain the null VLAN ID are also known as priority-tagged frames.
1	The default VID value used for classifying frames on ingress through an untagged switch port.
FFF	Reserved for implementation use. This VID value must not be configured in any forwarding database entry, used in any management operation, or transmitted in a tag header.

Ethernet packets that contain a VLAN tag are referred to as *tagged frames*, and switch ports that transmit tagged frames are referred to as *tagged ports*.

Ethernet packets that do not contain a VLAN tag are referred to as *untagged frames*, and switch ports that transmit untagged frames are referred to as *untagged ports*. VLANs can consist of simple logical groupings of untagged ports in which the ports receive and transmit untagged packets. Alternatively, VLANs can contain only tagged ports or a mixture of tagged and untagged ports.

The switch is VLAN-aware. It can accept VLAN tagged frames, and supports the VLAN switching required by such tags. A network can contain a mixture of VLAN-aware devices, for example, other 802.1q-compatible switches, and VLAN-unaware devices, for example, workstations and legacy switches that do not support VLAN tagging. The switch can be configured to send VLAN tagged or untagged frames on each port, depending on whether the devices connected to the port are VLAN-aware. By assigning a port to two different VLANs, to one as an untagged port and to another as a tagged port, it is possible for the port to transmit both VLAN-tagged and untagged frames. A port must belong to a VLAN at all times unless the port has been set as the mirror port for the switch.

Every frame admitted by the switch has a VID associated with it. When a frame arrives on a tagged port, the associated VID is determined from the VLAN tag the frame had when it arrived. When a frame arrives on an untagged port, it is associated with the VID of the VLAN for which the incoming port is untagged. When the switch forwards a frame over a tagged port, it adds a VLAN tag to the frame. When the switch forwards the frame over an untagged port, it transmits the frame as a VLAN-untagged frame, not including the VID in the frame.

The VLAN tag that the switch adds to a frame on egress depends on whether the frame is switched in Layer 2 or Layer 3. In Layer 3 switching, the switch determines the destination VLAN from its routing tables. The VID of the destination VLAN is added to the frame on egress. In Layer 2 switching, the frame's source and destination VLANs are the same. The VID that was associated with the frame on ingress is associated with it on egress.

VLAN membership using VLAN tags

Ports can belong to many VLANs as tagged ports. Because VLAN tags determine to which VLAN a packet belongs, it is easy to:

- Share network resources, such as servers and printers, across several VLANs
- Configure VLANs that span several switches

For tagged ports, the switch uses the VID of incoming frames, and the frame's destination field to switch traffic through a VLAN aware network. Frames are transmitted only on ports belonging to the required VLAN. Other vendors' VLAN-aware devices on the network can be configured to accept traffic from one or more VLANs. A VLAN-aware server can be configured to accept traffic from many different VLANs, and then return data to each VLAN without mixing or leaking data into the wrong VLANs.

Figure 8-5 on page 8-19 shows a network configured with VLAN tagging. Table 8-3 on page 8-19 shows the VLAN membership. The server on port 2 on Switch A belongs to both the *admin* and *marketing* VLANs. The two switches are connected through uplink port 26 on Switch A and uplink port 25 on Switch B, which belong to both the *marketing* VLAN and the *training* VLAN, so devices on both VLANs can use this link.

Figure 8-5: VLANs with tagged ports

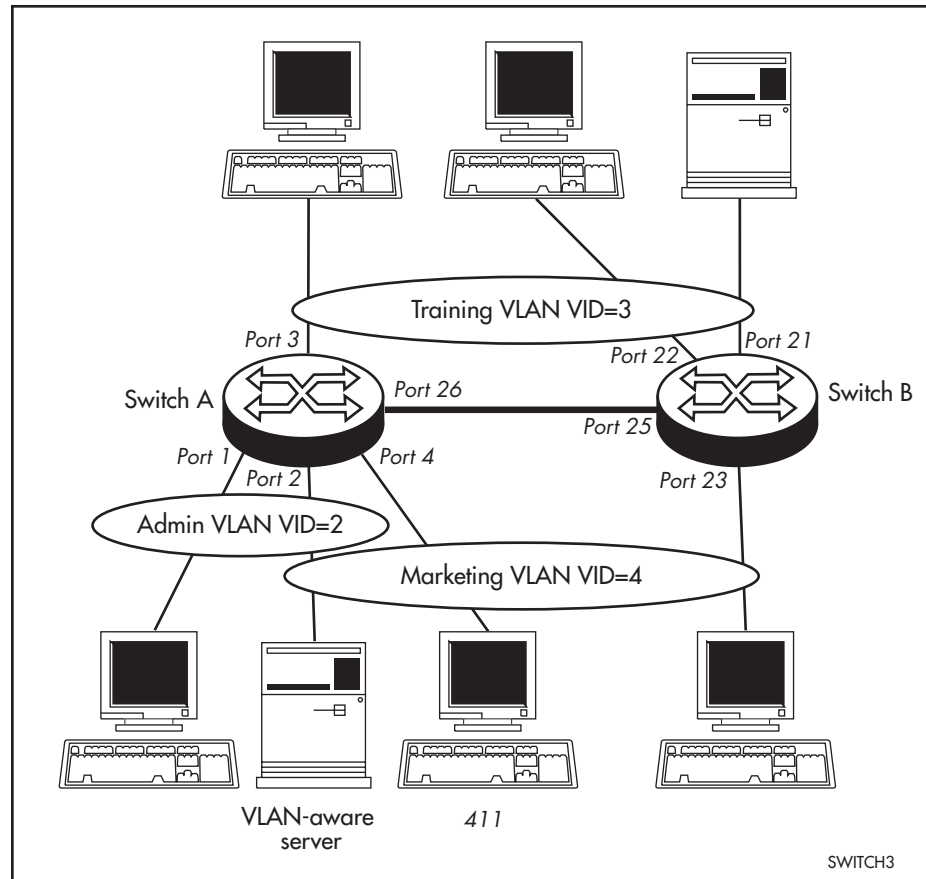


Table 8-3: VLAN membership of example of a network using tagged ports

VLAN	Member ports
Training	3, 26 on Switch A 21, 22, 25 on Switch B
Marketing	2, 4, 26 on Switch A 23, 25 on Switch B
Admin	1, 2 on Switch A

VLAN Membership of Untagged Packets

A VLAN that does not send VLAN-tagged frames is a logical grouping of ports. All untagged traffic arriving at those ports belongs to that VLAN.

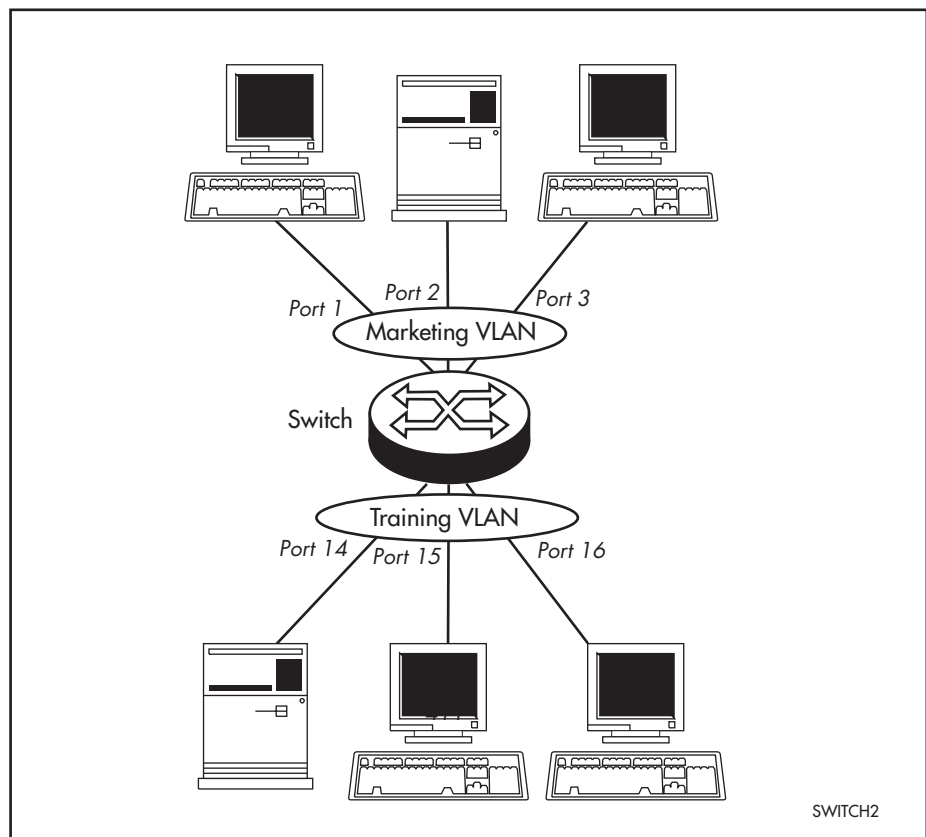
VLANs based on untagged ports are limited because each port can belong only to one VLAN as an untagged port. Limitations include:

- It is difficult to share network resources, such as servers and printers, across several VLANs. The routing functions in the switch must be configured to interconnect using untagged ports only.
- A VLAN that spans several switches requires a port on each switch for the interconnection of the various parts of the VLAN. When there are several VLANs in the switch that span more than one switch, then many ports are occupied with connecting the VLANs, and so are unavailable for other devices.

If the network includes VLANs that do not need to share network resources or span several switches, VLAN membership can usefully be based on untagged ports. Otherwise, VLAN membership should be determined by tagging (see “VLAN Tagging” on page 8-16).

Figure 8-6 on page 8-20 shows two port-based VLANs with untagged ports. Ports 1-3 belong to the *marketing* VLAN, and ports 14-16 belong to the *training* VLAN. The switch acts as two separate bridges: one that forwards traffic between the ports belonging to the *marketing* VLAN, and a second one that forwards traffic between the ports belonging to the *training* VLAN. Devices in the *marketing* VLAN can communicate with devices in the *training* VLAN only by using the switch’s routing functions.

Figure 8-6: VLANs with untagged ports



Creating VLANs

To summarise the process:

1. Create the VLAN.
2. Add tagged ports to the VLAN, if required.
3. Add untagged ports to the VLAN, if required.

To create a VLAN, use the command:

```
create vlan=vlan-name vid=2..4094
```

Every port must belong to a VLAN unless it is the mirror port. By default, all ports belong to the default VLAN as untagged ports.

To add tagged ports to a VLAN, use the command:

```
add vlan={vlan-name|1..4094} port={port-list|all}  
frame=tagged
```

A port can be tagged for any number of VLANs.

To add untagged ports to a VLAN, use the command:

```
add vlan={vlan-name|1..4094} port={port-list|all}  
[frame=untagged]
```

A port can be untagged for zero or one VLAN. A port can be added only to the default VLAN as an untagged port when it is not untagged for another VLAN. A port cannot transmit both tagged and untagged frames for the same VLAN (that is, it cannot be added to a VLAN as both a tagged and an untagged port).

To remove ports from a VLAN, use the command:

```
delete vlan={vlan-name|1..4094} port={port-list|all}
```

Removing an untagged port from a VLAN returns it to the default VLAN unless it is a tagged port for another static VLAN. An untagged port can be deleted from the default VLAN only when the port is a tagged port for another static VLAN.

Ports tagged for some VLANs and left in the default VLAN as untagged ports transmit broadcast traffic for the default VLAN. If this is not required, the unnecessary traffic in the switch can be reduced by deleting those ports from the default VLAN.

To change the tagging status of a port in a VLAN, use the command:

```
set vlan={vlan-name|1..4094} port={port-list|all}  
frame=tagged
```

To destroy a VLAN, use the command:

```
destroy vlan={vlan-name|2..4094|all}
```

VLANs can be destroyed only when no ports belong to them.

To display the VLANs configured on the switch, use the command:

```
show vlan[={vlan-name|1..4094|all}]
```

Information that may be useful for troubleshooting a network can be displayed with the VLAN debugging mode. This is disabled by default, and can be enabled for a specified time, disabled, and displayed using the commands:

```
enable vlan={vlan-name|1..4094|all} debug={pkt|all}
[output=console] [timeout={1..4000000000|none}]

disable vlan={vlan-name|1..4094|all} debug={pkt|all}

show vlan debug
```

To view packet reception and transmission counters for a VLAN, use the command (see the *Interfaces* chapter of the switch's Software Reference):

```
show interface=vlan counter
```

Summary of VLAN Tagging Rules

When designing a VLAN and adding ports to VLANs, consider the following rules:

- Except for the mirror port, each port must belong to at least one static VLAN. By default, a port is an untagged member of the default VLAN.
- A port can be untagged for zero or one VLAN. A port that is untagged for a VLAN transmits frames destined for that VLAN without a VLAN tag in the Ethernet frame.
- A port can be tagged for zero or more VLANs. A port that is tagged for a VLAN transmits frames destined for that VLAN with a VLAN tag, including the numerical VLAN Identifier of the VLAN.
- A port cannot be untagged and tagged for the same VLAN.
- If a mirror port is present, it is not a member of any VLAN.

VLAN Interaction with Trunk Groups

All the ports in a trunk group must have the same VLAN configuration. They must belong to the same VLANs and have the same tagging status; and they must be operated on as a group.

Static and Dynamic VLANs

All VLANs you create on the command line are static VLANs. The default VLAN is also a static VLAN. A port must belong to at least one static VLAN.

Dynamic VLANs are created by GVRP, a GARP application whose purpose is to propagate VLAN information between VLAN aware switches (see the *Generic Attribute Registration Protocol (GARP)* chapter). These dynamic VLANs are entitled gvrpxxx, where xxx is the VLAN's VLAN Identifier. Dynamic VLANs are created only when GVRP is enabled on the switch. GVRP is disabled by default.

All static VLANs except for the default VLAN can be destroyed by the user. Dynamic VLANs cannot be directly destroyed by the user, but may be destroyed according to the operations of GVRP by using the [reset garp command on page 10-16 of Chapter 10, Generic Attribute Registration Protocol \(GARP\)](#) or by disabling the GVRP instance.

A user can add, delete, or modify ports for a static VLAN but not for a dynamic VLAN. Dynamic VLANs created by GVRP include only tagged ports.

Protected VLANs

Layer 2 traffic is blocked between ports that are members of a protected VLAN. However, traffic can be Layer 3 switched to another VLAN. This feature prevents members of a protected VLAN from communicating with each other but lets members access another network. Layer 3 routing between ports in a protected VLAN can be prevented by adding a Layer 3 filter. The protected VLAN feature also allows all of the members of the protected VLAN to be in the same subnet.

A typical application is a hotel installation where each room has a port for accessing the Internet. In this situation, it is undesirable to allow communication between rooms.

To create a protected VLAN, use the [create vlan command on page 8-68](#) with the **protected** parameter. Protected VLANs cannot be configured on the same switch as private VLANs.

You can configure protected VLANs that span both switch instances.

Private VLANs

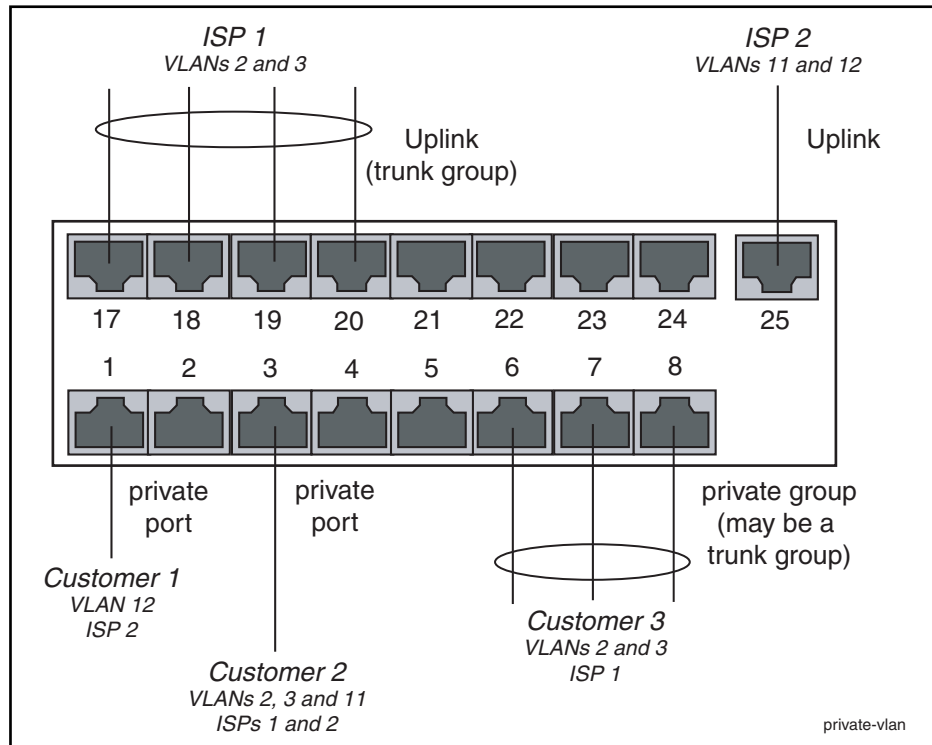
A private VLAN contains switch ports that are isolated from other ports in the VLAN, but can access another network through one or more uplink ports or uplink trunk groups. These ports are called *private ports*. Private ports may be standalone or be combined into groups. Standalone private ports can only communicate with the uplink ports, not with other ports in the VLAN. Private ports that are in a group can communicate with other ports in the group and with the uplink ports, but cannot communicate with the other private ports in the VLAN. Note that when adding a trunk group to a private VLAN as private ports, you *must* specify the group parameter.

The switch forwards traffic between private ports and the uplink ports, and between private ports within a group, according to its normal forwarding rules. The only difference is that forwarding to other private ports is blocked unless the ports are in the same group. Note that all traffic between private ports is blocked, not only Layer 2 traffic.

A typical application is a hotel installation where each room has a port for accessing the Internet. In this situation, it is undesirable to allow communication between rooms. Another application is to simplify IP address assignment. Ports can be isolated from each other while belonging to the same subnet.

[Figure 8-7 on page 8-24](#) shows an example of a network using private VLANs. In this scenario, two service providers are each providing multiple services through multiple VLANs over separate uplinks. Customers are subscribed to services from one or both service providers. Each customer's ports are isolated from other customers, but communicate with the ISP or ISPs through the appropriate uplink port. A single customer may use multiple ports, connected to individual PCs or trunked together to increase bandwidth. If a customer uses multiple ports, these ports are able to communicate with each other.

Figure 8-7: Example network configuration using private VLANs



Membership rules for private VLANs

Each private VLAN:

- Must contain at least one uplink port or uplink trunk group
- May contain multiple private ports
- Can be configured to span switch instances
- Cannot contain any non-private ports
- Cannot be the default VLAN (vlan1)
- Cannot be configured on the same switch as a protected VLAN

Each private port:

- Can be a member of multiple private VLANs
- Cannot be a private port in some VLANs and a non-private port in other VLANs
- Cannot be an uplink port in another VLAN

Each uplink port:

- Can be a member of multiple private VLANs
- Cannot be a member of both private and non-private VLANs

Each private or uplink port:

- May be tagged or untagged but can only be an untagged member of one port-based VLAN
- May be trunked with other ports of the same type

Configuring private VLANs

To create a private VLAN and add ports to it

1. Create the VLAN.

To create a private VLAN, use the command:

```
create vlan=vlan-name vid=2..4094 private
```

2. Add the uplink port or trunk group.

To add the uplink or uplinks to a private VLAN, use one of the commands:

```
add vlan={vlan-name|1..4094} port=port-list  
[frame={untagged|tagged}] uplink
```

where *port-list* is a single port number or a list of port numbers. If you are adding a trunk group to the VLAN as an uplink, the ports must already be trunked together, and you must specify all the ports.

3. Add the private ports.

To add a private port or ports to a private VLAN, use the command:

```
add vlan={vlan-name|1..4094} port={port-list|all}  
[frame={untagged|tagged}] [group]
```

The **group** parameter specifies that the listed ports may communicate with each other, but not with any other private ports in the VLAN.

4. Delete ports from a private VLAN as necessary.

To delete private ports from a private VLAN, use one of the commands:

```
delete vlan={vlan-name|1..4094} port=port-list  
delete vlan={vlan-name|1..4094} port=all
```

A private VLAN cannot contain private ports when the last uplink is deleted from the VLAN, because a private VLAN must always have an uplink. To delete all uplink and private ports from a private VLAN, use the **port=all** option in the above command.

If the port is a member of a private group, you must delete all ports in the group at once. This stops groups from having different member ports in different VLANs.

VLAN Relaying

VLAN relaying allows the passage of traffic between the VLANs on one switch, for protocols that are not processed by the switch's routing functions. Particular protocols or protocol groups can be specified, and filtering occurs on the basis of protocol identification number. VLAN relaying is similar to the bridging function of an Allied Telesis router.

Protocol names have been predefined for many protocol types. Those protocols that are transferred by VLAN relay and that have predefined names are given in [Table 8-4 on page 8-26](#), with their associated protocol identification numbers. Other protocols can be specified by entering their protocol identification numbers. Protocols that the switch routes cannot be VLAN relayed. These include IP, IPX, AppleTalk, STP, and GARP.

Table 8-4: Predefined protocol types implemented by VLAN relay

Protocol Name	Protocol Number	Encapsulation
All802	all SAP protocols	SAP
Netbeui	F0	SAP
SNA Path Control	04	SAP
PROWAY-LAN	0E	SAP
EIA-RS	4E	SAP
PROWAY	8E	SAP
ISO CLNS IS	FE	SAP
AllEthII	all EthII protocols	EthII
XEROX PUP	0200	EthII
PUP Addr Trans	0201	EthII
XEROX NS IDP	0600	EthII
X.75 Internet	0801	EthII
NBS Internet	0802	EthII
ECMA Internet	0803	EthII
Chaosnet	0804	EthII
X.25 Level 3	0805	EthII
XNS Compat	0807	EthII
Banyan Systems	0BAD	EthII
BBN Simnet	5208	EthII
DEC MOP Dump/Ld	6001	EthII
DEC MOP Rem Cons	6002	EthII
DEC LAT	6004	EthII
DEC Diagnostic	6005	EthII
DEC Customer	6006	EthII
DEC LAVC	6007	EthII
RARP	8035	EthII
DEC LANBridge	8038	EthII
DEC Encryption	803D	EthII
IBM SNA	80D5	EthII
SNMP	814C	EthII
AllSNAP	all SNAP protocols	SNAP

VLAN relaying operates in the following stages:

1. The user creates one or more VLAN relay entities and adds the required VLANs and protocols to each entity.
2. The VLAN relay entity attaches to each specified VLAN and receives traffic. If more than one VLAN relay entity is attached to the same VLAN for the same protocol type, an intermediate attachment level receives the packet, duplicates it, and sends it to separate VLAN relay entities as required.

3. The VLAN relay entity sends the packet to the appropriate destination VLAN. Destination addresses are determined from the switch's learned address tables. If the destination address cannot be found, the packet is sent to all ports on all VLANs that are part of the VLAN relay entity. If the packet is destined for the VLAN on which it was received, the relaying entity does not send it to that VLAN because the packet causes a destination lookup failure, and the switch itself sends the packet to all ports in the VLAN.

Configuring VLAN Relaying

To configure VLAN relaying on the switch, first create a VLAN relay entity and give it a unique name, using the command:

```
create vlanrelay=name
```

An existing VLAN relay entity can be disabled or destroyed using the commands:

```
disable vlanrelay=name
```

```
destroy vlanrelay=name
```

In many networks, only one VLAN relay entity is required. The following configurations are examples of situations when more than one VLAN relay entity is used.

- If a number of protocols and VLANs are part of VLAN relaying but not all protocols on all VLANs, then setting up a number of VLAN relay entities allows only relevant protocols and VLANs to be part of relaying.
- If traffic is to be relayed between certain VLANs but not others (for example, between VLAN 1 and VLAN 2, and between VLAN 1 and VLAN 3, but not between VLAN 2 and VLAN 3), then separate VLAN relay entities are required.

To initiate relaying, add the VLANs which packets are to be sent between, and the desired protocols, to the VLAN relay entity, by using the command:

```
add vlanrelay=name [protocol=protocoltype] [vlan={vlan-name|  
1..4094}]
```

Protocols are specified by protocol type and number, or by allowing all protocols of a certain type. A predefined list of common protocols is provided in [Table 8-4 on page 8-26](#).

VLANs and/or protocols can be removed from an existing VLAN relay entity by using the command:

```
delete vlanrelay=name [protocol=protocoltype]  
vlan=[{vlan-name|1..4094}]
```

A count of the packets relayed by the VLAN relay entity or entities, which shows the packets relayed from and to each VLAN, can be displayed by using the command:

```
show vlanrelay[-name]
```

The traffic being relayed, including the source and destination VLANs and the relevant VLAN relay entity, can be displayed by using the command:

```
enable vlanrelay debug
```

VLAN relay debugging can be disabled by using the command:

```
disable vlanrelay debug
```

Debugging is disabled by default. It can be enabled for one specified VLAN relay entity, and can be disabled for all entities or for a specified entity.

The Layer 2 Switching Process

The Layer 2 switching process comprises related but separate processes:

- [The Ingress Rules](#)
- [The Learning Process](#)
- [The Forwarding Process](#)
- [The Egress Rules](#)

Ingress rules admit or discard frames based on their VLAN tagging.

The Learning process learns the MAC addresses and VLAN membership of frames admitted on each port.

The Forwarding process determines to which ports the frames are forwarded, and the Quality of Service priority with which they are transmitted.

Finally, Egress rules determine for each frame whether VLAN tags are included in the Ethernet frames that are transmitted. These processes assume that each station on the extended LAN has a unique data link layer address, and that all data link layer frames have a header that includes the source (sender's) MAC address and destination (recipient's) MAC address.

The Ingress Rules

When a frame first arrives at a port, ingress rules for the port check the VLAN tagging in the frame to determine whether to discard it or forward it to the learning process.

The first check depends on whether the Acceptable Frame Types parameter is set to Admit All Frames or to Admit Only VLAN Tagged Frames. A port that transmits only VLAN tagged frames is automatically set to Admit Only VLAN Tagged Frames regardless of the VLAN to which the port belongs. The user cannot change this setting. Frames with a null numerical VLAN Identifier (VID) are VLAN-untagged frames or frames with priority tagging only.

Every frame received by the switch must be associated with a VLAN. When a frame is admitted by the Acceptable Frame Types parameter, the second part of the Ingress Rules associates each untagged frame admitted with the VID of the VLAN for which the port is untagged.

Every port belongs to one or more VLANs so every incoming frame has a VID that shows to which VLAN it belongs. The final part of the Ingress Rules depends on whether *Ingress Filtering* is enabled for the port. If Ingress Filtering is disabled, all frames are passed on to the Learning Process, regardless of which VLAN they belong to. If Ingress Filtering is enabled, frames are admitted only when they have the VID of a VLAN to which the port belongs. Otherwise, they are discarded.

The default settings for the Ingress Rules are to Admit All Frames, and for Ingress Filtering to be off. This means that if no VLAN configuration has been done, all incoming frames pass to the learning process, regardless of whether or not they are VLAN tagged. The parameters for each port's ingress rules can be configured by using the command:

```
set switch port={port-list|all} [acceptable={vlan|all}]  
[infiltering={on|off}]
```

The Learning Process

The learning process uses an *adaptive learning* algorithm, sometimes called *backward learning*, to discover the location of each station on the extended LAN.

All frames admitted by the Ingress Rules on any port are passed on to the Forwarding Process if they are for destinations within the same VLAN. Frames destined for other VLANs are passed to the layer three protocol, for instance IP. For every frame admitted, the frame's source MAC address and numerical VLAN Identifier (VID) are compared with entries in the forwarding database for the VLAN (also known as a MAC address table, or a forwarding table) maintained by the switch. The forwarding database contains one entry for every unique station MAC address the switch knows in each VLAN.

If the frame's source address is not already in the forwarding database for the VLAN, the address is added and an ageing timer for that entry is started. If the frame's source address is already in the forwarding database, the ageing timer for that entry is restarted. Switch learning is enabled by default; it can be disabled or enabled by using the commands:

```
disable switch learning  
  
enable switch learning
```

If the ageing timer for an entry in the forwarding database expires before another frame with the same source address is received, the entry is removed from the forwarding database. This prevents the forwarding database from being filled up with information about stations that are inactive or have been disconnected from the network, while ensuring that entries for active stations are kept alive in the forwarding database. The ageing timer is enabled by default; it can be disabled or enabled by using the commands:

```
enable switch ageingtimer  
  
disable switch ageingtimer
```

If switch learning is disabled and the ageing timer has aged out all dynamically learned filter entries, only statically entered MAC source addresses are used to decide which packets to forward or discard. If the switch finds no matching entries in the forwarding database during the Forwarding Process, then all switch ports in the VLAN are flooded with the packet, except the port on which the packet was received.

The default of the ageing timer is 300 seconds (5 minutes) but can be modified by using the command:

```
set switch ageingtimer
```

The forwarding database relates a station's (source) address to a port on the switch, and is used by the switch to determine from which port to transmit frames with a destination MAC address matching the entry in the station map.

To display the contents of the forwarding database, use the command:

```
show switch fdb [address=macadd] [discard={source|
destination}] [hit={yes|no}] [l3={yes|no}]
[port={portlist|all}] [status={static|dynamic}]
[vlan={vlan-name|1..4094}]
```

To display general switch settings, including settings for switch learning and the switch ageing timer, use the command:

```
show switch
```

The Forwarding Process

The forwarding process forwards received frames that are to be relayed to other ports in the same VLAN, filtering out frames on the basis of information contained in the station map and on the state of the ports. When a frame is received on the port for a destination in a different VLAN, it is either Layer 3 switched if it is an IP packet, or looked up in the Layer 3 routing tables.

Forwarding occurs only when the port on which the frame was received is in the Spanning Tree forwarding or disabled states. The destination address is then looked up in the forwarding database for the VLAN. If the destination address is not found, the switch floods the frame on all ports in the VLAN except the port on which the frame was received. If the destination address is found, the switch discards the frame if the port is not in the STP forwarding or disabled states, if the destination address is on the same port as the source address, or if there is a static filter entry for the destination address set to **discard** (see [“Layer 2 Filtering” on page 8-32](#)). Otherwise, the frame is forwarded on the indicated port.

This whole process can further be modified by the action of static switch filters. These are configurable filters that allow switched frames to be checked against a number of entries.

The forwarding process provides storage for queued frames to be transmitted over a particular port or ports. More than one transmission queue may be provided for a given port. The transmission queue where a frame is sent is determined by the user priority tag in the Ethernet frame and the Quality of Service mapping (see [“Quality of Service” on page 8-31](#)).

The Egress Rules

After the forwarding process determines the ports and transmission queues from which a frame is forwarded, the Egress Rules for each port determine whether the outgoing frame is VLAN-tagged with its numerical VLAN Identifier (VID).

When you add a port to a VLAN, configure it to transmit either untagged or VLAN tagged packets by using the command:

```
add vlan={vlan-name|1..4094} port={port-list|all}
[frame={tagged|untagged}]
```

To change this setting for a port that is already part of a VLAN, use the command:

```
set vlan={vlan-name|1..4094} port={port-list|all}
frame={untagged|tagged}
```

Quality of Service

The switch hardware has a number of Quality of Service (QoS) *egress queues* that can be used to give priority to the transmission of some frames over other frames on the basis of their user priority tagging. The user priority field in an incoming frame (with value 0 to 7) determines which of the eight priority levels the frame is allocated. When a frame is forwarded, it is sent to a QoS egress queue on the port determined by the mapping of priority levels to QoS egress queues.

By default, all frames in the first QoS queue are sent before frames in the second QoS egress queue, and so on, until frames in the last QoS egress queue, which are sent when there are no frames waiting to be sent in any of the higher QoS egress queues (strict priority queue scheduling). Other queue scheduling mechanisms are available if you configure QoS; see [“Class of Service \(CoS\) Queue Scheduling” on page 22-11 of Chapter 22, Quality of Service \(QoS\)](#) for more information.

The mapping between user priority and a QoS egress queue can be configured by using the command:

```
set switch qos
```

The switch has four QoS egress queues. It has a default mapping of priority levels to QoS egress queues as defined in IEEE Standard 802.1q ([Table 8-5](#)).

Table 8-5: Default priority level to queue mapping for four QoS egress queues

Priority level	QoS Egress Queue
0	1
1	0
2	0
3	1
4	2
5	2
6	3
7	3

To display the mapping of user priority to QoS egress queues, use the command:

```
show switch qos
```

Layer 2 Filtering

The switch has a forwarding database, entries that determine whether frames are forwarded or discarded over each port. Entries in this forwarding database are created dynamically by the learning process. A dynamic entry is automatically deleted from the Forwarding Database when its ageing timer expires. Filtering is specified in the IEEE Standard 802.1d.

The user can configure static switch filter entries using the command line interface. Static switch filter entries associate a MAC address with a VLAN and a port in the VLAN. When the switch receives a frame with a destination address and VLAN Identifier that match those of a static filter entry, the frame can be either forwarded to the port specified in the static filter entry, or discarded.

When a port is part of a trunk group, any static switch filters defined to forward traffic out that port are modified if the port goes link-down. By changing the egress port for the filter to a port within the trunk group which is link-up, the switch ensures that traffic flow is not interrupted.

The forwarding database supports queries by the forwarding process as to whether frames with given values of the destination MAC address field should be forwarded to a given port.

To add or delete a static switch filter entry, use the command:

```
add switch filter action={forward|discard} destaddress=macadd
port=port [entry=entry] [learn] [vlan={vlan-name|1..4094}]

delete switch filter port=port entry=entry-list
```

To display current static and learned switch filter entries, use the command:

```
show switch filter [port={port-list|all}]
[destaddress=macadd] [entry=entrylist] [vlan={vlan-name|
1..4094}]
```

For each VLAN, the destination MAC address of a frame to be forwarded is checked against the forwarding database. If there is no entry for the destination address and VLAN, the frame is transmitted on all ports in the VLAN that are in the forwarding or disabled states, except the port on which the frame was received. This process is referred to as *flooding*. If an entry is found in the forwarding database, but the entry is not marked as forwarding or it points to the same port the frame was received on, the frame is discarded. Otherwise, the frame is transmitted on the port specified by the entry in the forwarding database.

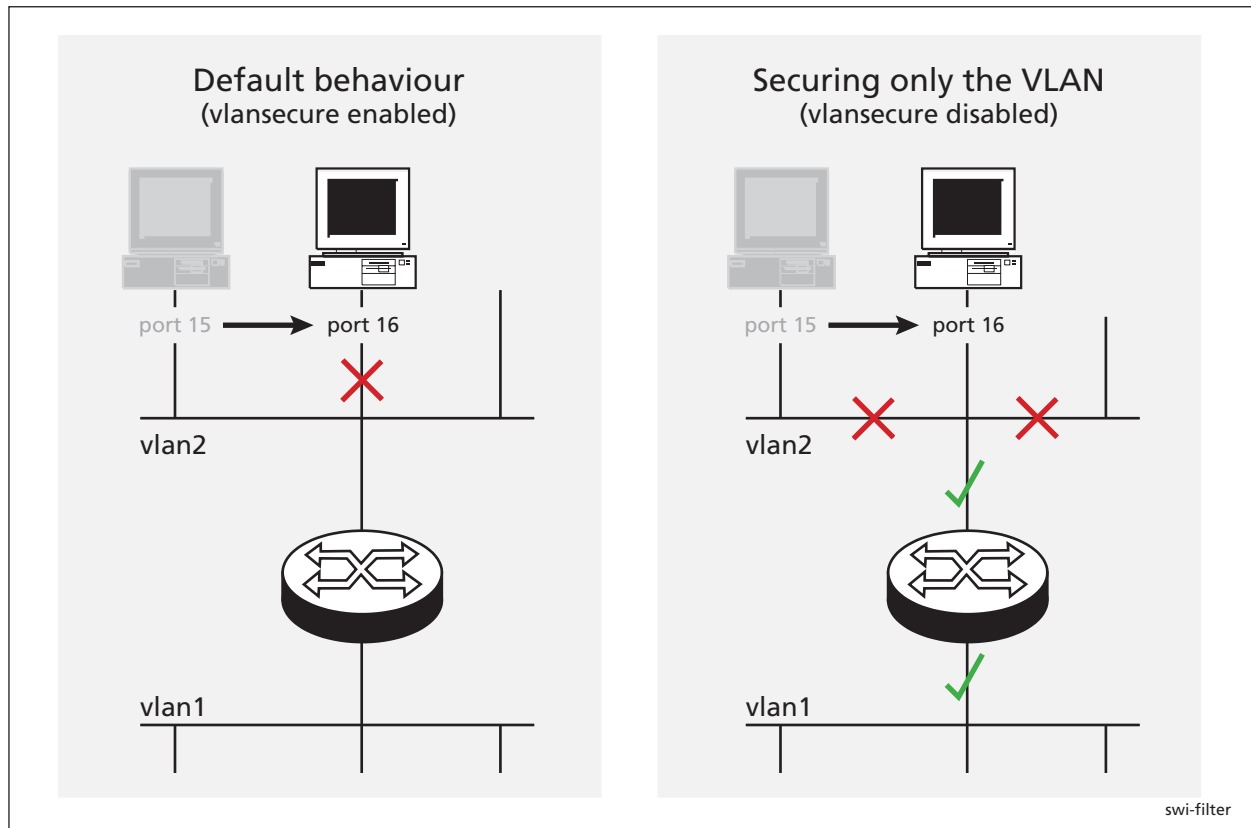
Securing a Single VLAN through Switch Filters

On 24-port switches, you can use switch filters to secure only the current VLAN, instead of securing all VLANs on the switch. To turn on this feature, you disable “vlansecure” mode for filters (see [“Configuring vlansecure” on page 8-33](#)).

In vlansecure mode (the default situation) a switch filter only allows a host to access the network through a particular port on the switch. For example, if you have a PC connected to port 15 in vlan2, and define the following filter, the PC can only communicate when it is connected to port 15:

```
add switch filter entry=0 dest=pc-mac-address vlan=2 port=15
action=forward
```


When you turn off vlansecure mode, the above filter limits the host to accessing vlan2 through port 15, but does not prevent the host from accessing other VLANs through other ports in vlan2. For example, if the above filter exists and you move the PC to another port in vlan2, turning off vlansecure mode prevents the PC from communicating with devices in vlan2 but allows it access to other VLANs on the switch. The following figure shows a PC that has been moved from port 15 to port 16 to illustrate the effect.



Configuring vlansecure

To turn off the default behaviour, so that the filter prevents access to only the current VLAN when you move the host, use the command:

```
disable switch filter vlansecure
```

To return to the standard filter behaviour, use the command:

```
enable switch filter vlansecure
```

To display which mode the filtering behaviour is in, use the command:

```
show switch filter
```

Hardware Packet Filters

The switch hardware can be configured to discard, forward, mirror, or change the priority of packets matching specified criteria at wire speed. Filters can also be configured to provide a range of Quality of Service (QoS) controls, including changing the DSCP byte, and actions can be specified for packets that match the ingress and egress ports of the filter (if set), but do not match the filter's other parameters.

Two sets of commands are available, one based on the Packet Classifier (see [Chapter 21, Generic Packet Classifier](#)), and one based on Layer 3 filter matches and entries. These two filter types cannot be used together. See the sections Classifier-Based Packet Filters on page 34 and Layer 3 Based Packet Filters on page 38 for details about using the filter types.

Classifiers and hardware packet filters can be configured to provide Access Control List functionality. See the section [“Access Control Lists \(ACLs\)” on page 8-39](#) for further details.

When Internet Group Management Protocol (IGMP) snooping is enabled, it uses a hardware filter, which reduces the number of available filters. IGMP snooping is enabled by default, but can be disabled to make its filter available by using the command:

```
disable igmpsnooping
```

When IGMP snooping is disabled, multicast packets flood the VLAN.

IGMP snooping cannot be enabled unless a filter is available. To enable IGMP snooping, use the command:

```
enable igmpsnooping
```

For more information, see [“IGMP Snooping” on page 17-24 of Chapter 17, IP Multicasting](#).

Classifier-Based Packet Filters

The switch hardware can be configured through entries in the Packet Classifier to copy, drop, forward, and associate QoS attributes to Layer 3 packets that match the criteria set using the classifier (see [Chapter 22, Quality of Service \(QoS\)](#) and [Chapter 21, Generic Packet Classifier](#)).

Every packet passing through the switch is matched against a series of classification tables by the Packet Classifier. Packets can be classified according to:

- Packet type
- Physical source/destination port
- Layer 3 protocol
- Source/destination IP address
- Destination IPX address
- Layer 4 protocol (for example: TCP/UDP/Socket number)
- Layer 4 source/destination ports
- Any 16-bit word in the first 64 bytes of a packet

See [Chapter 21, Generic Packet Classifier](#) for information on configuring classifiers.

Hardware-based packet filters can be configured by the user to take action upon the results of the classification tables. These actions are:

- Discard the packet
- Forward the packet
- Send the packet to the mirror port
- Forward the packet to a specified egress port, for unicast packets
- Send the packet to a Class of Service queue
- Replace the packet's 802.1p priority

The filter can also perform the following Quality of Service actions:

- Replace the packet's IP TOS value and/or the IP DSCP value.
- Direct non-unicast packets that were scheduled to be dropped or sent to the CPU to a specified port.
- Forward packets that were marked to be dropped. This option allows bandwidth limiting to be overridden for particular packets.

All actions are also available on packets that match the ingress and egress ports of the classifier (if either or both are set), but do not match the classifier's other parameters.

For more information about the circumstances when hardware filters are useful for performing QoS on Rapier *i* switches, see [Table 22-1 on page 22-6 in Chapter 22, Quality of Service \(QoS\)](#).

A classifier-based packet filter comprises a single classifier entry. A number of filters can be created at one time with the same action by specifying a list of classifiers, but each classifier is contained in a single filter. The number of packet filters supported by the switch is determined by the switch model and how different each filter is.

Ordering Filter Entries

The order of the classifier-based packet filters depends on the order in which they were entered on the switch. The first entry added becomes filter 1, the second entry becomes filter 2, and so on. You can see the entries using the command:

```
show switch hwfilter [classifier=1..9999]
```

The switch checks a packet against all the filters, starting at filter 1. Each time a filter matches the packet, the status of the packet changes. The switch filters the packet according to its status after it has been compared to every filter. For example, if filter 1 tells the switch to drop the packet, but filter 3 tells the switch not to drop the packet, then the switch does not drop the packet.

More than one filter can act on a packet. For example, if filter 4 tells the switch to send the packet to port 40, and filter 5 tells the switch to change the TOS field of the packet, then the packet is sent to port 40 with a new TOS field. The switch is able to carry out the request of both filters 4 and 5.

New filters are always added to the end of the classifier-based filter entries. This makes the order with which you add filters very important. On 48-port switches you may also need to change the filter mode when using classifier-based packet filters. See “Filter Modes in 48-Port Switches” on page 8-37 for more information.

See *How to configure port-IP binding* for an example of a classifier-based packet filter configuration, and further discussion about configuring these filters in the correct order. This is available from the Resource Center on your Documentation and Tools CD-ROM, or from the website:
www.alliedtelesis.co.uk/en-gb/solutions/techdocs.asp?area=howto

Configuring Filters

How to create classifier-based filters

To create a hardware-based packet filter:

1. Create the classifier by using the command:

```
create classifier=1..9999 [classifier-options...]
```

2. Create the filter by using the command:

```
add switch hwfilter classifier=1..9999
[action={setpriority|sendcos|settos|deny|sendeport|
sendmirror|movepriortotos|movetostoprio|setipdscp|
sendnonunicasttoport|nodrop|forward}[,...]]
[newipdscp=0..63] [newtos=0..7]
[nomatchaction={setpriority|sendcos|settos|deny|
sendeport|sendmirror|movepriortotos|movetostoprio|
setipdscp|sendnonunicasttoport|forward}[,...]]
[nomatchdscp=0..63] [nomatchport=port-number]
[nomatchpriority=0..7] [nomatchtos=0..7]
[port=port-number] [priority=0..7]
```

3. Verify the filter by using the command:

```
show switch hwfilter [classifier=1..9999]
```

How to delete classifier-based filters

To stop the switch from filtering packets that match a particular classifier, use the command:

```
delete switch hwfilter classifier=1..9999
```

How to disable and enable filtering

The switch automatically enables classifier-based packet filtering when you add the first filter. To disable it, use the command:

```
disable switch hwfilter
```

If the switch is not forwarding packets as you expect, disabling filtering may help with troubleshooting by indicating whether your filters are the cause of the behaviour. To enable classifier-based packet filtering again, use the command:

```
enable switch hwfilter
```

When Internet Group Management Protocol (IGMP) Snooping is enabled, hardware filtering is also enabled. IGMP snooping is enabled by default. Hardware filtering cannot be disabled unless IGMP snooping is first disabled by using the command:

```
disable igmpsnooping
```

Filter Modes in 48-Port Switches

In 48-port switches, you must choose between two ways of filtering using classifier-based packet filters: port-specific filters first, or non port-specific filters first.

Port-specific filters apply to traffic either ingressing or egressing a particular port. They use a classifier which specifies the **ipport** or **eport** parameter. Non port-specific filters can apply to all traffic travelling through the switch. Non port-specific filters are created with a classifier that does not have the **ipport** or **eport** parameter specified.

The switch defaults to port-specific filters first. You can change the filtering mode on the switch by using the command:

```
set switch hwfilter mode={psf|npsf}
```

When to Use Port-Specific Mode

Use the port-specific **psf** mode when you want non port-specific filters to override the port-specific filters for certain circumstances. In the following example:

- the first (port-specific) filter stops all traffic from ingressing port 2
- the second (port-specific) filter allows traffic with the specific IP address (192.168.2.2) to ingress port 2
- the third (non port-specific) filter allows any ARP request (**prot=0806**) to ingress and egress all ports

```
create classifier=1 ipport=2
create classifier=2 ipport=2 ipsa=192.168.2.2
create classifier=3 prot=0806

add swi hwf classifier=1 action=discard
add swi hwf classifier=2 action=nodrop
add swi hwf classifier=3 action=nodrop
```

In **psf** mode, you must enter the port-specific filters first. If you add a port-specific filter after the non port-specific filters, the switch may still use a matching non port-specific filter when the packet travels between ports on different switch instances.

When to Use Non Port-Specific Mode

Use the non port-specific **npsf** mode when you want port-specific filters to override the non port-specific filters for certain circumstances. In the following example, the second (port-specific) filter stops the first (non port-specific) filter from discarding packets from port 50:

```
create class=1 ipsa=192.168.1.254/32
create class=4 ipo=50

add switch hwf class=1 ac=dis
add switch hwf class=4 ac=nod
```

In **npsf** mode, you must enter the non port-specific filters first. If you add a non port-specific filter after the port-specific filters, the switch may not use the non port-specific filter when the packet travels between ports on different switch instances.

Changing Modes You can change the filter mode after filters have been entered. When you change modes, the filter entries remain in the original order. To see which mode the switch is in, use the command:

```
show switch hwfilter
```

Layer 3 Based Packet Filters

Layer 3 Filter Matches

As an alternative to classifier-based filters, Layer 3 filter matches can be configured to determine which fields in each packet are matched, whether ingress or egress ports are to be matched, and the source and destination class of IP masks to apply to the packets. An entry added to a filter specifies the values to be matched for each field and the action to be taken on packets matching the filter entry. Layer 3 filter matches can perform the same actions as classifier-based hardware filters, but classifiers match a wider range of packet types.

Filters can be configured while Layer 3 filtering is disabled or enabled, but it must be enabled for any of the existing filters to take effect. To enable the Layer 3 filter function, use the [enable switch l3filter command on page 8-90](#). Disable it with the [disable switch l3filter command on page 8-81](#).

When Internet Group Management Protocol (IGMP) Snooping is enabled, Layer 3 filtering is also enabled. Layer 3 filtering cannot be disabled unless IGMP snooping is first disabled, using the command **disable igmpsnooping** (see “IGMP Snooping” on page 17-24 of Chapter 17, IP Multicasting). IGMP snooping is enabled by default.

To add Layer 3 filter match criteria, use the [add switch l3filter match command on page 8-59](#).

To display hardware-based Layer 3 filtering match criteria configured on the switch and their filter entries, use the [show switch l3filter command on page 8-133](#).

Filter match criteria can be changed only when no filter entries belong to them. To change filter match criteria, delete any entries associated with them, use the [set switch l3filter match command on page 8-105](#).

To delete the Layer 3 filter match criteria, first delete any entries belonging to it, use the [delete switch l3filter command on page 8-71](#).

To configure a Layer 3 filter entry, first add the filter match criteria, then add a filter entry.

Layer 3 Filter Entries

Filter matches specify the aspect of the packet that the filter checks. Filter entries specify what that aspect must be set to in order for the traffic to be filtered by the filter. To add a Layer 3 switch filter entry to the match criteria described above, use the [add switch l3filter entry command on page 8-56](#).

All criteria specified in the filter match should also be set in the filter entry. Criteria not in the filter match are not valid in the filter entry. The **l3filter** parameter specifies the number of the filter match to be modified. Filter match numbers are in the output of the [show switch l3filter command on page 8-133](#).

To change the parameters for a filter entry, use the [set switch l3filter entry command on page 8-102](#).

To delete a Layer 3 filter entry, use the [delete switch l3filter entry command on page 8-72](#).

Access Control Lists (ACLs)

Classifiers and hardware packet filters can be configured to provide Access Control List functionality.

For example, to allow WWW servers in the 192.168.10.0 subnet to be accessed only from the 192.168.20.0 subnet:

1. Create a classifier to match all WWW traffic to the subnet

Create a classifier to match all WWW traffic to the 192.168.10.0 subnet.

```
create classifier=1 ipdaddr=192.168.10.0/24 tcpdport=80
```

2. Create a hardware packet filter to deny this traffic

```
add switch hwfilter classifier=1 action=deny
```

3. Create a classifier to match the subset of this traffic that is to be allowed

Create a classifier to match WWW traffic from the 192.168.20.0 subnet to the 192.168.10.0 subnet.

```
create classifier=2 ipdaddr=192.168.10.0/24  
ipsaddr=192.168.20.0/24 tcpdport=80
```

4. Create a hardware packet filter to allow this traffic

This filter must be created last so that it is the first filter that the switch processes.

```
add switch hwfilter classifier=2 action=nodrop
```

The **nomatchaction** parameter can create a hardware filter that acts upon traffic that does not match the classifier or any other hardware filters. For example, to allow traffic destined for TCP ports 25 and 80 and UDP port 5151, and block all other traffic, create the following set of classifiers and filters:

```
create classifier=1 tcpdport=80  
add switch hwfilter classifier=1 action=forward  
nomatchaction=deny  
create classifier=2 tcpdport=25
```

```

add switch hwfilter classifier=2 action=forward
    nomatchaction=deny
create classifier=3 udpport=5151
add switch hwfilter classifier=3 action=forward
    nomatchaction=deny

```

If the **nomatchaction** is not specified in these filters, all traffic is forwarded, including traffic that matched the classifiers.

Triggers

The Trigger facility can be used to automatically run specified command scripts when particular triggers are activated. When a trigger is activated by an event, global parameters and parameters specific to the event are passed to the script that runs. For a full description of the Trigger facility, see [Chapter 37, Trigger Facility](#).

The switch can generate triggers to activate scripts when a switch port goes up or down.

The following section lists the events that may be specified for the Switching module for the **event** parameter, the parameters that may be specified as *module-specific-parameters* for the Switching module, and the arguments passed to the script activated by the trigger.

Module Layer 3 Switching module: **module=swi**

Event linkdown

Description The port link specified by the **port** parameter has just gone down.

Parameters The following command parameter must be specified in the **create/set trigger** commands:

Parameter	Description
port= <i>port</i>	The port where the event activates the trigger.

Script Parameters The trigger passes the following parameter to the script:

Argument	Description
%1	The port number of the port that has just gone down.

Event linkup

Description The port link specified by the **port** parameter has just come up.

Parameters The following command parameter must be specified in the **create/set trigger** commands:

Parameter	Description
port= <i>port</i>	The port where the event activates the trigger.

Script Parameters The trigger passes the following parameter to the script:

Argument	Description
%1	The port number of the port that has just come up.

To create or modify a switch trigger, use the commands:

```
create trigger=trigger-id module=switch event={linkdown|
linkup} port=port [after=hh:mm] [before=hh:mm]
[{date=date|days=day-list}] [name=name] [repeat={yes|no|
once|forever|count}] [script=filename...] [state={enabled|
disabled}] [test={yes|no|on|off|true|false}]

set trigger=trigger-id [port=port] [after=hh:mm]
[before=hh:mm] [{date=date|days=day-list}] [name=name]
[repeat={yes|no|once|forever|count}] [test={yes|no|on|
off|true|false}]
```

Configuration Examples

This section shows the following examples of how to configure Layer 2 switch functions on the switch:

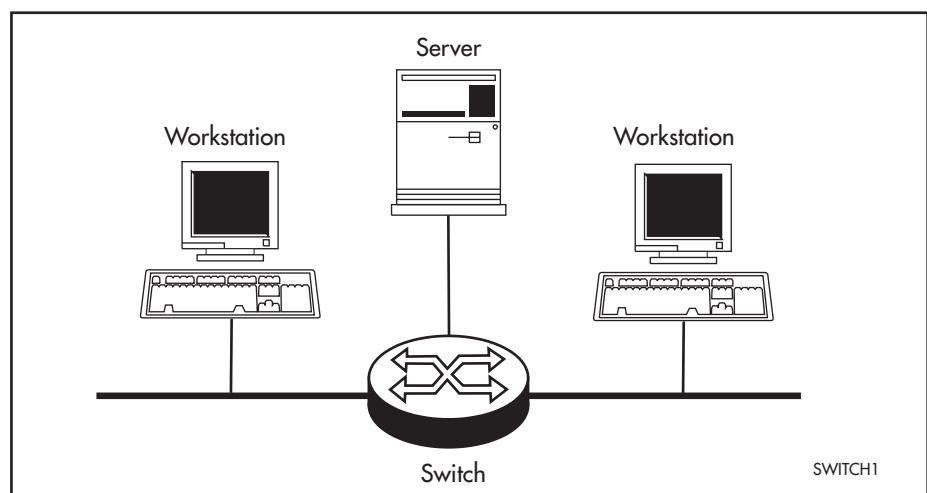
- **One Switch to Extend a Local LAN**
- **VLAN with Untagged Ports**
- **VLAN with Tagged Ports**
- **Meshed Network with VLAN Tagged Ports**

All examples assume that the switch configuration begins from factory default settings. Note that routing, required for communication between the VLANs, is not shown in these examples.

One Switch to Extend a Local LAN

The example in [Figure 8-8](#) uses a single switch to connect two (or more) physical LANs and a server. All the devices connected belong to the same broadcast domain, and separate collision domains. The learning and forwarding processes in the switch give this topology better performance than a single LAN would give, and allow more devices to be attached than would a single physical LAN.

Figure 8-8: Example of switch with default configuration

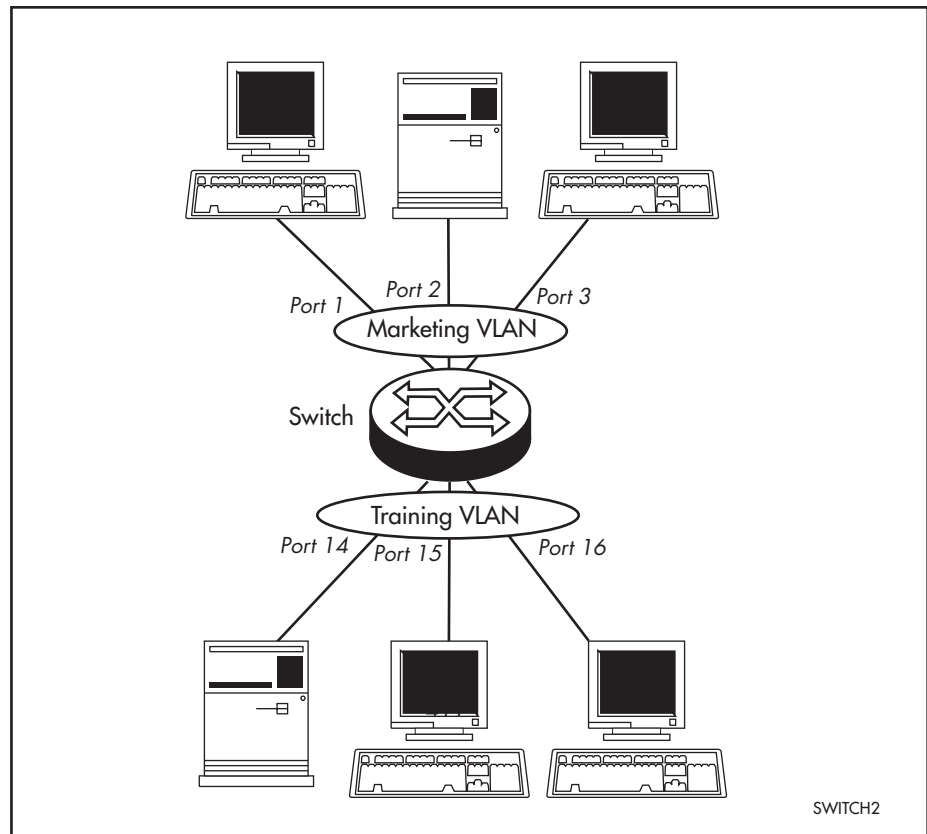


No software configuration is required. The default switch settings let the switch learn source addresses and forward frames to correct ports as soon as it is physically connected and powered up.

VLAN with Untagged Ports

The example in [Figure 8-9](#) has two VLANs using untagged ports. Ports 1-3 belong to one broadcast domain, the *marketing* VLAN, and ports 14-16 belong to another broadcast domain, the *training* VLAN. The switch acts as two separate bridges: one that forwards between the ports belonging to the *marketing* VLAN, and a second one that forwards between the ports belonging to the *training* VLAN. Devices on ports 2 and 14 can only communicate with each other by using the switch's IP routing functions.

Figure 8-9: VLANs with untagged ports



[Table 8-6](#) shows the parameters used to configure this example. Since there is only one switch and no loops in this topology, the Spanning Tree Protocol (STP) is not needed. This example assumes that the switch has factory default settings.

Table 8-6: Parameters for port-based VLAN example

VLAN name	VLAN ID	Ports
Marketing	VID=2	PORT 1-3
Training	VID=3	PORT 14-16

Configure the switch

1. Create VLANs.

Create the two VLANs using the following commands on the switch:

```
create vlan=marketing vid=2
create vlan=training vid=3
```

2. Add ports to VLANs.

Add the ports to these VLANs on the switch by using the following commands:

```
add vlan=marketing port=1-3
add vlan=training port=14-16
```

Check the VLAN configuration by using the command:

```
show vlan
```

3. Check the switch.

Check that the switch is switching across the ports. Traffic on the switch can be monitored using the command:

```
show switch port=1-3,14-16 counter
```

VLAN with Tagged Ports

Figure 8-10 shows a network that must be configured with VLAN tagging, since the VLAN aware server on port 2 on Switch A belongs to both the *admin* VLAN and the *marketing* VLAN. Using VLAN tags, port 26 on Switch A and port 25 on Switch B belong to both the *marketing* VLAN and the *training* VLAN, so that devices on both VLANs can use this uplink to communicate with other devices in the same VLAN on the other switch. There are no loops in this topology, so STP is not needed.

Figure 8-10: VLANs with tagged ports

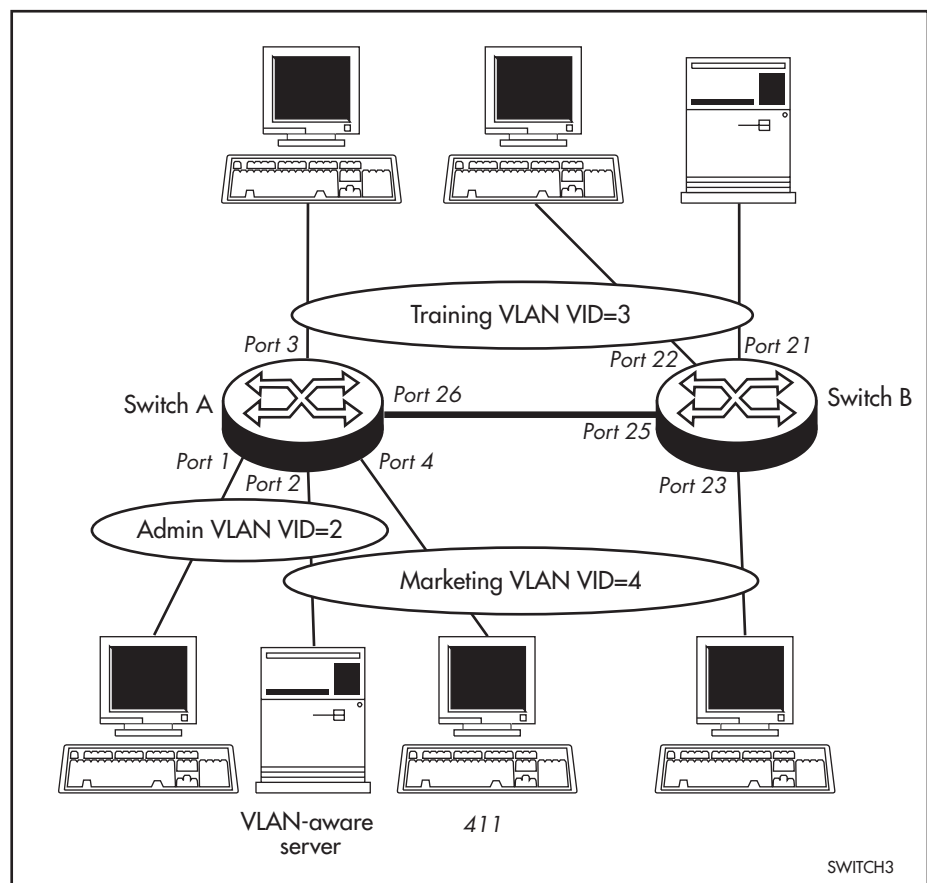


Table 8-7: Configuration example parameters for VLANs with tagged ports

Switch A			Switch B	
VLAN name	VID	Tagged ports	Untagged ports	Tagged ports
Admin	VID=2	PORT 2	PORT 1	
Training	VID=3	PORT 26	PORT 3	PORT 25
Marketing	VID=4	PORT 2,26	PORT 4	PORT 25

Configure Switch A

1. Create VLANs.

Create the three VLANs using the following commands on the switch:

```
create vlan=admin vid=2
create vlan=training vid=3
create vlan=marketing vid=4
```

2. Add ports to VLANs.

Add the ports to these VLANs on the switch by using the following commands:

```
add vlan=admin port=2 frame=tagged
add vlan=admin port=1
add vlan=training port=26 frame=tagged
add vlan=training port=3
add vlan=marketing port=2,26 frame=tagged
add vlan=marketing port=4
```

Check the VLAN configuration by using the command:

```
show vlan
```

Configure Switch B

1. Create VLANs.

Create the two VLANs using the following commands on the switch:

```
create vlan=training vid=3
create vlan=marketing vid=4
```

2. Add ports to VLANs.

Add the ports to these VLANs on the switch by using the following commands:

```
add vlan=training port=25 frame=tagged
add vlan=training port=21,22
add vlan=marketing port=25 frame=tagged
add vlan=marketing port=23
```

Check the VLAN configuration by using the command:

```
show vlan
```

Check

Check that the switch is switching across the ports. Traffic on Switch A can be monitored using the command:

```
show switch port=1-4,26 counter
```

Traffic on Switch B can be monitored using the command:

```
show switch port=21-23,25 counter
```

Meshed Network with VLAN Tagged Ports

In this example, the uplink ports on all three switches connect the VLANs. Server S on Switch B is VLAN aware, and is shared between all three VLANs. The other devices shown are VLAN-unaware end stations, connected to untagged ports. Because both uplink ports on all three switches belong to the *marketing* VLAN, the Spanning Tree Protocol eliminates the loop in this VLAN, and provides redundancy in case links fail. Because the VLAN-aware shared server on Switch B, and the uplink ports belong to all three VLANs, these VLANs must all belong to the same STP.

Figure 8-11: Example of meshed network with VLAN tagged ports

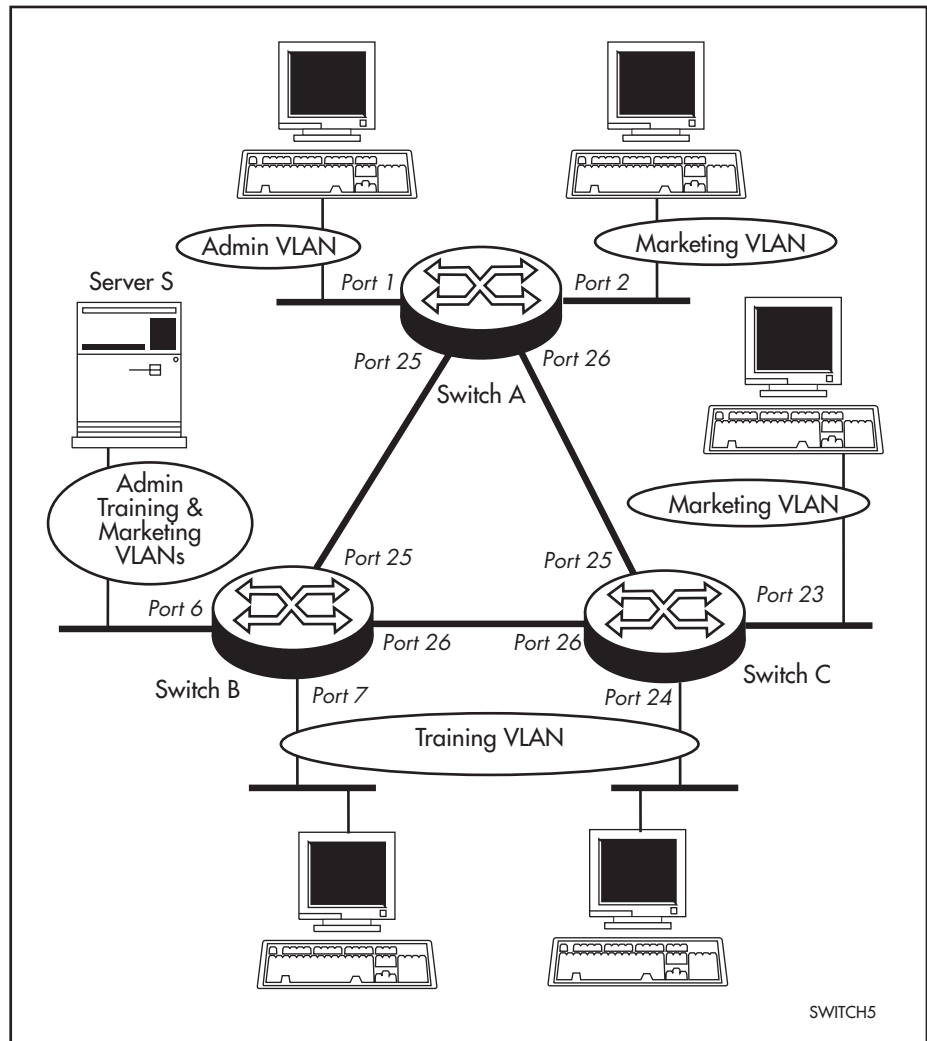


Table 8-8 on page 8-46 shows the parameters for creating the VLANs on the switches and adding ports to the VLANs. Note that by default all VLANs belong to the default STP, which is disabled at switch start-up.

Note that all three VLANs are created on all three switches, and all uplink ports belong to all three VLANs. This should be done even though the training VLAN has no devices on Switch A that need to communicate with Switch B or C, and Switch C has no devices belonging to the admin VLAN requiring links to Switch A or B. This is because STP is enabled, and inevitably blocks ports on one of the three links to prevent a loop in the marketing VLAN. This also blocks traffic over these ports for the other VLANs. Therefore the training and admin VLANs must be able to communicate over either of the links on each switch to ensure full VLAN operation. Failing to include the switches and uplink ports in the VLANs for which they have no devices attached is likely to block either the admin or training VLANs access to some of their members. An alternative is use an enhancement such as MSTP, which allows multiple spanning trees to be configured. See [Chapter 9, Multiple Spanning Tree Protocol \(MSTP\)](#).

Table 8-8: Parameters for meshed VLAN network with tagged ports

		Switch A		Switch B		Switch C	
VLAN name	VID	Tagged ports	Untagged ports	Tagged ports	Tagged ports	Tagged ports	Tagged ports
Admin	VID=2	25,26	1	6,25,26	-	25,26	-
Training	VID=3	25,26	-	6,26,25	7	26,25	24
Marketing	VID=4	25,26	2	6,25,26	-	25,26	23
STP		Default STP		Default STP		Default STP	
		Enabled		Enabled		Enabled	

To configure the uplink ports in the above example, use the following commands:

Configure Switch A

1. Create VLANs.

Create the three VLANs using the following commands on the switch:

```
create vlan=admin vid=2
create vlan=training vid=3
create vlan=marketing vid=4
```

2. Add ports to VLANs.

Add the ports to these VLANs on the switch by using the following commands:

```
add vlan=admin port=25-26 frame=tagged
add vlan=admin port=1
add vlan=training port=25-26 frame=tagged
add vlan=marketing port=25-26 frame=tagged
add vlan=marketing port=2
```

Check the VLAN configuration by using the command:

```
show vlan
```

3. Enable STP.

All VLANs belong to the default STP, which must be enabled to eliminate loops in the network. Use the command:

```
enable stp=default
```

Configure Switch B

1. Create VLANs.

Create the three VLANs using the following commands on the switch:

```
create vlan=admin vid=2
create vlan=training vid=3
create vlan=marketing vid=4
```

2. Add ports to VLANs.

Add the ports to these VLANs on the switch by using the following commands:

```
add vlan=admin port=6,25-26 frame=tagged
add vlan=training port=6,25-26 frame=tagged
add vlan=training port=7
add vlan=marketing port=6,25-26 frame=tagged
```

Check the VLAN configuration by using the command:

```
show vlan
```

3. Enable STP.

All VLANs belong to the default STP, which must be enabled to eliminate loops in the network. Use the command:

```
enable stp=default
```

Configure Switch C

1. Create VLANs.

Create the three VLANs using the following commands on the switch:

```
create vlan=admin vid=2
create vlan=training vid=3
create vlan=marketing vid=4
```

2. Add ports to VLANs.

Add the ports to these VLANs on the switch by using the following commands:

```
add vlan=admin port=25-26 frame=tagged
add vlan=training port=25-26 frame=tagged
add vlan=training port=24
add vlan=marketing port=25-26 frame=tagged
add vlan=marketing port=23
```

Check the VLAN configuration by using the command:

```
show vlan
```

3. Enable STP.

All VLANs belong to the default STP, which must be enabled to eliminate loops in the network. Use the command:

```
enable stp=default
```

Check that the switch is switching across the ports.**1. Check the traffic on Switch A.**

```
show switch port=1,2,25,26 counter
```

2. Check the traffic on Switch B.

```
show switch port=6,7,25,26 counter
```

3. Check the traffic on Switch C.

```
show switch port=23-26 counter
```


Command Reference

This section describes the commands available to configure and manage the switching functions on the switch.

The shortest valid command is denoted by capital letters in the Syntax section. See “Conventions” on page xxxviii of [About this Software Reference](#) in the front of this manual for details of the conventions used to describe command syntax. See [Appendix A, Messages](#) for a complete list of messages and their meanings.

activate switch port

Syntax ACTivate SWItch Port={*port-list*|ALL} {AUTOnegotiate}
{LOCK}

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description	This command activates autonegotiation of port speed and duplex mode for a port or a group of ports.
--------------------	--

The **port** parameter specifies the port or ports for which autonegotiation is to be activated. Only ports in the list that are set to autonegotiate are actually affected by this command. Ports with a fixed speed setting or that belong to a trunk group are not modified.

A port that has been added to LACP autonegotiates until it actively becomes part of an aggregated link (i.e. trunked), when it then operates at the speed of the aggregated link.

The **autonegotiate** parameter specifies that the port is to activate the autonegotiation process. The port begins to autonegotiate link speed and duplex mode.

The **lock** parameter manually locks the switch port before it reaches its learning limit so that no new addresses are automatically learned. The **learn** parameter for the port is set to the current number of learned MAC addresses.

Examples To activate autonegotiation on ports 1-8 and port 10, use the command:

```
act swi po=1-8,10 auto
```

Related Commands

add lacp port

Syntax ADD LACP Port=[*port-list*|ALL] [Adminkey=*key*]
[Priority=*priority*] [Mode={Active|Passive}]
[Periodic={Fast|Slow}]

where:

- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of port numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered port, including uplink ports.
- *key* is an integer from 0 to 65535
- *priority* is an integer from 0 to 65535

Description This command adds a port to LACP's control thus enabling LACP to put it into an aggregated link. By default, ports are added in the active mode. If a port is added in the active mode, and its link's requirements for trunking are met, then the port and its associated link are automatically aggregated without further configuration. The same situation applies for a port configured in passive mode but whose link connects to a remote port configured in active mode. To run LACP the port must be operating in the full duplex mode.

The **port** parameter specifies the ports whose parameters are to be modified. Where none of the ports specified are presently managed by LACP, the command takes effect if it can be applied to all the specified ports. Where some of the ports specified are already managed by LACP, and additional ports are added (by specifying ALL, for example), then the LACP managed ports have their Key and other parameters changed, and the command succeeds on all the specified ports.

In the following descriptions, references to an individual port refers to all ports selected by the **port** parameter.

The **adminkey** parameter specifies the Admin LACP port key. This affects the LACP port key that is generated but does not determine its value. You can use this parameter to prevent ports from being aggregated when they might otherwise form a trunk. By default all ports that can be aggregated are given the same LACP port key. The default for **adminkey** is 1.

The **priority** parameter specifies the *LACP port priority*. The priority assigned is used where the number of physical links connecting two devices is greater than the number that can be aggregated. The priority entered is then used to determine which ports are selected for aggregation. The default of 32,768 (0 being the highest priority) is applied to all ports.

Where the port priority is the same, the port number governs which ports are selected. The lower the port number, the higher its priority. Excess ports are put into a standby mode, in which they are effectively disabled. They will remain in this state unless required to replace inoperative links within their associated aggregated group.

The **mode** parameter specifies whether the port runs in LACP *passive* or *active* mode. A port in passive mode begins sending LACPDU's in response to a received LACPDU; whereas, a port in active mode always sends LACPDU's at regular intervals specified by the **periodic** parameter.

The **periodic** parameter specifies the requested rate that the LACP port receives LACPDU *update messages* from its partner port. A port in fast mode receives one LACPDU every second; in slow mode, a port receives one every thirty seconds.

Examples To add ports 3 and 5 to LACP, use the command:

```
add lacp po=3,5
```

Related Commands

- [delete lacp port](#)
- [disable lacp](#)
- [enable lacp](#)
- [set lacp port](#)
- [show lacp port](#)

add switch filter

Syntax ADD SWITCh FILTER ACtion={FORward|DIScard}
DESTaddress=*macadd* PORT=*port* [ENTry=*entry*] [LEARN]
[VLAN={*vlan-name*|1..4094}]

where:

- *entry* is a filter entry number, from 0 to n+1 where n is the highest filter entry currently defined in the permanent forwarding database. The permanent forwarding database has a maximum of 320 entries, ranging from 0 to 319. Each port has its own permanent forwarding database.
- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.
- *port* is the number of the switch port or uplink port to which this filter applies.
- *macadd* is an Ethernet six-octet MAC address, expressed as six pairs of hexadecimal digits delimited by hyphens.

Description This command adds a single static filter entry to the permanent forwarding database for a specified port. If the static entry matches an existing dynamic entry that was learnt by the switch (a match means that the **destaddress** and **vlan** parameters are the same for both entries), the static filter overwrites the existing dynamic learnt entry. All the received frames that match the static filter entry are forwarded to the specified port with an action of **forward** or **discard**.

The **action** parameter specifies the outcome of the forwarding process for the frame. When **forward** is specified, the frame is transmitted on the given port or ports. When **discard** is specified, the frame is discarded.

The **destaddress** parameter specifies the value to be matched against the destination MAC address from frames being filtered. The destination MAC address must be an individual MAC address, and cannot be the MAC address of the switch.

The **port** parameter specifies the outbound port over which a frame matching this filter entry is discarded or forwarded. Whether the ports are tagged ports or untagged ports is determined by the **vlan** parameter. When the **port** parameter specifies tagged ports, then the **vlan** parameter is required.

The **entry** parameter specifies where in the permanent forwarding database the new entry is added for the specified port. **entry** cannot be set greater than n+1 where n is the highest filter entry currently defined. When **entry** is not specified, the new entry is appended to the bottom of the permanent forwarding database: the default is n+1 where n is the highest filter entry currently defined. Static and dynamic entries in the forwarding database are kept in sorted order determined by their VLAN Identifier and MAC address. Therefore the **entry** parameter does not affect the order of the filters in the forwarding database. The order in which filter entries are displayed by the **show switch filter** command is dependent upon the **entry** parameter.

The **learn** parameter specifies if the filter being added should be counted and used as a learned MAC address for intrusion detection. Learned filters are not totally static, and can be lost if the learning process is stopped by setting the **learn** parameter to zero (see the **set switch port** command).

The **vlan** parameter specifies the VLAN Identifier to which the filter entry is associated. The **vlan** parameter is required when the **port** parameter specifies tagged ports. When the **port** parameter specifies untagged ports, the **vlan** parameter is not required, and defaults to the VLAN Identifier of the VLAN for which the ports are untagged. Therefore, when the **vlan** parameter is not specified, the ports are treated as untagged ports.

The switch automatically deletes static filter entries for a port if the port is deleted from the specified VLAN.

Examples To forward all frames destined for MAC address 00-00-cd-12-34-56 on the VLAN to which port 3 is an untagged port, use the command:

```
add swi fil dest=00-00-cd-12-34-56 ac=for po=3
```

To discard all frames destined for MAC address 00-00-cd-12-34-56 on port 4 in VLAN 4, use the command:

```
add swi fil dest=00-00-cd-12-34-56 po=4 ac=dis vlan=4
```

Related Commands [delete switch filter](#)
[show switch filter](#)

add switch hwfilter classifier

Syntax ADD SWItch HWFilter CLASSifier=*classifier-list*
 [Action={SETPRIORITY | SENDCOS | SETTOS | DENY | SENDEPORT |
 SENDMIRROR | MOVEPRIOTOTOS | MOVETOSTOPRIO | SETIPDSCP |
 SENDNONUNICASTTOPORT | NODROP | FORWARD} [, ...]]
 [NEWIPDscp=0..63] [NEWTos=0..7]
 [NOMATCHAction={SETPRIORITY | SENDCOS | SETTOS | DENY |
 SENDEPORT | SENDMIRROR | MOVEPRIOTOTOS | MOVETOSTOPRIO |
 SETIPDSCP | SENDNONUNICASTTOPORT | FORWARD} [, ...]]
 [NOMATCHDscp=0..63] [NOMATCHPort=*port-number*]
 [NOMATCHPriority=0..7] [NOMATCHTos=0..7]
 [Port=*port-number*] [PRIOrity=0..7]

where:

- *classifier-list* is an integer from 1 to 9999, a range of integers (specified as 1-4), or a comma-separated list of classifier numbers and/or ranges (1, 3, 4-9).
- *port-number* is the switch port number from 1 to *m* where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command adds hardware based filters based on the specified classifier(s). The classifiers in the list must exist, and they must not already be specified as part of an existing filter entry, neither may they be a duplicate of another classifier that is already used by a filter entry. The **switch hwfilter classifier** commands may not be used with the **switch l3filter** commands.

The **action** parameter specifies a comma-separated list of actions to take when a packet matches the filter criteria specified in this entry. If **setpriority** is specified, the packet's 802.1p priority is set to the value specified by the **priority** parameter. If **sendcos** is specified, the packet is sent to the priority queue specified by the **priority** parameter. If **settos** is specified, the packet's TOS (Type of Service) field is set to the value specified by the **newtos** parameter. When **deny** is specified, the packet is discarded. If **sendeport** is specified and the frame is not a broadcast, multicast, DLF frame or marked for dropping or to be sent to the CPU, the new output port is set to the value of the **port** parameter. If **sendmirror** is specified, the packet is sent to the mirror port. If **forward** is specified, the packet is forwarded using the default Class of Service (priority). If **movepriototos** is specified, the IP TOS field in the frame is replaced with the 802.1p priority value. If **movetostoprio** is specified, the 802.1p priority field in the frame is replaced with the IP TOS value, this also determines the egress priority queue. If **setipdscp** is specified and the frame is an IPv4 frame, the Diffserv Codepoint field in the frame is set to the value specified by the **newipdscp** parameter. Actions that modify both the IP TOS and IP DSCP values in the frame are mutually exclusive. If **sendnonunicasttoport** is specified, matching frames that are broadcast or DLF, multicast, marked for dropping or to be sent to the CPU are sent to the egress port specified by the **port** parameter. If **nodrop** is specified, matching frames previously marked for dropping are not dropped. The default is **forward**.

If the **sendeport** action directs packets to a particular egress port, then the packet is transmitted from the mirror port with a VLAN tag.

The **newipdscp** parameter indicates the value to set in an IPv4 packet Diffserv CodePoint field when the **action** parameter is set to **setipdscp**.

The **newtos** parameter specifies the new type of service value, assigning a new value to the TOS precedence field in the IP Header. When this parameter is used, only when the **action** parameter is set to **settos**.

The **nomatchaction** parameter specifies a comma-separated list of actions to take when a frame matches both the **ipport** and **eport** values (if they are specified in the match) on an associated entry but there is no match for the frame contents. When **setpriority** is specified, the packet's 802.1p priority is set to the value specified by the **priority** parameter. When **sendcos** is specified, the packet is sent to the priority queue specified by the **priority** parameter. When **settos** is specified, the packet's TOS (Type of Service) field is set to the value specified by the **newtos** parameter. If **deny** is specified, the packet is discarded. When **sendeport** is specified and the frame is not a broadcast, multicast, DLF frame or marked for dropping or to be sent to the CPU, the new output port is set to the value of the **port** parameter. When **sendmirror** is specified, the packet is sent to the mirror port. When **forward** is specified, the packet is forwarded using the default Class of Service (priority). When **movepriortotos** is specified, the IP TOS field in the frame is replaced with the 802.1 priority value. When **movetostoprio** is specified, the 802.1 priority field in the frame is replaced with the IP TOS value, this also determines the egress priority queue. When **setipdscp** is specified and the frame is an IPv4 frame, the Diffserv Codepoint field in the frame is set to the value specified by the **newipdscp** parameter. Actions that modify both the IP TOS and IP DSCP values in the frame are mutually exclusive. When **sendnonunicasttoport** is specified, matching frames that are broadcast or DLF, multicast, marked for dropping or to be sent to the CPU are sent to the egress port specified by the **port** parameter. The default is **forward**.

The **nomatchdscp** parameter indicates the value to set in an IPv4 packet Diffserv CodePoint field when the **nomatchaction** parameter is set to **setipdscp**. The range of values for this parameter is from 0 to 63.

The **nomatchport** parameter specifies the new output port number. This port overrides the egress port selected by the forwarding database.

The **nomatchpriority** parameter specifies the packet priority. There are eight levels of priority, from 0 to 7. This parameter is used when the **nomatchaction** parameter is set to **setpriority** or **sendcos**.

The **nomatchtos** parameter specifies the new type of service value, assigning a new value to the TOS precedence field in the IP Header. This parameter is used when the **nomatchaction** parameter is set to **settos**.

The **port** parameter specifies the new output port number. This port overrides the egress port selected by the forwarding database.

The **priority** parameter specifies the packet priority. There are eight levels of priority, from 0 to 7. This parameter is used when the **action** parameter is set to **setpriority** or **sendcos**.

Examples To add hardware filtering entries to the switch based on classifier entries 1 to 5 that drop all matching packets, use the command:

```
add swi hwf class=1-5 ac=deny
```

Related Commands

- [delete switch hwfilter classifier](#)
- [set switch hwfilter classifier](#)
- [show switch hwfilter](#)

add switch l3filter entry

Syntax ADD SWITCH L3Filter=*filter-id* ENTRY [ACTION={DENY|FORWARD|SEND COS|SENDEPORT|SENDMIRROR|SETPRIORITY|SETTOS|MOVEPRIOTOTOS|MOVETOSTOPRIO|NODROP|SENDNONUNICASTTOPORT|SETIPDSCP}[,...]] [DIPaddress=*ipadd*] [EPORT=*port-number*] [IPDSCP=0..63] [IPort=*port-number*] [NEWIPDSCP=0..63] [NEWTOS=0..7] [PORT=*port-number*] [PRIORITY=0..7] [PROTOCOL={TCP|UDP|ICMP|IGMP|*protocol*}] [SIPADDR=*ipadd*] [TCPAck={True|False}] [TCPDport=*port-id*] [TCPFin={True|False}] [TCPSport=*port-id*] [TCPSyn={True|False}] [TOS=0..7] [TTL=0..255] [TYPE=*protocol-type*] [UDPSPORT=*port-id*] [UDPDPORT=*port-id*]

where:

- *filter-id* is a decimal number in the range 1 to the number of filters defined.
- *ipadd* is an IP address in dotted decimal notation.
- *port-number* is the switch port number from 1 to *m* where *m* is the highest numbered Ethernet switch port, including uplink ports.
- *protocol* is an IP protocol number from 1 to 255.
- *port-id* is a TCP/UDP port number with a maximum value less than 65535.
- *protocol-type* is a valid protocol-type number. A protocol type number is 2 bytes for Ethernet type II and 802.3 (DSAP/SSAP) encapsulation, or 5 bytes for SNAP encapsulation, and is specified in hexadecimal.

Description This command adds a filter entry to an existing filter match criteria. All criteria specified in the filter match should also be set in the filter entry, and criteria not specified in the filter match are not valid in the filter entry. Up to 126 filter entries may be created.

The **switch hwfilter classifier** commands may not be used with the **switch l3filter** commands.

The **l3filter** parameter specifies the number of the filter match (*filter-id*) for which the entry is being created. Each filter entry is automatically assigned an *entry-id* number. Filter and filter entry numbers are in the output of the [show switch l3filter command on page 8-133](#).

The **action** parameter specifies a comma-separated list of actions to take when a packet matches the filter criteria specified in this entry. If **deny** is specified, the packet is discarded. If **forward** is specified, the packet is forwarded using the default Class of Service (priority). If **sendcos** is specified, the packet is sent to the priority queue specified by the **priority** parameter. If **sendeport** is specified, the new output port is set to the value of the **port** parameter. If **sendmirror** is specified, the packet is sent to the mirror port. If **setpriority** is specified, the packet's 802.1p priority is set to the value specified by the **priority** parameter. If **settos** is specified, the packet's **tos** (Type of Service) field is set to the value specified by the **newtos** parameter. If **movepriototos** is specified, the **ip tos** field in the frame is replaced with the 802.1p priority value. If **movetostoprio** is specified, the 802.1p priority field in the frame is replaced with the **ip tos** value, this also determines the egress priority queue. If **nodrop** is specified, matching frames previously marked for dropping are not dropped. If **sendeport** is specified and the frame is not a broadcast, multicast, DLF frame or marked for dropping or to be sent to the CPU, the new output

port is set to the value of the **port** parameter. If **sendnonunicasttoport** is specified, matching frames that are broadcast or DLF, multicast, marked for dropping or to be sent to the CPU are sent to the egress port specified by the **port** parameter. If **setipdscp** is specified and the frame is an IPv4 frame, the Diffserv Codepoint field in the frame is set to the value specified by the **newipdscp** parameter. Actions that modify both the TOS and DSCP values in the frame are mutually exclusive. The default is **forward**.

If the **sendeport** action directs packets to a particular egress port, then the packet is transmitted from the mirror port with a VLAN tag.

The **dipaddr** parameter specifies the destination IP addresses to match.

The **eport** parameter specifies the egress port number to be matched by this filter entry when the **emport** parameter in the filter match is **true**. The default is no port; that is, the filter entry does not apply to any egress ports. If the **emport** parameter in the filter match is **false**, the **eport** parameter is ignored, and the filter entry applies to all egress ports.

The **ipdscp** parameter indicates the value to match to the IPv4 packet Diffserv Codepoint field for this entry.

The **ipport** parameter specifies the ingress port number to be matched by this filter entry, if the **import** parameter in the filter match is **true**. The default is no port; that is, the filter entry does not apply to any ingress ports. If the **import** parameter in the filter match is **false**, the **ipport** parameter is ignored, and the filter entry applies to all ingress ports.

The **newipdscp** parameter indicates the value to set in an IPv4 packet Diffserv Codepoint field when the **action** parameter is set to **setipdscp**.

The **newtos** parameter specifies the new type of service value, assigning a new value to the TOS precedence field in the IP Header. This parameter is used when the **action** parameter is set to **settos**.

The **port** parameter specifies the new output port number. This port overrides the egress port selected by the forwarding database.

The **priority** parameter specifies the packet priority. There are eight levels of priority, from 0 to 7. This parameter is used when the **action** parameter is set to **setpriority** or **sendcos**.

The **protocol** parameter specifies the IP protocol to match.

The **protocol** parameter specifies the IP protocol to match if the **switch l3filter match** value is set to **protocol**.

The **sipaddr** parameter specifies the source IP address to match.

The **tcpack** parameter specifies the ACK (acknowledgement) flag in the TCP header to match, if the protocol is TCP. This parameter is required if **tcpack** is specified in the **add** or **set switch l3filter match** parameter, otherwise it is invalid.

The **tcpdport** parameter specifies the destination TCP port to match, if the protocol is TCP.

The **tcpfin** parameter specifies the FIN flag in the TCP header to match, if the protocol is TCP. This parameter is required if **tcpfin** is specified in the **ADD** or **set switch l3filter match** parameter, otherwise it is invalid.

The **tcpSPORT** parameter specifies the source TCP port to match, if the protocol is TCP.

The **tcpsyn** parameter specifies the SYN flag in the TCP header to match, if the protocol is TCP. This parameter is required if **tcpsyn** is specified in the **add** or **set switch l3filter match** parameter, otherwise it is invalid.

The **tos** parameter specifies the type of service to match.

The **ttl** parameter specifies the *Time to Live* to match.

The **type** parameter specifies a protocol-type number to match. The number is entered in hexadecimal, e.g. 0800 for an Ethernet type II IP packet. This parameter may not be used with any other packet field matching criteria, nor may it be used with the **settos** action. With all other packet matching criteria there is an implicit match to an IP protocol Ethernet type II packet.

The **udpport** parameter specifies the UDP destination port to match, if the protocol is UDP.

The **udpSPORT** parameter specifies the UDP source port to match, if the protocol is UDP.

Example To add a filter to block Telnet sessions, use the commands:

```
add switch l3filter match=tcpdport,prot
add switch l3filter=1 entry action=deny prot=tcp tcpdport=23
```

Related Commands [delete switch l3filter entry](#)
[set switch l3filter entry](#)
[show switch l3filter](#)

add switch l3filter match

Syntax `ADD SWITCh L3Filter Match={DIPAddr|IPDScp|PROTOcol|
SIPAddr|TCPAck|TCPFin|TCPDport|TCPSport|TCPSyn|TOS|TTL|
TYPE|UDPDport|UDPSport|NONE}[,...] [DClass={A|B|C|Host|
1..32}] [EMPort={YES|NO|ON|Off|True|False}]
[IMPort={YES|NO|ON|Off|True|False}]
[NOMATCHAction={SETPRIORITY|SENDCOS|SETTOS|DENY|
SENDEPORT|SENDMIRROR|MOVEPRIOTOTOS|MOVETOSTOPRIO|
SETIPDSCP|SENDNONUNICASTTOPT|FORWARD}[,...]]
[NOMATCHDscp=1..63] [NOMATCHPORT=port-number]
[NOMATCHPriority=0..7] [NOMATCHTos=0..7] [SClass={A|B|
C|Host|1..32}] [TYpe={802|Ethii|Snap}]`

where:

- *port-number* is the switch port number from 1 to m where m is the highest numbered switch port.

Description This command adds a filter that specifies the matching filter criteria used for the hardware-based packet filtering mechanism. Up to 16 filters matches may be created.

Each filter is automatically assigned a *filter-id* number, which is in the output of the [show switch l3filter command on page 8-133](#). Once the filter has been created, entries must be added using the [add switch l3filter entry command on page 8-56](#).

Enabling the Internet Group Management Protocol (IGMP) with the **enable ip igmp** command also enables Layer 3 filtering. IGMP uses two Layer 3 filters, so the number of available filters is reduced by two. IGMP cannot be enabled unless two filters are still available.

The **switch hwfilter classifier** commands may not be used with the **switch l3filter** commands.

The **match** parameter specifies a comma-separated list of packet fields and/or types to match. There is no default.

The **dclass** parameter specifies the IP destination address mask to apply to the destination IP address field in packets when matching destination IP addresses. If A is specified, the Class A mask 255.0.0.0 is used (mask length of 8). If B is specified, the Class B mask 255.255.0.0 is used (mask length of 16). If C is specified, the Class C mask 255.255.255.0 is used (mask length of 24). If **host** is specified, the host mask 255.255.255.255 is used (mask length of 32). If a number is specified, a mask of that length is used. The default is for no mask to be used (mask length of 0). The **dclass** parameter is required if **dipaddr** is specified by the **match** parameter.

The **emport** parameter specifies whether the filter applies to all egress ports or to a specific one. If **no**, **off**, or **FALSE** is specified, the filter is applied to all egress ports. If **yes**, **on**, or **true** is specified, the filter is applied to the egress port specified by the **eport** parameter in the **add** or **set switch l3filter entry** command. The default is **false**, meaning the filter is applied to all egress ports.

The **import** parameter specifies whether the filter applies to all ingress ports or to a specific one. If **no**, **off**, or **false** is specified, the filter is applied to all ingress ports. If **yes**, **on**, or **true** is specified, the filter is applied to the ingress port specified by the **ipport** parameter in the **add** or **set switch l3filter entry** command. The default is **false**, meaning the filter is applied to all ingress ports.

The **nomatchaction** parameter specifies a comma-separated list of actions to take when a frame matches both the **import** and **export** values (if they are specified in the match) on an associated entry but there is no match for the frame contents. If **setpriority** is specified, the packet's 802.1p priority is set to the value specified by the **priority** parameter. If **sendcos** is specified, the packet is sent to the priority queue specified by the **priority** parameter. If **settos** is specified, the packet's TOS (Type of Service) field is set to the value specified by the **newtos** parameter. If **deny** is specified, the packet is discarded. If **sendexport** is specified and the frame is not a broadcast, multicast, DLF frame or marked for dropping or to be sent to the CPU, the new output port is set to the value of the **port** parameter. If **sendmirror** is specified, the packet is sent to the mirror port. If **forward** is specified, the packet is forwarded using the default Class of Service (priority). If **movepriortos** is specified, the IP TOS field in the frame is replaced with the 802.1p priority value. This also determines the egress priority queue. If **setipdsdp** is specified and the frame is an IPv4 frame, the Diffserv Codepoint field in the frame is set to the value specified by the **newipdsdp** parameter. Actions that modify both the IP TOS and the IP DSCP values in the frame are mutually exclusive. If **sendnonunicasttoport** is specified, matching frames that are broadcast or DLF, multicast, marked for dropping or to be sent to the CPU are sent to the egress port specified by the **port** parameter. The default is **forward**.

The **nomatchdsdp** parameter indicates the value to set in an IPv4 packet DiffServe CodePoint field if the **nomatchaction** parameter is set to **setipdsdp**. The range of values for this parameter is from 0 to 63.

The **nomatchport** parameter specifies the new output port number. This port overrides the egress port selected by the forwarding database.

The **nomatchpriority** parameter specifies the packet priority. There are eight levels of priority, from 0 to 7. This parameter is used either if the **nomatchaction** parameter is set to **setpriority** or **sendcos**.

The **nomatchtos** parameter specifies the new Type of Service value, assigning a new value to the TOS precedence field in the IP header. This parameter is used when the **nomatchaction** parameter is set to **settos**.

The **sclass** parameter specifies the IP source address mask to apply to the source IP address field in packets when matching source IP addresses. If A is specified, the Class A mask 255.0.0.0 is used (mask length of 8). If B is specified, the Class B mask 255.255.0.0 is used (mask length of 16). If C is specified, the Class C mask 255.255.255.0 is used (mask length of 24). If **host** is specified, the host mask 255.255.255.255 is used (mask length of 32). If a number is specified, a mask of that length is used. The default is for no mask to be used (mask length of 0). The **sclass** parameter is required if **sipaddr** is specified by the **match** parameter.

The **type** parameter specifies the format of the protocol-type. This parameter may be used with the **export** and **import** parameters, but not with the other packet matching criteria. When other criteria are used, there is an implicit match to an IP protocol Ethernet type II packet. If 802 is specified, then the match is on the 2-byte DSAP/SSAP field of an 802.3 packet. If **ethii** is specified, then the match is on the 2-byte type field of an Ethernet type II packet. If **snap** is specified, then the match is on the 5-byte variable part of the identifier field of a SNAP packet (SNAP identifiers have the format *aa-aa-03-xx-xx-xx-xx-xx*).

Example To add a filter to block Telnet sessions, use the commands:

```
add swi l3f ma=tcpdport,prot
add swi l3f=1 ent ac=deny prot=tcp tcpd=23
```

Related Commands

- [add switch l3filter entry](#)
- [delete switch l3filter](#)
- [set switch l3filter match](#)
- [show switch l3filter](#)

add switch trunk

Syntax ADD SWITCh TRunk=*trunk* PORT=*port-list*

where:

- *trunk* is a character string 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. Do not name a trunk using the letters lacp. The switch automatically adds this prefix when it creates an LACP trunk group (or aggregated link).
- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command adds ports to an existing trunk group on the switch. When a port is added to a trunk group, its current speed and duplex mode settings are ignored and the port is set to autonegotiate to the speed of the trunk group and full duplex mode. Port trunking must be configured on both ends of the link, or network loops may result.

The **trunk** parameter specifies the name of the trunk group. The name is not case sensitive. The name uniquely identifies the trunk group. The specified trunk group must already exist.

The **port** parameter specifies the switch ports to be added to the trunk group. Ports specified must not be in another trunk group, and must have the same VLAN configuration. They cannot include the switch's mirroring port. A trunk group can consist of a maximum of 8 fixed or uplink ports but not a mixture of both types. On 48-port switches, avoid creating a trunk group that spans multiple switch instances (ports 1-24 form one instance and ports 25-48 form another instance). Note that all ports in a trunk group must belong to the same **group** if they have the same private VLAN configuration. See [add vlan port command on page 8-63](#).

When you add a port to a trunk group, the switch saves the port's current speed and duplex mode settings and sets the port to autonegotiate to the speed of the trunk group and full duplex mode. If the port does not support auto-negotiation, the switch sets the port to the fixed speed of the trunk group and full duplex mode. When you remove a port from a trunk group, the switch restores the port's speed and duplex mode settings to the values they had before the port was added to the trunk group.

If you add a disabled port to a trunk group, the port will not transmit or receive traffic for the trunk group. The remaining ports in the trunk group will share the traffic of the trunk group. However, the disabled port remains a member of the trunk group configuration. If the port is enabled, it will start transmitting and receiving traffic for the trunk group.

Example To add ports 5 and 6 to trunk group Trunk1, use the command:

```
add swi tr=trunk1 po=5,6
```

Related Commands

- [create switch trunk](#)
- [delete switch trunk](#)
- [destroy switch trunk](#)
- [set switch trunk](#)
- [show switch stp](#)

add vlan port

Syntax ADD VLAN={*vlan-name*|1..4094} Port={*port-list*|ALL}
[FRame={TAGged|UNTAGged}]

For private VLANs:

ADD VLAN={*vlan-name*|1..4094} Port={*port-list*|ALL}
[FRame={TAGged|UNTAGged}] [UPLINK] [GROUP]

where:

- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.
- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command adds ports to the specified VLAN.

A port cannot be a member of both a private VLAN and a non-private VLAN. See [“Private VLANs” on page 8-23](#) for more information about configuring private VLANs.

A port can belong to multiple spanning trees when the port is a member of more than one VLAN. If the port being added to the VLAN also belongs to another spanning tree through concurrent membership of another VLAN, it is not removed from that VLAN or spanning tree.

If as a result of the port addition, ports are moved from one spanning tree to another, the two affected spanning trees are initialised if they are currently enabled. Any previously disabled ports in the spanning trees are enabled.

The **vlan** parameter specifies the name or numerical VLAN Identifier of the VLAN. The name is not case sensitive, although the case is preserved for display purposes. The **vlan** must already exist. By default, all ports belong to the default VLAN, with a numerical VLAN Identifier (VID) of 1.

The **port** parameter specifies the ports to add to the selected VLAN. The command will fail unless successful on all ports. The following rules apply when adding ports to VLANs:

- You cannot add mirror ports to a VLAN.
- All ports in a trunk group must belong to the same VLAN and spanning tree.
- You cannot delete trunked ports from the default VLAN. For example, you cannot add a trunk member port as an untagged port of another VLAN, because this would result in a trunk with mixed VLAN membership.

If the VLAN is a private VLAN and you do not specify the **uplink** or **group** parameter, then the ports are added as individual private ports. Private ports cannot be added to a private VLAN until the VLAN has an uplink port or uplink trunk group added to it. The port must not be in a non-private VLAN. See [“Private VLANs” on page 8-23](#) for information about configuring private VLANs.

The **frame** parameter specifies whether a VLAN tag header is included in each frame transmitted on the specified ports. If **tagged** is specified, a VLAN tag is added to frames prior to transmission. The port is then called a *tagged* port for this VLAN. If **untagged** is specified, the frame is transmitted without a VLAN tag. The port is then called an *untagged* port for this VLAN. A port can be untagged for one and only one of the VLANs to which it belongs, or for none of the VLANs to which it belongs. A port can have the **frame** parameter set to **tagged** for zero or more VLANs to which it belongs. It is not possible to add an untagged port to a VLAN when the port is already present in another port-based VLAN, except the default VLAN. When the port is an untagged member of the default VLAN, adding it untagged to another VLAN deletes it from the default VLAN. The default setting is **untagged**.

The **group** parameter specifies that the listed ports may communicate with each other, but not with any other private ports in the VLAN, and is valid only for private VLANs. You can add a group of ports to multiple private VLANs, as long as the group contains identical ports in each VLAN. See [“Private VLANs” on page 8-23](#) for information about configuring private VLANs. Note that when adding a trunk group to a private VLAN as private ports, you *must* specify the group parameter.

The **uplink** parameter specifies that the port or ports are to be added to the VLAN as uplink ports, and is valid only for private VLANs. The port must not be a member of a non-private VLAN. If the port was in the default VLAN, adding it to another VLAN as an uplink removes it from the default VLAN. See [“Private VLANs” on page 8-23](#) for information about configuring private VLANs.

Examples To add port 4 to the port-based *marketing* VLAN, use the command:

```
add vlan=marketing po=4
```

To add port 25 to the *training* VLAN as a tagged port, use the command:

```
add vlan=training po=25 fra=tag
```

To create vlan2 with two groups of private ports (3-5 and 6-9) connected to an uplink trunk group (ports 21-24), without any Layer 3 configuration:

1. Create vlan2, making it private.

```
cre vlan=vlan2 vid=2 priv
```

2. Add the uplink trunk group to the VLAN. The ports must already be trunked together.

```
add vlan=vlan2 po=21-24 uplin
```

3. Define the groups and add their ports to vlan2.

```
add vlan=vlan2 po=3-5 group
```

```
add vlan=vlan2 po=6-9 group
```

Related Commands [delete vlan port](#)
[show vlan](#)

add vlanrelay

Syntax ADD VLANRelay=*name* [PROTOCOL=*protocoltype*]
[VLAN={*vlan-name*|1..4094}]

where:

- *name* is a unique name for the VLAN relay entity 1 to 32 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.
- *protocoltype* is either a valid protocol number in hexadecimal notation, or a recognised protocol name. A protocol number is 1 byte for SAP, 2 bytes for ETHII, or 5 bytes for an 802.2 SNAP type packet.
- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.

Description This command adds a protocol number and/or a VLAN to a VLAN relay entity. At least one protocol and two VLANs must be added to a VLAN relay entity before the entity can begin relaying packets.

The **vlanrelay** parameter specifies the unique identifier for the VLAN relay entity. A VLAN relay entity with this name must already exist.

The **protocol** parameter specifies an Ethernet protocol number for packets that are to be relayed. A predefined list of common protocols is provided in [Table 8-4 on page 8-26](#). To relay one of these protocols, specify the protocol name as the value for the **protocol** parameter. There is also the option of relaying all protocols of a given encapsulation type by use of the keywords “**all802**”, “**allethii**” and “**allsnap**”.



Use of the “ALL802”, “ALLETHII” and “ALLSNAP” protocols can cause traffic to be unexpectedly relayed where it is not desired. It is more desirable to explicitly enter the identification numbers of the protocols to be relayed.

The **vlan** parameter specifies the name or VLAN identifier of a VLAN to add to the VLAN relay entity. Adding a VLAN allows packets from that VLAN to be received and relayed, and packets from other VLANs to be relayed to that VLAN. The VLAN must already exist, and must be a static VLAN.

Example To add the VLAN whose ID is 2, and all SAP protocols, to VLAN relay entity SNARelay, use the command:

```
add vlanr=snarelay vlan=2 prot=all802
```

Related Commands

- [create vlanrelay](#)
- [delete vlanrelay](#)
- [destroy vlanrelay](#)
- [show vlanrelay](#)

create switch trunk

Syntax `CREate SWitch TRunk=trunk [Port=port-list]
[SElect={MACSrc|MACDest|MACBoth|IPSrc|IPDest|IPBoth}]
[SPeed={10M|100M|1000M}]`

where:

- *trunk* is a character string 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.
- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command creates a trunk group on the switch and optionally adds ports to it and sets its speed. The switch supports static 802.3ad link aggregation. Port trunking must be configured on both ends of the link, or network loops may result. You can create up to six trunk groups.

The **trunk** parameter specifies the name of the trunk group. The name is not case sensitive, although the case entered is preserved for display purposes. The name uniquely identifies the trunk group. The specified trunk group must not already exist.

The **port** parameter specifies the switch ports to be added to the trunk group. Ports specified must not be in another trunk group, and must have the same VLAN configuration. They cannot include the switch's mirroring port. A trunk group can consist of a maximum of 8 fixed or uplink ports but not a mixture of both types. On 48-port switches, avoid creating a trunk group that spans multiple switch instances (ports 1-24 form one instance and ports 25-48 form another instance). Note that all ports in a trunk group must belong to the same **group** if they have the same private VLAN configuration. See [add vlan port command on page 8-63](#).

When you add a port to a trunk group, the switch saves the port's current speed and duplex mode settings and sets the port to autonegotiate to the speed of the trunk group and full duplex mode. If the port does not support auto-negotiation, the switch sets the port to the fixed speed of the trunk group and full duplex mode. When you remove a port from a trunk group, the switch restores the port's speed and duplex mode settings to the values they had before the port was added to the trunk group.

If you add a disabled port to a trunk group, the port will not transmit or receive traffic for the trunk group. The remaining ports in the trunk group will share the traffic of the trunk group. However, the disabled port remains a member of the trunk group configuration. If the port is enabled, it will start transmitting and receiving traffic for the trunk group.

The **select** parameter specifies the port selection criterion for the trunk group. Each packet to be sent on the trunk group is checked, using the selection criterion, and a port in the trunk group chosen down which to send the packet. If **macsrc** is specified, the source MAC address is used. If **macdest** is specified, the destination MAC address is used. If **macboth** is specified, both source and destination MAC addresses are used. If **ipsrc** is specified, the source IP address is used. If **ipdest** is specified, the destination IP address is used. If **ipboth** is specified, both the source and destination IP addresses are used. The user of the switch should choose the value of this parameter to try to spread the load as evenly as possible on the trunk group. The default is **macboth**.

The **speed** parameter specifies the speed of the ports in the trunk group. For gigabit ports, only the 1000M value is allowed. For switch ports, 10M and 100M values are allowed. The default is 100M. When a port is added to a trunk group, its current speed and duplex mode settings are ignored and the port is set to autonegotiate to the speed of the trunk group and full duplex mode.

Example To create a trunk group called Trunk1 containing ports 1 to 4, use the command:

```
cre swi tr=Trunk1 po=1-4
```

Related Commands

- [add switch trunk](#)
- [delete switch trunk](#)
- [destroy switch trunk](#)
- [set switch trunk](#)
- [show switch stp](#)

create vlan

Syntax `CREate VLAN=vlan-name VID=2..4094 [PROtected]`

`CREate VLAN=vlan-name VID=2..4094 [PRIVate]`

where *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.

Description This command creates a VLAN with a unique name and VLAN identifier (VID), and assigns it to the default STP. You can have a maximum of 254 VLANs. To change the VID of an existing VLAN, that VLAN must be destroyed and created again with a modified VID.

If you create a private or protected VLAN, you can add ports or groups of ports to it that are isolated from the other ports in the VLAN. Protected VLANs cannot be configured on the same switch with private VLANs. See [“Protected VLANs” on page 8-23](#) and [“Private VLANs” on page 8-23](#) for more information.

The **vlan** parameter specifies a unique name for the VLAN. This name can be more meaningful than the VID and makes administration easier. The VLAN name is used within the switch; it is not transmitted to other VLAN-aware devices, or used in the forwarding process or stored in the forwarding database. If the VLAN name begins with “vlan” and ends with a number, for instance “vlan1” or “vlan234”, then the number must be the same as the VID specified. This avoids confusion when identifying to which VLAN subsequent commands refer.

The **vid** parameter specifies a unique VLAN identifier for the VLAN. If tagged ports are added to this VLAN, the specified VID is used in the VID field of the tag in outgoing frames. If untagged ports are added to this VLAN, the specified VID acts as an identifier for the VLAN in the forwarding database. The default port based VLAN has a VID of 1.

The **private** parameter specifies that the VLAN is a private VLAN. A private VLAN contains ports or groups of ports that are isolated from the other ports in the VLAN. If you configure an ingress rate limit less than 1000kbps on a port, it cannot participate in a private VLAN. Data ingressing the switch over that port is not subject to any restrictions the private VLAN imposes. Therefore, we recommend that you configure ingress rate limits greater than 1000kbps on ports that are members of private VLANs.

The **protected** parameter specifies that the VLAN is a protected VLAN. If a VLAN is protected, Layer 2 traffic is blocked between its ports.

Examples To create a VLAN named *marketing* with a VLAN Identifier of 2, use the command:

```
cre vlan=marketing vid=2
```

To create a VLAN named *vlan42*, which must have a VID of 42, use the command:

```
cre vlan=vlan42 vid=42
```

To create vlan2 and make it a private VLAN, use the command:

```
cre vlan=vlan2 vid=2 priv
```

To create a protected VLAN named *protvlan* with a VLAN Identifier of 3, use the command:

```
cre vlan=protvlan vid=3 pro
```

Related Commands

- [add vlan port](#)
- [destroy vlan](#)
- [set switch port](#)
- [show vlan](#)

create vlanrelay

Syntax CREate VLANRelay=*name*

where *name* is a unique name for the VLAN relay entity 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

Description This command creates a VLAN relay entity, which can be used to relay packets of a given protocol type between VLANs. The VLAN relay entity is enabled by default.

For packet relaying to commence, VLANs and protocol types must be added to this entry, using the [add vlanrelay command on page 8-65](#).

The **vlanrelay** parameter specifies the unique identifier for the VLAN relay entity. No VLAN relay entity with this name may already exist. Comparisons of VLAN relay entity names are done without regard to the case of letters, although the case of letters is preserved in order to improve readability. For example, "relaying" and "RelayOne" are treated as the same VLAN relay entity name.

Example To create a VLAN relay entity called SNARelay, use the command:

```
cre vlanr=snarelay
```

Related Commands

- [add vlanrelay](#)
- [delete vlanrelay](#)
- [destroy vlanrelay](#)
- [show vlanrelay](#)

delete lacp port

Syntax DELEte LACP PORt={*port-list*}

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of port numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered switch port, including uplink ports.

Description This command removes ports from LACP's control and LACP frames are no longer transmitted across the link. It is good practice to delete LACP from ports that are linked to non-LACP-capable devices.

The **port** parameter specifies switch ports to be deleted from LACP's control. Ports specified must be under the control of LACP. **All** is not a configurable option; to stop LACP on all ports, use the **disable lacp** command.

Examples To delete ports 3 and 5 from LACP, use the command:

```
del lacp po=3,5
```

Related Commands

- [add lacp port](#)
- [disable lacp](#)
- [enable lacp](#)
- [set lacp port](#)
- [show lacp port](#)

delete switch filter

Syntax DELEte SWItch FILter PORt=*port* ENTRy=*entry-list*

where:

- *port* is the number of one of the switch ports or an uplink port.
- *entry-list* is an entry number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Entry numbers start at 0 and end at *m*, where *m* is the highest filter entry currently defined in the permanent forwarding database. Each port has its own permanent forwarding database.

Description This command deletes the specified static filter entry port from the permanent forwarding database. The static filter is deleted on the port specified by the **port** parameter. The **entry** parameter must specify an existing filter entry in the permanent forwarding database.

Example To delete filter entry 9 on port 2, use the command:

```
del swi fil po=2 ent=9
```

Related Commands

- [add switch filter](#)
- [show switch filter](#)

delete switch hwfilter classifier

Syntax DELEte SWItch HWFilter CLASSifier={*classifier-list*|ALL}

where *classifier-list* is either an integer from 1 to 9999; a range of integers (specified as 1-4), or a comma-separated list of classifier numbers and/or ranges (1, 3, 4-9)

Description This command deletes any hardware-based filters associated with the specified classifier(s). All of the specified classifiers must exist and must already be incorporated into a filter entry. The **switch hwfilter classifier** commands may not be used with the **switch l3filter** commands.

The **classifier** parameter specifies a list of classifiers for which hardware filter entries are to be deleted. If you specify **all**, this deletes entries for all classifiers except the classifiers automatically created by DHCP snooping.

Examples To delete hardware filtering entries based on classifiers 1 to 5 from the switch, use the command:

```
del swi hwf class=1-5
```

Related Commands [add switch hwfilter classifier](#)
[set switch hwfilter classifier](#)
[show switch hwfilter](#)

delete switch l3filter

Syntax DELEte SWItch L3Filter=*filter-id*

where *filter-id* is a decimal number in the range 1 to the number of filters defined

Description This command deletes the specified filter match criteria. A filter match criteria cannot be deleted if it contains a filter entry. Delete the filter entries and then delete the filter.

Example To delete filter 1, use the command:

```
del swi l3f=1
```

Related Commands [add switch l3filter match](#)
[set switch l3filter match](#)
[show switch l3filter](#)

delete switch l3filter entry

Syntax DELEte SWItch L3Filter=*filter-id* ENTRy=*entry-id*

where:

- *filter-id* is a decimal number in the range 1 to the number of filters defined.
- *entry-id* is a decimal number in the range 1 to the number of entries defined.

Description This command deletes the specified entry from the specified filter. Both the entry and the filter must already exist. The **l3filter** parameter specifies the number of the filter. The **entry** parameter specifies the number of the entry to delete. Filter and entry numbers are in the output of the [show switch l3filter command on page 8-133](#).

Example To delete entry 3 from filter 1, use the command:

```
del swi l3f=1 ent=3
```

Related Commands [add switch l3filter entry](#)
[set switch l3filter entry](#)
[show switch l3filter](#)

delete switch trunk

Syntax DELEte SWItch TRunk=*trunk* PORT={*port-list*|ALL}

where:

- *trunk* is a character string 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.
- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered switch Ethernet port, including uplink ports.

Description This command deletes ports from an existing trunk group on the switch.

The **trunk** parameter specifies the name of the trunk group. The name is not case sensitive. The name uniquely identifies the trunk group. The specified trunk group must already exist.

The **port** parameter specifies switch ports to be deleted from the trunk group. Ports specified must be in the specified trunk group. If **all** is specified, then all ports in the trunk group are deleted. When you remove a port from a trunk group, the switch restores the port's speed and duplex mode settings to the values they had before the port was added to the trunk group.

Example To delete port 3 from trunk group Trunk1, use the command:

```
del swi tr=trunk1 po=3
```

Related Commands

- [add switch trunk](#)
- [create switch trunk](#)
- [destroy switch trunk](#)
- [set switch trunk](#)
- [show switch stp](#)

delete vlan port

Syntax DELEte VLAN={*vlan-name*|1..4094} PORt={*port-list*|ALL}

where:

- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.
- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered switch Ethernet port (including uplink ports).

Description This command deletes ports from the specified **vlan**. An untagged port can be deleted from a VLAN when the port is still a member of a VLAN after the deletion has occurred. If the port does not belong to a VLAN as a tagged port, then the port is implicitly added to the default VLAN as an untagged port. It is not possible to delete a port that belongs only to the default VLAN as an untagged port.

If the port becomes a tagged port as a result of the deletion; that is, the port does not belong to any VLAN as an untagged port, then the **acceptable** switch parameter for the port is set to VLAN. The user is not able to change the **acceptable** parameter for the port.

A tagged port can be deleted from a VLAN if the port is still a member of a VLAN after the deletion has occurred.

If as a result of the port deletion, ports are moved from one STP to another STP, the two affected STPs are initialised when they are presently enabled. Previously disabled ports in the STPs are enabled.

The **vlan** parameter specifies the name or numerical VLAN Identifier of the VLAN. The name is *not* case sensitive. The VLAN must already exist.

The **port** parameter specifies the ports to be deleted from the VLAN. If **all** is specified, then all ports belonging to the VLAN are deleted. When the command succeeds on a subset of the specified ports but causes errors on the others, then the command as a whole fails and has no effect.

A port can belong to multiple STPs when the port is a member of more than one VLAN. If the port being deleted from the VLAN also belongs to another STP through concurrent membership of another VLAN, it is not removed from that VLAN or STP.

If a port belongs to a trunk group, all the ports in the trunk group must be specified. A subset of the ports in a trunk group cannot be deleted from the VLAN unless they are first removed from the trunk group.

A private VLAN cannot contain any private ports when the last uplink is deleted from the VLAN, because a private VLAN must always have an uplink. To delete all uplink and private ports from a private VLAN, use the option **port=all**.

If the port is a member of a private group, you must delete all ports in the group at once. This stops groups from having different member ports in different VLANs.

Example To delete port 3 from the *marketing* VLAN, use the command:

```
del vlan=marketing po=3
```

Related Commands [add vlan port](#)
[show vlan](#)

delete vlanrelay

Syntax DELEte VLANRelay=*name* [PROToCol=*protocoltype*]
[VLAN={*vlan-name*|1..4094}]

where:

- *name* is a unique name for the VLAN relay entity 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.
- *protocoltype* is either a valid protocol number in hexadecimal notation, or a recognised protocol name. A protocol number is 1 byte for SAP, 2 bytes for ETHII, or 5 bytes for an 802.2 SNAP type packet.
- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.

Description This command deletes a protocol number and/or a VLAN from a VLAN relay entity. The relay entity must still contain at least one protocol and two VLANs in order to relay packets.

The **vlanrelay** parameter specifies the unique identifier for the VLAN relay entity. A VLAN relay entity with this name must already exist.

The **protocol** parameter specifies an Ethernet protocol number for packets that are no longer to be relayed. The protocol number must be currently being relayed. [Table 8-4 on page 8-26](#) lists predefined protocol types.

The **vlan** parameter specifies the static VLAN to remove from the VLAN relay entity. The VLAN can be referenced by name or VLAN ID. The VLAN must already exist and must currently be part of the VLAN relay entity.

Example To delete VLAN 2 from VLAN relay entity SNARelay, use the command:

```
del vlanr=snarelay vlan=2
```

Related Commands [add vlanrelay](#)
[create vlanrelay](#)
[destroy vlanrelay](#)
[show vlanrelay](#)

destroy switch trunk

Syntax DESTroy SWItch TRunk=*trunk*

where *trunk* is a character string 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

Description This command destroys a trunk group on the switch. The trunk group must be empty—it must not contain any ports.

The **trunk** parameter specifies the name of the trunk group. The name is not case sensitive. The name uniquely identifies the trunk group. The specified trunk group must already exist.

Example To destroy a trunk group called Trunk1, use the command:

```
dest swi tr=trunk1
```

Related Commands [add switch trunk](#)
[create switch trunk](#)
[delete switch trunk](#)
[set switch trunk](#)
[show switch stp](#)

destroy vlan

Syntax DESTroy VLAN={*vlan-name* | 2..4094 | ALL}

where *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.

Description This command destroys the specified static VLAN or all static VLANs in the switch. The default VLAN, which has a numerical VLAN Identifier (VID) of 1, cannot be destroyed. If **all** is specified, then all VLANs except the default VLAN are destroyed. A VLAN cannot be destroyed when ports still belong to it or other modules are attached to it.

The [reset garp](#) command on page 10-16 of Chapter 10, [Generic Attribute Registration Protocol \(GARP\)](#) can be used to destroy dynamic VLANs. However, the dynamic VLANs may be recreated if the switch receives GARP packets after the RESET GARP command has been executed. Disabling a GVRP instance destroys all dynamic VLANs created by the GVRP instance. Dynamic VLANs exist only when GVRP is enabled.

Examples To destroy the VLAN with the VLAN Identifier of 1234, use the command:

```
dest vlan=1234
```

To remove all user created VLANs from the switch, none of which have any member ports, use the command:

```
dest vlan=all
```

Related Commands [create vlan](#)
[show vlan](#)

destroy vlanrelay

Syntax DESTroy VLANRelay=*name*

where *name* is a unique name for the VLAN relay entity 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

Description This command destroys a VLAN relay entity. Packet relaying as configured in this VLAN relay entity immediately stops.

The **vlanrelay** parameter specifies the unique identifier for the VLAN relay entity. A VLAN relay entity with this name must already exist.

Example To destroy the VLAN relay entity called **snarelay**, use the command:

```
dest vlanr=snarelay
```

Related Commands [add vlanrelay](#)
[create vlanrelay](#)
[delete vlanrelay](#)

disable lacp

Syntax DISable LACP

Description This command disables the LACP processes on the switch. A warning message, notification message, and log message are generated when this command is executed. LACP is disabled by default. LACP port settings that are changed while LACP is disabled take effect when LACP is re-enabled.

Related Commands [enable lacp](#)
[show lacp](#)

disable lacp debug

Syntax DISable LACP DEBug={MSG|PACKet|STATe|TRAcE|DEV|PERSistent|ALL}

Description This command disables the LACP debugging process, which is disabled by default. The **msg** option displays the decoded form of incoming and outgoing LACP packets.

The **packet** option displays incoming and outgoing LACP packets in hex. The **state** option displays internal state machine changes. The **trace** option displays the function call tree.

The **dev** option displays internal support information. The **persistent** option enables the debug state to persist over one reboot.

If **all** is specified, the debugging process is disabled for all options. The default is **all**.

Related Commands [enable lacp debug](#)
[show lacp](#)
[disable debug active](#) in Chapter 4, Configuring and Monitoring the System
[show debug active](#) in Chapter 4, Configuring and Monitoring the System

disable switch ageingtimer

Syntax DISable SWITch AGEingtimer

Description This command stops the ageing timer from ageing dynamically learned entries in the forwarding database. The default setting for the ageing timer is enabled.

Example To disable the ageing of learned MAC addresses, use the command:

```
dis swi age
```

Related Commands [enable switch ageingtimer](#)
[set switch ageingtimer](#)
[show switch](#)

disable switch debug

Syntax DISable SWitch DEBug={ALL | ARL | CMIC | DMA | MSTp | PHY | QOS | S5600 | STP}

Description This command disables the specified switch debug mode or all switch debugging. The **debug** parameter specifies the debug mode to disable (Table 8-9).

Table 8-9: Switch debugging options

Debug Options	Description
ALL	All debug options.
ARL	Operations related to the forwarding database.
CMIC	Operations at the CMIC layer.
DMA	Operations related to Direct Memory Access requests.
MSTp	Changes to the STP state of a switch port. See the enable mstp debug command on page 9-46 of Chapter 9, Spanning Trees for debugging the STP state requests made by STP.
PHY	Operations related to the PHY port interfaces.
QOS	Operations related to Quality of Service.
S5600	Operations related to the switching hardware.
STP	Changes to the STP state of a switch port. See the enable mstp debug command on page 9-46 of Chapter 9, Spanning Trees for debugging the STP state requests made by STP.

Example To disable all switch debugging, use the command:

```
dis swi deb=all
```

Related Commands

- [disable debug active](#) in Chapter 4, Configuring and Monitoring the System
- [disable mstp debug](#) in Chapter 9, Spanning Trees
- [disable stp debug](#) in Chapter 9, Spanning Trees
- [enable mstp debug](#) in Chapter 9, Spanning Trees
- [enable stp debug](#) in Chapter 9, Spanning Trees
- [enable switch debug](#)
- [show debug active](#) in Chapter 4, Configuring and Monitoring the System
- [show switch debug](#)
- [show switch mstp](#)
- [show switch stp](#)

disable switch filter vlansecure

Syntax DISable SWITch FILTER VLANSecure

Description This command modifies Layer 2 switch filtering by disabling **vlansecure** mode. The **vlansecure** mode is enabled by default.

When **vlansecure** mode is disabled and a filter exists for a given host and port, moving the host to a different port in the same VLAN only stops the host from accessing that VLAN, not other VLANs. When **vlansecure** mode is enabled and a filter exists for a given host and port, moving the host to a different port blocks the host completely. For more information, see [“Securing a Single VLAN through Switch Filters” on page 8-32.](#)

Example To turn off the default filtering behaviour, use the command:

```
disable switch filter vlansecure
```

Related Commands [enable switch filter vlansecure](#)
[show switch filter](#)

disable switch hwfilter

Syntax DISable SWITch HWFilter

Description This command disables classifier-based packet filtering.

Hardware filtering is automatically disabled when the last filter match is removed, however this command may be used to manually disable filtering if this is required.

Some other modules and processes (such as IGMP snooping) require filtering to be enabled at all times. If any of these are active when the **disable switch hwfilter** command is entered, it has no effect and an error message results.

Example To disable existing classifier-based packet filters, use the command:

```
dis swi hwf
```

Related Commands [enable switch hwfilter](#)
[show switch hwfilter](#)

disable switch l3filter

Syntax DISable SWITch L3Filter

Description This command disables hardware-based Layer 3 packet filtering.

Hardware filtering is automatically disabled when the last filter match is removed; however, this command may be used to manually disable filtering. Some other modules and processes (such as IGMP snooping) require filtering to be enabled at all times. If any of these are active when this command is entered, it has no effect and an error message results.

Example To disable existing hardware-based Layer 3 packet filters, use the command:

```
dis swi l3f
```

Related Commands [enable switch l3filter](#)
[show switch l3filter](#)

disable switch learning

Syntax DISable SWITch LEarning

Description This command disables the dynamic learning and updating of the forwarding database. The default setting for the learning function is enabled.

If switch learning is disabled and the ageing timer has aged out all dynamically learned filter entries, only MAC source addresses that are statically entered are used to decide which packets to forward or discard. If the switch finds no matching entries in the forwarding database during the forwarding process, then all switch ports in the VLAN are flooded with the packet, except the port on which the packet was received.

Example To disable the switch learning function, use the command:

```
dis swi le
```

Related Commands [enable switch learning](#)
[show switch](#)

disable switch mirror

Syntax DISable SWItch MIRRor

Description This command disables traffic mirroring on the switch. Mirrored traffic is stopped from being sent on the switch's mirror port. The mirror port and mirror settings for the sources of mirror traffic remain configured. The default state of switch mirroring is disabled.

Example To disable traffic mirroring, use the command:

```
dis swi mirr
```

Related Commands [enable switch mirror](#)
[set switch mirror](#)
[set switch port](#)
[show switch](#)
[show switch port](#)

disable switch port

Syntax `DISable SWItch PORT={port-list|ALL} [FLOW={JAMming|PAUse}]
[,...] [LINK={ENable|DISable}]`

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered switch Ethernet port, including uplink ports.

Description This command disables one or more of:

- a port or group of ports on the switch
- the link belonging to any specified port(s). This ensures that the device at the other end of the link realises that the port is down.
- flow control on the port(s)

When a port is disabled, it no longer sends or receives frames. Ports should be disabled when faulty wiring or equipment is attached to them, or as a security measure to stop access from intruders. Switch ports are enabled by default.

If the port is a member of a trunk group, the port will no longer transmit or receive traffic for the trunk group. The remaining ports in the trunk group will share the traffic of the trunk group. However, the disabled port remains a member of the trunk group configuration. If the port is re-enabled, it will resume transmitting and receiving traffic for the trunk group.

The **port** parameter specifies the port or ports that will be affected by the command.

The **flow** parameter specifies the type of flow control to be disabled for the port, one or both of **pause** and **jamming**. If you specify **pause**, that disables flow control for full duplex ports—the port no longer sends PAUSE frames. If you specify **jamming**, that disables flow control for half duplex ports—the port no longer asserts the jamming signal. You can only specify **jamming** when **port=all**. The **pause** flow control is enabled by default.

The **link** parameter specifies whether switch ports are enabled or disabled at the hardware level. This parameter is valid for ports on the base switch—uplink module ports can only be disabled at the software level. If **disable** is specified, this is the equivalent of disconnecting the cable. If the **link** parameter is not specified, the link remains physically enabled. On a disabled port, entering the command **disable switch port=port-number link=enable** brings the link up in software without re-enabling the port.

Example To disable ports 2, 3, 4 and 6, use the command:

```
dis swi po=2-4,6
```

Related Commands [enable switch port](#)
[reset switch port](#)
[show switch port](#)

disable vlan debug

Syntax `DISable VLAN={vlan-name|1..4094|ALL} DEBug={PKT|ALL}`

where *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.

Description This command disables packet debugging or all debugging for all VLANs or a specific one. The default is for all VLAN debugging to be disabled.

The **debug** parameter specifies the VLAN debugging mode to be disabled. If PKT is specified, the packet debug mode (displaying raw ASCII packets) is disabled. If **all** is specified, all debugging is disabled.

Example To disable packet debugging on the *marketing* VLAN, use the command:

```
dis vlan=marketing deb=pkt
```

Related Commands [enable vlan debug](#)
 [show vlan debug](#)

disable vlanrelay

Syntax `DISable VLANRelay=name`

where *name* is a unique name for the VLAN relay entity 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

Description This command disables packet relaying by the VLAN relay entity. The entity must exist and must be currently enabled. VLAN relay entities are enabled by default upon creation.

Example To disable packet relaying by the VLAN relay entity SNARelay, use the command:

```
dis vlanr=snarelay
```

Related Commands [add vlanrelay](#)
 [delete vlanrelay](#)
 [enable vlanrelay](#)

disable vlanrelay debug

Syntax `DISable VLANRelay=name DEBug`

where *name* is a unique name for the VLAN relay entity 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

Description This command disables the output of debugging information about packets relayed by a VLAN relay entity. The relay entity must already exist and VLAN relay debugging must currently be enabled. Debugging of VLAN relay entities is disabled by default.

Example To disable the display of packets relayed by the VLAN relay entity SNARelay, use the command:

```
dis vlanr=snarelay deb
```

Related Commands [add vlanrelay](#)
[delete vlanrelay](#)
[enable vlanrelay](#)
[enable vlanrelay debug](#)

enable lacp

Syntax `ENAbLe LACP`

Description This command enables LACP on the switch. A notification message and a log message file are generated when this command is executed. LACP is disabled by default.

Related Commands [disable lacp](#)
[show lacp](#)

enable lacp debug

Syntax `ENABle LACP DEBUg={MSG|PACKet|STAtE|TRAcE|DEV|PERsistent|ALL}}`

Description This command enables the LACP debugging facility, which is disabled by default. The **msg** option displays the decoded form of incoming and outgoing LACP packets.

The **packet** option displays all incoming and outgoing LACP packets. The **state** option displays internal state machine changes. The **trace** option displays the function call tree.

The **dev** option displays internal support information. The **persistent** option enables the debug state to persist over one reboot.

If **all** is specified, the debugging process is enabled for all options. The default is **all**.

Related Commands [disable lacp debug](#)
[show lacp](#)
[disable debug active](#) in Chapter 4, Configuring and Monitoring the System
[show debug active](#) in Chapter 4, Configuring and Monitoring the System

enable switch ageingtimer

Syntax `ENABle SWItch AGEingtimer`

Description This command enables the ageing timer to age out dynamically learned entries in the forwarding database. The default setting for the ageing timer is enabled.

If the ageing timer ages out all dynamically learned filter entries, and switch learning is disabled, only statically entered MAC source addresses are used to decide which packets to forward or discard. If the switch finds no matching entries in the forwarding database during the forwarding process, then all switch ports in the VLAN are flooded with the packet, except the port on which the packet was received.

Example To enable the ageing of learned MAC addresses, use the command:

```
ena swi age
```

Related Commands [disable switch ageingtimer](#)
[set switch ageingtimer](#)
[show switch](#)

enable switch bist

Syntax ENABle SWITch BIST=*bist*

ENABle SWITch BIST=*bist* INSTance=*instance*

where:

- *bist* is a single integer number.
- *instance* is 0 or 1 and specifies a switch instance on 48 port switches.

Description This command runs a set of built-in self tests on the external packet buffer memory and internal memories of a switch chip (or instance). The **instance** parameter must be specified *only* for switches with 48 ports. For example output, see [Figure 8-12](#).



This command should be used by authorised personnel because it affects network and switch performance. Disconnect switch ports from any live networks before enabling this command, and reboot the switch afterwards.

Figure 8-12: Example output from the **enable switch bist=0** command

```
INFO - Starting built in self tests, unit 0

INFO - Writing incrementing pattern
.....
INFO - Reading incrementing pattern
.....
INFO - Writing inverted incrementing pattern
.....
INFO - Reading inverted incrementing pattern
.....
INFO - Memory comparison successful
Running other BIST tests
INFO - INITIATE1=0x00003fff INITIATE2=0x0bffffff IN_BIST=2
INFO - Waiting for completion
INFO - INITIATE1=0x00003fff
INFO - INITIATE2=0x0bffffff
INFO - EPIC0.DONE=2
INFO - EPIC1.DONE=2
INFO - EPIC2.DONE=2
INFO - mem=L3 addr=0x09000000
INFO - mem=CAB0 addr=0x0a610000
INFO - mem=CAB1 addr=0x0a620000
INFO - mem=CAB2 addr=0x0a630000
INFO - mem=CAB3 addr=0x0a640000
INFO - mem=CBPDATA0 addr=0x0a6a0000
.
.
.
INFO - mem=XQ25 addr=0x0c690000
INFO - mem=XQ27 addr=0x0c6b0000

INFO - BIST test succesful

Warning (2087309): The SWITCH MUST BE RESTARTED after running the BIST.
```

Examples To enable the BIST test, use the command:

```
ena swi bist=0
```

enable switch debug

Syntax `ENABle SWItch DEBUg={ALL|ARL|CMIC|DMA|MSTp|PHY|QOS|S5600|STP} [OUTput=CONSOLE] [TIMEOut={1..400000000|NONE}]`

Description This command enables the specified switch debug mode or all switch debugging. Be aware that enabling debug may flood the receiving Telnet session or asynchronous port with raw data.

The **debug** parameter specifies the switch debug mode to enable ([Table 8-9](#)).

Table 8-10: Switch debugging options

Debug Options	Description
ALL	All debug options.
ARL	Operations related to the forwarding database.
CMIC	Operations at the CMIC layer.
DMA	Operations related to Direct Memory Access requests.
MSTp	Changes to the STP state of a switch port. See the enable mstp debug command on page 9-46 of Chapter 9, Spanning Trees for debugging the STP state requests made by STP.
PHY	Operations related to the PHY port interfaces.
QOS	Operations related to Quality of Service.
S5600	Operations related to the switching hardware.
STP	Changes to the STP state of a switch port. See the enable mstp debug command on page 9-46 of Chapter 9, Spanning Trees for debugging the STP state change requests made by STP.

The **output** parameter set to **console** specifies that the debugging information produced is sent to the console. The debugging data is by default sent to the port on which it received the **enable switch debug** command. Use this option if the command is used in a script, since a script is not received on a port.

The **timeout** parameter specifies the time in seconds that switch debugging is enabled. This reduces the risk of the switch and the display being overloaded with too much debugging information. This value overrides any previous switch debugging timeout values, even if they were specified for other debugging modes. If **timeout** is not specified, the time out is the most recent **timeout** value previously used in an **enable vlan debug** command, or **none** if it has not been previously set.

Example To enable the ARL switch debugging mode, use the command:

```
enable switch debug=arl
```

Related Commands

- [disable debug active](#) in Chapter 4, Configuring and Monitoring the System
- [disable mstp debug](#) in Chapter 9, Spanning Trees
- [disable stp debug](#) in Chapter 9, Spanning Trees
- [disable switch debug](#)
- [enable mstp debug](#) in Chapter 9, Spanning Trees
- [enable stp debug](#) in Chapter 9, Spanning Trees
- [show debug active](#) in Chapter 4, Configuring and Monitoring the System
- [show switch debug](#)
- [show switch mstp](#)
- [show switch stp](#)

enable switch filter vlansecure

Syntax ENABle SWItch FILTER VLANSecure

Description This command returns Layer 2 switch filtering to its default behaviour by enabling **vlansecure** mode. The **vlansecure** mode is enabled by default.

When **vlansecure** mode is enabled and a filter exists for a given host and port, moving the host to a different port blocks the host completely. When **vlansecure** mode is disabled and a filter exists for a given host and port, moving the host to a different port in the same VLAN only stops the host from accessing that VLAN, not other VLANs.

Example To turn on the default filtering behaviour, use the command:

```
enable switch filter vlansecure
```

Related Commands [disable switch filter vlansecure](#)
[show switch filter](#)

enable switch hwfilter

Syntax ENABle SWItch HWFilter

Description This command enables hardware-based Layer 3 packet filtering.

Hardware filtering is automatically enabled when the first filter match is added. This command may be used to re-enable filtering if it has been temporarily disabled by the **disable switch hwfilter** command, or to enable the filtering mechanism prior to the addition of the first filter match.

Example To enable existing hardware-based Layer 3 packet filters, use the command:

```
ena swi hwf
```

Related Commands [disable switch hwfilter](#)
[show switch hwfilter](#)

enable switch l3filter

Syntax ENABle SWItch L3Filter

Description This command enables hardware-based Layer 3 packet filtering.

Hardware filtering is automatically enabled when the first filter match is added. However this command may be used to re-enable filtering if it has been temporarily disabled by the **disable switch l3filter** command, or to enable the filtering mechanism prior to the addition of the first filter match.

Example To enable existing hardware-based Layer 3 packet filters, use the command:

```
ena swi l3f
```

Related Commands [disable switch l3filter](#)
[show switch l3filter](#)

enable switch learning

Syntax ENABle SWItch LEarning

Description This command enables the dynamic learning and updating of the forwarding database. The default setting for the learning function is enabled.

Example To enable the switch learning function, use the command:

```
ena swi le
```

Related Commands [disable switch learning](#)
[show switch](#)

enable switch mirror

Syntax ENABle SWItch MIRRor

Description This command enables traffic mirroring on the switch. Mirrored traffic is sent on the switch's mirror port as long as a valid one is defined and sources of mirror traffic have been configured. If a packet is Layer 3 switched and mirrored, then the packet is always transmitted from the mirror port with a VLAN tag. Four or more ports set to mirror traffic to the mirror port may significantly reduce switch performance. The default state of mirroring is disabled.

Example To enable traffic mirroring, use the command:

```
ena swi mirr
```

Related Commands [disable switch mirror](#)
[set switch mirror](#)
[set switch port](#)
[show switch](#)
[show switch port](#)

enable switch port

Syntax ENABle SWItch Port={*port-list*|ALL} [FLow={JAMming|PAUse}]
 [,...]

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered switch Ethernet port, including uplink ports.

Description	This command enables a port or group of ports on the switch, or enables the flow control mechanism. When the port is enabled, it sends and receives packets subject to the operation of STP. Enabling the switch port does not affect STP on the port. Switch ports are enabled by default.
--------------------	---

If the port is a member of a trunk group, the port will resume transmitting and receiving traffic for the trunk group.

You cannot use this command to enable a port that has been disabled by the Port Security function. Instead, use the **set switch port** command on page 8-108 and set **learn=0**.

The **port** parameter specifies the port to be enabled, or which are to have flow control methods enabled.

The **flow** parameter specifies the type of flow control to be enabled for the port, one or both of **pause** and **jamming**. If you specify **pause**, that enables flow control for full duplex ports by sending PAUSE frames. If you specify **jamming**, that enables flow control for half duplex ports by asserting the jamming signal. You can only specify **jamming** when **port=all**. The **pause** flow control is enabled by default.

Example To enable ports 2, 4 and 6, use the command:

```
ena swi po=2,4,6
```

Related Commands [disable switch port](#)
 [reset switch port](#)
 [show switch port](#)

enable vlan debug

Syntax ENABle VLAN={*vlan-name*|1..4094|ALL} DEBUg={PKT|ALL}
[OUTput=CONSOLE] [TIMEOut={1..4000000000|NONE}]

where *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.

Description This command enables debugging options for the specified VLAN or all VLANs. Be aware that enabling debug may flood the receiving Telnet session or asynchronous port with raw data. The default is for all VLAN debugging to be disabled.

The **debug** parameter specifies the debugging mode that is enabled. If **pkt** is specified, packet debug mode (displaying raw ASCII packets) is enabled. If **all** is specified, all debugging is enabled.

The **output** parameter set to **console** specifies that the debugging information produced is sent to the console. The debugging data is by default sent to the port on which it received the **enable vlan debug** command. Use this option if the command is used in a script, since a script is not received on a port.

The **timeout** parameter specifies the time in seconds when debugging is enabled on the specified VLAN. This reduces the risk of the switch and the display being overloaded with too much debugging information. This value overrides any previous VLAN debugging timeout values for the VLAN, even if they were specified for other debugging modes. If **timeout** is not specified, the time out is the most recent **timeout** value used in an **enable vlan debug** command or **none** if none had been set.

Example To enable all debugging on the *marketing* VLAN, use the command:

```
enable vlan=marketing debug=all
```

Related Commands [disable vlan debug](#)
[show vlan debug](#)

enable vlanrelay

Syntax ENABle VLANRelay=*name*

where *name* is a unique name for the VLAN relay entity 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

Description This command enables the relaying of packets by the VLAN relay entity. The relay entity must already exist and must be currently disabled. VLAN relay entities are enabled by default upon creation.

Example To enable packet relaying by the VLAN relay entity SNARelay, use the command:

```
ena vlanr=snarelay
```

Related Commands [add vlanrelay](#)
 [delete vlanrelay](#)
 [disable vlanrelay](#)

enable vlanrelay debug

Syntax ENABle VLANRelay=*name* DEBug

where *name* is a unique name for the VLAN relay entity 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

Description This command enables the output of debugging information about packets relayed by the VLAN relay entity. The relay entity must already exist, and VLAN relay debugging must be currently disabled. Debugging of VLAN relay entities is disabled by default.

The format of the output messages from packet debugging is as follows:

```
vr: 2->3: 0000cd001234 0000cd004321 040403060708090560403
```

The first part of the output shows which VLANs the packet is being relayed between. The second part shows the packet, with destination and source MAC addresses separated from the payload of the packet.

Example To enable the display of packets relayed by the VLAN relay entity SNARelay, use the command:

```
ena vlanr=snarelay deb
```

Related Commands [add vlanrelay](#)
 [delete vlanrelay](#)
 [disable vlanrelay debug](#)
 [enable vlanrelay](#)

purge lacp

Syntax PURge LACP

Description This command destroys all LACP configuration and restores the defaults to all the configurable parameters. The LACP parameters for all ports are reset to their defaults. This command returns the LACP module to the status that existed when first powered on.

Example To purge the LACP configuration, use the command:

```
pur lacp
```

Related Commands [enable lacp](#)
[disable lacp](#)
[set lacp port](#)

reset lacp port counter

Syntax RESET LACP PORT[={*port-list*|ALL}] COUnter

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of port numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command resets LACP counters for the specified switch ports to zero.

The **port** parameter specifies the ports. If **all** is specified, all port counters in the switch are reset. The default value is **all**.

Examples To reset the LACP counters for port 5, use the command:

```
reset lacp po=5 cou
```

Related Commands [purge lacp](#)
[show lacp port counter](#)

reset switch

Syntax RESET SWITCh

Description This command resets the switch module. All dynamic switch information is cleared. All ports are reset. All counters and timers are reset to zero.

Example To reset the switch module, use the command:

```
reset swi
```

Related Commands [show switch](#)
[show switch fdb](#)

reset switch port

Syntax RESET SWITCh Port={*port-list*|ALL} [COUNTER]

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command resets a port or group of ports on the switch. All packets queued for reception or transmission on the port are discarded and switch port counters are reset to zero. If a port had been disabled at the hardware level with the [disable switch port command on page 8-83](#), when it is enabled it is reset at the hardware level and autonegotiation of speed and duplex mode is activated. This command can be used to try to ensure that packets stuck in a queue are cleared, perhaps after a packet storm of some nature.

The **port** parameter specifies the ports to be reset.

The **counter** parameter specifies that switch port counters be reset only. If the **counter** parameter is not used, the switch port is fully reset.

Example To reset port 3, use the command:

```
reset swi po=3
```

Related Commands [disable switch port](#)
[enable switch port](#)
[show switch port](#)

set lacp port

Syntax SET LACP Port=[{*port-list*|ALL}] [Adminkey=*key-number*]
[PRIOrity=*priority*] [MODE={ACTIVE|PASSive}]
[PERiodic={FAST|SLOW}]

where:

- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of port numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.
- *key-number* is a integer from 0 to 65535
- *priority* is a integer from 0 to 65535

Description This command modifies the value of parameters for LACP ports.

The **port** parameter specifies the ports for which parameters are modified. If the command would succeed on a subset of the ports specified, but cause an error on the others, then the command as a whole fails and has no effect. Reference in the descriptions below to an individual port should be taken as a reference to all ports selected by the **port** parameter.

The **adminkey** parameter specifies the Admin LACP port key. This affects the LACP port key that is generated but does not determine its value. You can use this parameter to prevent ports from being aggregated when they might otherwise form a trunk. By default all ports that can be aggregated are given the same LACP port key. The default for **adminkey** is 1.

The **priority** parameter specifies the LACP port priority. This value is used to decide which ports should be selected when being added to a trunk group (where there are more links existing between the two devices than the switch is able to aggregate). The default is one. This means that port number governs which ports are selected (low port number equals high priority). Excess ports are put into a standby mode. In this mode they remain untrunked, but still able replace a link that goes down.

The **mode** parameter specifies whether the port runs in LACP passive or active mode. A port in passive mode sends an LACPDU in response to receiving one; whereas, a port in active mode sends LACPDU at regular intervals as specified by the **periodic** parameter.

The **periodic** parameter specifies the rate at which the LACP port transmits updates. A port in fast mode transmits one LACPDU every second; a port in slow mode transmits one LACPDU every thirty seconds.

Related Commands [add lacp port](#)
[delete lacp port](#)
[show lacp port](#)

set lacp priority

Syntax SET LACP PRIOrity=*priority*

where *priority* is an integer from 0 to 65535

Description This command modifies the relative priority of LACP enabled partners.

The **priority** parameter specifies a numeric value that is used as part of the system priority calculation. When systems with multiple links connect and use LACP to control link aggregation, each system compares its system priority data identifiers to determine which system should control the links. A system identifier comprises a system priority component (configured by this parameter) followed the system's MAC address. Link control is assigned to the system with the numerically *lower* system priority data identifier. The default is 32768.

Examples System A is to connect to system B using LACP and System B is to control their aggregated links.

System A has a MAC address of 00-00-cd-00-0d-42 and has been assigned an LACP PRIORITY value of 500. System B has a MAC address of 00-00-cd-00-0d-52.

In order to ensure that System B controls the links, its LACP PRIORITY must be set to a value **lower** than 500. The LACP PRIORITY on System B is therefore set to 300. Note that system control is determined by the values set by the LACP Priority values because these have a greater numeric significance than MAC Addresses.

```
set lacp prio=300
```

Related Commands [show lacp](#)

set switch ageingtimer

Syntax SET SWITCh AGEingtimer=10..1000000

Description This command sets the threshold value, in seconds, of the ageing timer, after which a dynamic entry in the Layer 2 forwarding database is automatically removed. The maximum setting of 1 000 000 seconds is approximately 11 days 13 hours. The default is 300 seconds (5 minutes).

Example To set the ageing timer to 180 seconds (3 minutes), use the command:

```
set switch ageingtimer=180
```

Related Commands [disable switch ageingtimer](#)
[enable switch ageingtimer](#)
[show switch](#)

set switch hwfilter classifier

Syntax SET SWitch HWfilter CLASSifier=1.9999
 [Action={SETPRIORITY | SENDCOS | SETTOS | DENY | SENDEPORT |
 SENDMIRROR | MOVEPRIOTOTOS | MOVETOSTOPRIO | SETIPDSCP |
 SENDNONUNICASTTOPORT | NODROP | FORWARD} [, ...]]
 [NEWIPDscp=0..63] [NEWTos=0..7]
 [NOMATCHAction={SETPRIORITY | SENDCOS | SETTOS | DENY |
 SENDEPORT | SENDMIRROR | MOVEPRIOTOTOS | MOVETOSTOPRIO |
 SETIPDSCP | SENDNONUNICASTTOPORT | FORWARD} [, ...]]
 [NOMATCHDscp=*dscp-value*] [NOMATCHPort=*port-number*]
 [NOMATCHPriority=0..7] [NOMATCHTos=0..7]
 [Port=*port-number*] [PRIOrity=0..7]

where:

- *classifier-list* is either an integer from 1 to 9999; a range of integers (specified as 1-4), or a comma-separated list of classifier numbers and/or ranges (1, 3, 4-9).
- *port-number* is the switch port number from 1 to *m* where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command sets the properties of hardware-based filters based on the specified classifier(s). All of the specified classifiers must exist and must already be incorporated into a filter entry. The **switch hwfilter classifier** commands may not be used with the **switch l3filter** commands.

A port can belong to multiple STPs when the port is a member of more than one VLAN. A port can belong to a single STP. This means that when the port is member of multiple VLANs, all these VLANs must belong to the same STP.

The **action** parameter specifies a comma-separated list of actions to take when a packet matches the filter criteria specified in this entry. If **setpriority** is specified, the packet's 802.1p priority is set to the value specified by the **priority** parameter. If **sendcos** is specified, the packet is sent to the priority queue specified by the **priority** parameter. If **settos** is specified, the packet's TOS (Type of Service) field is set to the value specified by the **newtos** parameter. If **deny** is specified, the packet is discarded. If **sendeport** is specified and the frame is not a broadcast, multicast, DLF frame or marked for dropping or to be sent to the CPU, the new output port is set to the value of the **port** parameter. If **sendmirror** is specified, the packet is sent to the mirror port. If **forward** is specified, the packet is forwarded using the default Class of Service (priority). If **movepriototos** is specified, the IP TOS field in the frame is replaced with the 802.1p priority value. If **movetostoprio** is specified, the 802.1p priority field in the frame is replaced with the IP TOS value, this also determines the egress priority queue. If **setipdscp** is specified and the frame is an IPv4 frame, the Diffserv Codepoint field in the frame is set to the value specified by the **newipdscp** parameter. Actions that modify both the IP TOS and IP DSCP values in the frame are mutually exclusive. If **sendnonunicasttoport** is specified, matching frames that are broadcast or DLF, multicast, marked for dropping or to be sent to the CPU are sent to the egress port specified by the **port** parameter. If **nodrop** is specified, matching frames previously marked for dropping are not dropped. The default is **forward**.

If the **sendeport** action directs packets to a particular egress port, then the packet is transmitted from the mirror port with a VLAN tag.

The **newipdscp** parameter indicates the value to set in an IPv4 packet Diffserv CodePoint field when the **action** parameter is set to **setipdscp**. The range of values for this parameter is from 0 to 63.

The **newtos** parameter specifies the new type of service value, assigning a new value to the TOS precedence field in the IP Header. This parameter is used only when the **action** parameter is set to **settos**.

The **nomatchaction** parameter specifies a comma-separated list of actions to take when a frame matches both the **ipport** and **eport** values (if they are specified in the match) on an associated entry but there is no match for the frame contents. If **setpriority** is specified, the packet's 802.1p priority is set to the value specified by the **priority** parameter. If **sendcos** is specified, the packet is sent to the priority queue specified by the **priority** parameter. If **settos** is specified, the packet's TOS (Type of Service) field is set to the value specified by the **newtos** parameter. If **deny** is specified, the packet is discarded. If **sendeport** is specified and the frame is not a broadcast, multicast, DLF frame or marked for dropping or to be sent to the CPU, the new output port is set to the value of the **port** parameter. If **sendmirror** is specified, the packet is sent to the mirror port. If **forward** is specified, the packet is forwarded using the default Class of Service (priority). If **movepriortotos** is specified the IP TOS field in the frame is replaced with the 802.1 priority value. If **movetostoprio** is specified, the 802.1 priority field in the frame is replaced with the IP TOS value, this also determines the egress priority queue. If **setipdscp** is specified and the frame is an IPv4 frame, the Diffserv Codepoint field in the frame is set to the value specified by the **newipdscp** parameter. Actions that modify both the IP TOS and IP DSCP values in the frame are mutually exclusive. If **sendnonunicasttoport** is specified, matching frames that are broadcast or DLF, multicast, marked for dropping or to be sent to the CPU are sent to the egress port specified by the **port** parameter. The default is **forward**.

The **nomatchdscp** parameter indicates the value to set in an IPv4 packet Diffserv CodePoint field when the **nomatchaction** parameter is set to **setipdscp**. The range of values for this parameter is from 0 to 63.

The **nomatchport** parameter specifies the new output port number. This port overrides the egress port selected by the forwarding database.

The **nomatchpriority** parameter specifies the packet priority. There are eight levels of priority, from 0 to 7. This parameter is used only when the **nomatchaction** parameter is set to **setpriority** or **sendcos**.

The **nomatchtos** parameter specifies the new type of service value, assigning a new value to the TOS precedence field in the IP Header. This parameter is used only when the **nomatchaction** parameter is set to **settos**.

The **port** parameter specifies the new output port number. This port overrides the egress port selected by the forwarding database.

The **priority** parameter specifies the packet priority. There are eight levels of priority from 0 to 7. This parameter is used only when the **action** parameter is set to **setpriority** or **sendcos**.

Examples To change the hardware packet filter that acts on traffic matched by classifier 1 so that it to denies this traffic, use the command:

```
set swi hwf class=1 ac=deny
```

To set the transmit priority on all packets matching Classifier 100 to 3, and set the transmit priority on packets that partially match this classifier to 0, use the command:

```
set swi hwf class=100 ac=sendcos nomatcha=sendcos prio=3  
nomatchpr=0
```

Related Commands [add switch hwfilter classifier](#)
[delete switch hwfilter classifier](#)
[set switch hwfilter mode](#)
[show switch hwfilter](#)

set switch hwfilter mode

Syntax SET SWITCh HWFilter MODe={PSF|NPSF}

Description This command changes the switch's classifier-based packet filter mode, and is only valid for models with 48 ports (two switch instances). Use this command to ensure that packets are filtered as expected on 48-port switches.

You can change the hardware filter mode after filters have been entered. When you change modes, the filter entries remain in the original order. For further information about using this command, see the section "[Filter Modes in 48-Port Switches](#)" on page 8-37.

The **mode** parameter specifies the filtering mode the switch is set in. The default mode is **psf**.

When you specify **psf**, the switch expects port-specific filters to be entered first. Use this mode when you want non port-specific filters to override the port-specific filters for certain circumstances. If you add a port-specific filter after the non port-specific filters, the switch may still use a matching non port-specific filter when the packet travels between ports on different switch instances.

When you specify **npsf**, the switch expects non port-specific filters to be entered first. Use this mode when you want port-specific filters to override the non port-specific filters for certain circumstances. If you add a non port-specific filter after the port-specific filters, the switch may not use the non port-specific filter when the packet travels between ports on different switch instances.

Examples To set the hardware filter mode to non port-specific filters first, use the command:

```
set swi hwf mod=npsf
```

Related Commands [add switch hwfilter classifier](#)
[delete switch hwfilter classifier](#)
[show switch hwfilter](#)

set switch l3ageingtimer

Syntax SET SWITCh L3Ageingtimer=[30..43200]

Description This command sets the threshold value of the ageing timer for dynamic entries in the Layer 3 forwarding database. After a cycle of this timer, entries not used during the cycle remain in the table but their hit bits are reset to zero. After the next cycle, entries with hit bit still set to zero are deleted. Therefore, entries in the table are deleted when they are unused during two consecutive cycles of the timer. The default is 900 seconds.

This command can be executed only when the hardware forwarding entry ageing timer is enabled with the **enable switch ageingtimer** command. This ageing timer is enabled by default.

Examples To set the threshold of the Layer 3 forwarding table ageing timer to 30 minutes, use the command:

```
set swi l3a=1800
```

Related Commands [disable switch ageingtimer](#)
[enable switch ageingtimer](#)
[show switch](#)

set switch l3filter entry

Syntax SET SWitch L3Filter=*filter-id* ENtry=*entry-id*
 [Action={SETPRIORITY | SENDCOS | SETTOS | DENY | SENDEPORT |
 SENDMIRROR | MOVEPRIOTOTOS | MOVETOSTOPRIO | SETIPDSCP |
 SENDNONUNICASTTOPORT | FORWARD} [, ...]] [DIPaddr=*ipadd*]
 [EPort=*port-number*] [IPort=*port-number*]
 [NEWIPDscp=0..63] [NEWTos=0..7] [Port=*port-number*]
 [PRIOrity=0..7] [PROToCol={TCP | UDP | ICMP | IGMP | *protocol*}]
 [SIPaddr=*ipadd*] [TCPAck={True | False}]
 [TCPDport=*port-id*] [TCPFin={TRUE | FALSE}]
 [TCPSPORT=*port-id*] [TCPSYn={True | False}] [TOS=0..7]
 [TTL=0..255] [TYpe=*protocol-type*] [UDPSport=*port-id*]
 [UDPDPport=*port-id*]

where:

- *filter-id* is a decimal number in the range 1 to the number of filters defined.
- *entry-id* is a decimal number in the range 1 to the number of entries defined.
- *ipadd* is an IP address in dotted decimal notation.
- *port-number* is the switch port number from 1 to *m* where *m* is the highest numbered Ethernet switch port, including uplink ports.
- *protocol* is an IP protocol number from 1 to 255.
- *port-id* is an IP port number.
- *protocol-type* is a valid protocol-type number. A protocol type number is 2 bytes for Ethernet type II and 802.3 (DSAP/SSAP) encapsulation, or 5 bytes for SNAP encapsulation, and is specified in hexadecimal.

Description This command modifies the selector values for an existing filter entry. The **l3filter** and **entry** parameters specify the number of the filter and the filter entry to be modified, respectively. Filter and filter entry numbers are in the output of the [show switch l3filter command on page 8-133](#). The **switch hwfilter classifier** commands may not be used with the **switch l3filter** commands.

A port can belong to multiple STPs when the port is a member of more than one VLAN.

The **action** parameter specifies a comma-separated list of actions to take when a packet matches the filter criteria specified in this entry. If **deny** is specified, the packet is discarded. If **forward** is specified, the packet is forwarded using the default Class of Service (priority). If **sendcos** is specified, the packet is sent to the priority queue specified by the **priority** parameter. If **sendeport** is specified, the new output port is set to the value of the **port** parameter. If **sendmirror** is specified, the packet is sent to the mirror port. If **setpriority** is specified, the packet's 802.1p priority is set to the value specified by the **priority** parameter. If **settos** is specified, the packet's **tos** (Type of Service) field is set to the value specified by the **newtos** parameter. If **movepriototos** is specified, the **ip tos** field in the frame is replaced with the 802.1 priority value. If **movetostoprio** is specified, the 802.1 priority field in the frame is replaced with the **ip tos** value, this also determines the egress priority queue. If **nodrop** is specified, matching frames previously marked for dropping are not dropped. If **sendeport** is specified and the frame is not a broadcast, multicast, DLF frame or marked for dropping or to be sent to the CPU, the new output

port is set to the value of the **port** parameter. If **sendnonunicasttoport** is specified, matching frames that are broadcast or DLF, multicast, marked for dropping or to be sent to the CPU are sent to the egress port specified by the **port** parameter. If **setipdscp** is specified and the frame is an IPv4 frame, the Diffserv Codepoint field in the frame is set to the value specified by the **newipdscp** parameter. Actions that modify both the TOS and DSCP values in the frame are mutually exclusive. The default is **forward**.

The **dipaddr** parameter specifies the destination IP addresses to match.

The **eport** parameter specifies the egress port number to be matched by this filter entry, if the **emport** parameter in the filter match is set to **true**. The default is no port, that is, the filter entry does not apply to any egress ports. If the **emport** parameter in the filter match is set to **false**, the **eport** parameter is ignored, and the filter entry applies to all egress ports.

The **ipport** parameter specifies the ingress port number to be matched by this filter entry, if the **import** parameter in the filter match is set to **true**. The default is no port, that is, the filter entry does not apply to any ingress ports. If the **import** parameter in the filter match is set to **false**, the **ipport** parameter is ignored, and the filter entry applies to all ingress ports.

The **newipdscp** parameter indicates the value to set in an IPv4 packet Diffserv CodePoint field when the **action** parameter is set to **setipdscp**.

The **newtos** parameter specifies the new type of service value, assigning a new value to the TOS precedence field in the IP Header. This parameter is used only when the **action** parameter is set to **settos**.

The **port** parameter specifies the new output port number. This port overrides the egress port selected by the forwarding database.

The **priority** parameter specifies the new packet priority. There are eight levels of priority from 0 to 7. This parameter is used only when the **action** parameter is set to **setpriority** or **sendcos**.

The **protocol** parameter specifies the IP protocol to match.

The **sipaddr** parameter specifies the source IP address to match.

The **tcpack** parameter specifies the ACK (acknowledgement) flag in the TCP header to match when the protocol is TCP. This parameter is required when **tcpack** is specified in the **add** or **set switch l3filter match** parameter, otherwise it is invalid.

The **tcpdport** parameter specifies the destination TCP port to match when the protocol is TCP.

The **tcpfin** parameter specifies the FIN flag in the TCP header to match when the protocol is TCP. This parameter is required when **tcpfin** is specified in the **add** or **set switch l3filter match** parameter, otherwise it is invalid.

The **tcpsport** parameter specifies the source TCP port to match, if the protocol is TCP.

The **tcpsyn** parameter specifies the SYN flag in the TCP header to match, if the protocol is TCP. This parameter is required if **tcpsyn** is specified in the **add** or **set switch l3filter match** parameter, otherwise it is invalid.

The **tos** parameter specifies the type of service to match.

The **ttl** parameter specifies the *Time to Live* to match.

The **type** parameter specifies a protocol-type number to match. The number is entered in hexadecimal, e.g. 0800 for an Ethernet type II IP packet. This parameter may not be used with any other packet field matching criteria, nor may it be used with the **settos** action. With all other packet matching criteria there is an implicit match to an IP protocol Ethernet type II packet.

The **udpport** parameter specifies the UDP destination port to match, if the protocol is UDP.

The **udpport** parameter specifies the UDP source port to match, if the protocol is UDP.

Example To modify entry 2 of filter 1 to match UDP port 23, use the command:

```
set swi l3f=1 ent=2 prot=udp tcpd=23
```

Related Commands

- [add switch l3filter entry](#)
- [delete switch l3filter entry](#)
- [show switch l3filter](#)

set switch l3filter match

Syntax SET SWITCh L3Filter=*filter-id* MAtch={DIPAddr|IPDscp|PROTOcol|SIPAddr|TCPAck|TCPFin|TCPPort|TCPSport|TCPSyn|TOS|TTL|TYPE|UDPDport|UDPSport|NONE}{[,...]} [DClass={A|B|C|Host|1..32}] [EMPort={Yes|No|ON|OFF|True|False}] [IMPort={Yes|No|ON|OFF|True|False}] [NOMATCHAction={SETPRIORITY|SENDCOS|SETTOS|DENY|SENDEPORT|SENDMIRROR|MOVEPRIOTOTOS|MOVETOSTOPRIO|SETIPDSCP|SENDNONUNICASTTOPORT|FORWARD}{[,...]}] [NOMATCHDscp=0..63] [NOMATCHPort=*port-number*] [NOMATCHPRiority=0..7] [NOMATCHTos=0..7] [SClass={A|B|C|HOST|1..32}] [TYpe={802|Ethii|Snap}]

where:

- *filter-id* is a decimal number in a range from 1 to the number of filters defined.
- *port-number* is the switch port number from 1 to m where m is the highest numbered Ethernet switch port.

Description This command modifies an existing filter that specifies matching filter criteria for the packet filtering mechanism. The **l3filter** parameter specifies the number of the filter to be modified. Filter numbers are displayed in the output of the [show switch l3filter command on page 8-133](#). The **switch hwfilter classifier** commands may not be used with the **switch l3filter** commands.

A port can belong to multiple STPs when the port is a member of more than one VLAN.

The **match** parameter specifies a comma-separated list of packet fields and/or types to match. There is no default.

The **dclass** parameter specifies the IP destination address mask to apply to the destination IP address field in packets when matching destination IP addresses. If A is specified, the Class A mask 255.0.0.0 is used (mask length of 8). If B is specified, the Class B mask 255.255.0.0 is used (mask length of 16). If C is specified, the Class C mask 255.255.255.0 is used (mask length of 24). If **host** is specified, the host mask 255.255.255.255 is used (mask length of 32). If a number is specified, a mask of that length is used.

The **emport** parameter specifies whether the filter applies to all egress ports or to a particular egress port specified in a filter entry. If **no**, **off**, or **false** is specified, the filter is applied to all egress ports. If **yes**, **on**, or **true** is specified, the filter is applied to the egress port specified by the **eport** parameter in the **add** or **set switch l3filter entry** command. The default is **false**, meaning the filter applies to all egress ports.

The **import** parameter specifies whether the filter applies to all ingress ports or to a particular ingress port specified in a filter entry. If **no**, **off**, or **false** is specified, the filter is applied to all ingress ports. If **yes**, **on**, or **true** is specified, the filter is applied to the ingress port specified by the **ipport** parameter in the **add** or **set switch l3filter entry** command. The default is **false**, meaning the filter applies to all ingress ports.

The **nomatchaction** parameter specifies a comma-separated list of actions to take when a frame matches both the **ipport** and **eport** values (if they are specified in the match) on an associated entry but there is no match for the

frame contents. If **setpriority** is specified, the packet's 802.1p priority is set to the value specified by the **priority** parameter. If **sendcos** is specified, the packet is sent to the priority queue specified by the **priority** parameter. If **settos** is specified, the packet's TOS (Type of Service) field is set to the value specified by the **newtos** parameter. If **deny** is specified, the packet is discarded. If **sendeport** is specified and the frame is not a broadcast, multicast, DLF frame or marked for dropping or to be sent to the CPU, the new output port is set to the value of the **port** parameter. If **sendmirror** is specified, the packet is sent to the mirror port. If **forward** is specified, the packet is forwarded using the default Class of Service (priority). If **movepriortotos** is specified, the IP TOS field in the frame is replaced with the 802.1p priority value. This also determines the egress priority queue. If **setipdscp** is specified and the frame is an IPv4 frame, the Diffserv Codepoint field in the frame is set to the value specified by the **newipdscp** parameter. Actions that modify both the IP TOS and the IP DSCP values in the frame are mutually exclusive. If **sendnonunicasttoport** is specified, matching frames that are broadcast or DLF, multicast, marked for dropping or to be sent to the CPU are sent to the egress port specified by the **port** parameter. The default is **forward**.

The **nomatchdscp** parameter indicates the value to set in an IPv4 packet DiffServe CodePoint field if the **nomatchaction** parameter is set to **setipdscp**.

The **nomatchport** parameter specifies the new output port number. This port overrides the egress port selected by the forwarding database.

The **nomatchpriority** parameter specifies the packet priority. There are eight levels of priority, from 0 to 7. This parameter is used only when the **nomatchaction** parameter is set to **setpriority** or **sendcos**.

The **nomatchtos** parameter specifies the new Type of Service value, assigning a new value to the TOS precedence field in the IP header. This parameter is used only when the **nomatchaction** parameter is set to **settos**.

The **sclass** parameter specifies the IP source address mask to apply to the source IP address field in packets when matching source IP addresses. If A is specified, the Class A mask 255.0.0.0 is used (mask length of 8). If B is specified, the Class B mask 255.255.0.0 is used (mask length of 16). If C is specified, the Class C mask 255.255.255.0 is used (mask length of 24). If **host** is specified, the host mask 255.255.255.255 is used (mask length of 32). If a number is specified, a mask of that length is used.

The **type** parameter specifies the format of the protocol-type. This parameter may be used with the **emport** and **import** parameters, but not with the other packet matching criteria. When other criteria are used, there is an implicit match to an IP protocol Ethernet type II packet. If 802 is specified, then the match is on the 2-byte DSAP/SSAP field of an 802.3 packet. If **ethii** is specified, then the match is on the 2-byte type field of an Ethernet type II packet. If **snap** is specified, then the match is on the 5-byte variable part of the identifier field of a SNAP packet (SNAP identifiers have the format *aa-aa-03-xx-xx-xx-xx-xx*).

Example To modify filter 1 to match UDP port, use the command:

```
set switch l3filter=1 match=udpdport,prot
```

Related Commands

- [add switch l3filter entry](#)
- [add switch l3filter match](#)
- [delete switch l3filter](#)
- [show switch l3filter](#)

set switch mirror

Syntax SET SWITCH MIRROR={NONE|*port*}

where *port* is a single switch port number. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port.

Description This command sets the mirror port for the switch, and removes it from the default VLAN. If another port was previously set as the mirror port, this command returns it to the default VLAN as an untagged port. The mirror port is the one where mirrored traffic is sent. Configure the source of mirror traffic with the [set switch port command on page 8-108](#).

Port mirroring does not duplicate packets. If one mirrored packet is captured in different ports, only one copy of the packet is sent to the mirror port.

If a packet is Layer 3 switched and mirrored, then the packet is always transmitted from the mirror port with a VLAN tag.

The **mirror** parameter specifies the switch port where mirror traffic is to be sent. The specified port must belong only to the default VLAN as an untagged or tagged port. The port cannot be part of a trunk group. If the value **none** is specified, no mirror port is defined for the switch and mirroring is disabled. The mirror port cannot be added to any VLAN.

Example To set the mirror port to port 12, use the command:

```
set switch mirror=12
```

Related Commands

- [disable switch mirror](#)
- [enable switch mirror](#)
- [set switch port](#)
- [show switch](#)
- [show switch port](#)

set switch port

Syntax SET SWITCH PORT={*port-list*|ALL} [ACCEptable={ALL|VLAN}] [BCLimit={NONE|*limit*}] [DESCription=[*description*]] [DLFLimit={NONE|*limit*}] [EGReSSLimit={NONE|DEFAULT|0|1000..127000|8..1016}] [IGMPACtion={DENY|REPlace}] [IGMPFilter={NONE|*filter-id*}] [IGMPMAxgroup={NONE|1..65535}] [INFILTering={OFF|ON}] [INGReSSLimit={NONE|DEFAULT|0|64..127000|8..1016}] [LEARN={NONE|0|1..256}] [INTRusionaction={DISABle|DISCard|TRap}] [MCLimit={NONE|*limit*}] [MIRRoR={BOTH|NONE|RX|TX}] [MODE={AUTOnegotiate|MASTer|SLAve}] [MULTicastmode={A|B|C}] [SPeED={AUTOnegotiate|10MAUTO|10MHAlf|10MFUll|10MHAUTO|10MFAuto|100MAUTO|100MHAlf|100MFUll|100MHAUTO|100MFAuto|1000MHAlf|1000MFULL|1000MHAUTO|1000MFAuto}]

where:

- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered switch Ethernet port, including uplink ports.
- *limit* is a decimal number, from 0 to the maximum value of the limit variable based on the particular switch hardware. The maximum packet storm protection limit is 262143.
- *description* is a string 1 to 47 characters long. Valid characters are any printable characters.
- *filter-id* is a decimal number in the range 1 to 99.

Description This command modifies the value of parameters for switch ports.

The **port** parameter specifies the ports for which parameters are modified. When the command succeeds on a subset of the specified ports but causes errors on the others, then the command as a whole fails and has no effect. Reference in the descriptions below to an individual port should be taken as a reference to all ports selected by the **port** parameter. If packet storm protection limits are set on the switch, the **port** parameter must specify complete processing blocks (see the note after the **bclimit** parameter description).

While the user may specify **set switch port** commands using groups of ports, the [create config command on page 5-22 of Chapter 5, Managing Configuration Files and Software Versions](#) generates a separate **set switch port** command for each port.

The **acceptable** parameter sets the Acceptable Frame Types parameter, in the Ingress Rules, which controls reception of VLAN-tagged and VLAN-untagged frames on the port. If **all** is specified, then the Acceptable Frame Types parameter is set to Admit All Frames. If VLAN is specified, the parameter is set to Admit Only VLAN-tagged Frames, and any frame received that carries a null VLAN Identifier (VID) is discarded by the ingress rules. Untagged frames and priority-tagged frames carry a null VID. Untagged frames admitted according to the **acceptable** parameter have the VID of the VLAN for which the port is untagged associated with them. The **acceptable** parameter can be set only when the port is untagged for one VLAN. In this case, the default is **all**, admitting all tagged and untagged frames. If the port is tagged for all the VLANs to which it belongs, the **acceptable** parameter is automatically set to VLAN, and cannot be changed to admit untagged frames.

The **bclimit** parameter specifies a limit on the rate of reception of broadcast packets for the port(s). The value of this parameter represents a per second rate of packet reception above which packets are discarded for broadcast packets. If the value **none** or 0 is specified, then packet rate limiting for broadcast packets is turned off. If another value is specified, the reception of broadcast packets is limited to this number. See the note below for important information about packet rate limiting. The default is **none**.

Limiting packet reception rates for different classes of packets depends on the particular switch hardware. In particular, groups of ports may have to have the same limits set, and the same limit may be set for the different types of packets, depending on the hardware. When packet rate limits are set on switches with this type of constraint, the most current parameter values supersede earlier ones. When a command for specific ports changes parameters for other ports, a message reports these changes.

Packet storm protection limits cannot be set for each individual port on the switch, but can be set for each processing block of ports. The processing blocks are sets of 8 ports (e.g. as many as are applicable of ports 1-8, 9-16 and 17-24) and each uplink port is a further processing block. Therefore, a 16-port switch has four processing blocks and a 24-port switch has five. The two uplink ports are numbered sequentially after the last port, and therefore are 17 and 18 for a 16-port and 25 and 26 for a 24-port switch. Only one limit can be set per processing block, and then applies to all three packet types. Thus each of the packet types are either limited to this value, or unlimited (**none**).

The **description** parameter can be used to describe the port. It is displayed by the [show switch port command on page 8-137](#) and sets the value of the ifDescr MIB object, but does not affect the operation of the switch in any way. You can also enter the parameter without a value, to remove an existing description. The default is no description.

The **dlflimit** parameter specifies a limit on the rate of reception of destination lookup failure packets for the port. The value of this parameter represents a per second rate of packet reception above which packets will be discarded for destination lookup failure packets. If the value **none** or 0 is specified, then packet rate limiting is turned off for these packets. If another value is specified, the reception of these packets is limited to this number. See the note after the **bclimit** parameter description for important information about packet rate limiting. The default is **none**. If packet storm protection limits are set on the switch, the **port** parameter must specify complete processing blocks.

A destination lookup failure packet is one for which the switch hardware does not have a record of the Layer 2 destination address of the packet. These packets are passed to the CPU for further processing, so limiting the rate of reception of these packets may be a desirable feature to improve system performance.

The **egresslimit** parameter specifies the maximum bandwidth for traffic egressing a specific port in kbps (10/100 Mbps ports) or Mbps (Gigabit ports). If **none** or 0 (zero) is specified, egress limiting is disabled for the specified port. For 10/100 Mbps ports the input value (1000 to 127000) in kbps is rounded up to the nearest 1000 (or 1 Mbps). For Gigabit ports the input value (8 to 1016) in Mbps is rounded up to the nearest 8 Mbps. The default is **none**.

The **igmpaction** parameter specifies the action to take when the number of multicast group memberships associated with the port reaches the limit set by **igmpmaxgroup**. If you specify **deny**, then additional Membership Reports are discarded until existing group memberships age out. If you specify **replace**, then additional membership entries will replace existing membership entries. The default is **deny**.

The **igmpfilter** parameter specifies the number of an IGMP filter to apply to the port. An IGMP filter controls the multicast groups that the port can be a member of by filtering IGMP Membership Reports from hosts attached to the port. If you specify a filter number, an IGMP filter with the specified number must already exist. You can apply an IGMP filter to more than one switch port, but a single port can have only one filter assigned to it. Specify **none** to apply no filter to the port, or to remove an existing filter from the port. The default is **none**.

The **igmpmaxgroup** parameter specifies the maximum number of multicast groups that the port can join. Specify **none** to set no limit. The default is **none**.

For trunk ports, the value of **igmpaction**, **igmpfilter**, and **igmpmaxgroup** for the master port will apply to the trunk.

The **infiltering** parameter enables or disables Ingress Filtering of frames admitted according to the **acceptable** parameter, on the specified ports. Each port on the switch belongs to one or more VLANs. If **infiltering** is set to **on**, Ingress Filtering is enabled; frames received on a specified port are admitted when the port belongs to the VLAN with which the frames are associated. Conversely, frames are discarded when the port does not belong to the VLAN with which the frames are associated. Untagged frames admitted by the **acceptable** parameter are admitted since they have the numerical VLAN Identifier (VID) of the VLAN for which the port is an untagged member. If **off** is specified, Ingress Filtering is disabled, and no frames are discarded by this part of the Ingress Rules. The default is **off**.

The **ingresslimit** parameter specifies the maximum bandwidth for traffic ingressing a specific port in kbps (10/100 Mbps ports) or Mbps (Gigabit ports). If **none** or 0 (zero) is specified, ingress limiting is disabled for the specified port. For 10/100 Mbps ports, the input value (64..127000) in kbps is rounded up to the nearest 64 kbps if below 1000; otherwise, it is rounded up to the nearest 1000 (or 1 Mbps). For Gigabit ports, the input value (8..1016) in Mbps is rounded up to the nearest 8 Mbps. The default is **none**.

If you configure an ingress rate limit less than 1000 kbps on a port, it cannot participate in a private VLAN. Data ingressing the switch over that port is not subject to any restrictions the private VLAN imposes. Therefore, we recommend that you configure ingress rate limits greater than 1000 kbps on ports that are members of private VLANs.

The **intrusionaction** parameter specifies the action taken when the port receives a packet from a MAC address that is not on the learned list of addresses as specified by the **learn** parameter. If **discard** is specified, the packet is discarded. If **trap** is specified, the packet is discarded and an SNMP trap is generated. If **disable** is specified, the first time a packet is received from a MAC address not on the port's learn list, the packet is discarded, an SNMP trap is generated, and the port is disabled. To re-enable the port, disable the Port Security function on the port. The default is **discard**.

The **learn** parameter specifies whether the security feature of limiting the number of MAC addresses learned on this port is enabled. If **none** or zero is specified, all MAC addresses are learned on this port and the Port Security function is disabled. When a port has been automatically disabled by the switch's port security, setting the **learn** parameter to 0 (zero) re-enables it. If a number from 1 to 256 is specified, the switch stops learning MAC addresses on this port when the number of MAC addresses is reached, and the port is locked. If the **learn** parameter is set to a value lower than the number of MAC addresses currently learned, then the port is unlocked if previously locked, all

learned MAC addresses are cleared from the forwarding database for the port, and learning restarts. Packets from other addresses after this time are handled as intrusion packets (see the **intrusionaction** parameter). The default is **none**.

Learned addresses on locked ports can be saved as part of the switch configuration and become part of the configuration after a power cycle by using the [create config command on page 5-22 of Chapter 5, Managing Configuration Files and Software Versions](#). If the configuration is not saved when there is a locked list for a port, the learning process begins again after the router is restarted.

The **mclimit** parameter specifies a limit on the rate of reception of multicast packets for the port. The value of this parameter represents a per second rate of packet reception above which packets are discarded for multicast packets. If the value **none** or 0 is specified, then packet rate limiting for multicast packets is turned off. If another value is specified, the reception of multicast packets is limited to this number. See the note after the **bclimit** parameter description for important information about packet rate limiting. The default is **none**. If packet storm protection limits are set on the switch, the **port** parameter must specify complete processing blocks.

The **mirror** parameter specifies the role of these ports as a source of mirror traffic. Be aware that four or more ports set to mirror traffic to the mirror port may significantly reduce switch performance. If **none** is specified, no traffic received or sent on these ports is mirrored. If RX is specified, all traffic received on these ports is mirrored. If TX is specified, all traffic transmitted is mirrored. If **both** is specified, all traffic received and transmitted is mirrored. Traffic is mirrored only when a mirror port is defined and mirroring is enabled. The default is **none**.

The **mode** parameter applies to gigabit interfaces only. It forces the interface to operate in master or slave mode by setting it to **master** or **slave**. This is not typically required and should be used when the link partner does not support autonegotiation of master/slave mode. The default is **autonegotiate**.

The **multicastmode** parameter indicates how the switch handles traffic addressed to a multicast group to which the specified port or list of ports belongs. If A is specified, all traffic is flooded on all ports on the VLAN, irrespective of whether the ports have joined the multicast group. The effect of this option is to disable IGMP snooping without disabling IGMP. (See [Chapter 17, IP Multicasting](#)). If B is specified, the traffic is sent to ports that have joined the multicast group unless no ports have joined, in which case the traffic is flooded on all ports on the VLAN. If C is specified, the traffic is sent to ports that have joined the multicast group; if no ports have joined, the traffic is discarded. This option allows the manager more control over who receives traffic. The default is B.

The **speed** parameter specifies the configured line speed and duplex mode of the port. For the options supported on each type of port, see [“Port types and speed” on page 8-9](#). If **autonegotiate** is specified, the port autonegotiates the highest mutually possible line speed and duplex mode with the link partner. If **10Mauto** or **100Mauto** is specified, the port autonegotiates with the link partner to determine duplex mode but only accepts operation at the specified speed. If **10Mfauto**, **10Mhauto**, **100Mfauto**, **100Mhauto**, **1000Mfauto**, or **1000Mhauto** is specified, the port autonegotiates with the link partner and accepts operation at the specified speed and duplex mode. If **10Mhalf**, **10Mfull**, **100Mhalf**, **100Mfull**, **1000Mhalf**, or **1000Mfull** is specified, then autonegotiation is disabled and the interface must operate at the specified speed and duplex mode regardless of whether the link partner is capable of

working at that speed. When a port is included in a trunk group, it must operate at the speed specified for the trunk group and in full duplex mode. This speed is selected by autonegotiation with the link partner. If the port is removed from the trunk group, the previously configured speed and duplex mode are restored. The default is **autonegotiate**.

The following table describes switch port speeds.

Option	Meaning
10Mauto	10Mbps, autonegotiate duplex mode
10Mhalf	10Mbps, half duplex, fixed
10Mfull	10Mbps, full duplex, fixed
10Mhauto	10Mbps, half duplex, autonegotiate
10Mfauto	10Mbps, full duplex, autonegotiate
100Mauto	100Mbps, autonegotiate duplex mode
100Mhalf	100Mbps, half duplex, fixed
100Mfull	100Mbps, full duplex, fixed
100Mhauto	100Mbps, half duplex, autonegotiate
100Mfauto	100Mbps, full duplex, autonegotiate
1000Mhalf	1000Mbps, half duplex, fixed
1000Mfull	1000Mbps, full duplex, fixed
1000Mhauto	1000Mbps, half duplex, autonegotiate
1000Mfauto	1000Mbps, full duplex, autonegotiate

If you override a port's autonegotiation by setting it to a fixed speed/duplex setting, automatic MDI/MDI-X detection is also overridden. The port defaults to MDI-X.

Examples To set the speed of port 5 to 10Mbps, half duplex, use the command:

```
set swi po=5 sp=10Mhalf
```

To limit the rate of destination lookup failure packets to 1000 packets per second for the processing block of ports 17-24, use the command:

```
set swi po=17-24 dlfl=1000
```

To accept only VLAN-tagged frames on port 2, use the command:

```
set swi po=2 acc=vlan
```

To apply IGMP filter 1 to port 12, use the command:

```
set swi po=12 igmpfi=1
```

To limit the number of multicast groups that ports 12-23 can join to 50, use the command:

```
set swi po=12-23 igmpma=50
```

Related Commands [disable switch port](#)
[enable switch port](#)
[show switch port](#)

set switch qos

Syntax SET SWITCH QOS=*P0, P1, P2, P3, P4, P5, P6, P7*

where *P0-P7* are each numbers from 0-n where n+1 is the number of Quality of Service egress queues supported

Description This command maps user priority levels to Quality of Service egress queues.

This command also updates the Quality of Service module Hardware Priority settings (see the [set qos hwpriority command on page 22-32](#) and the [show qos hwpriority command on page 22-39](#) in [Chapter 22, Quality of Service \(QoS\)](#)).

The **qos** parameter specifies a comma-separated list of eight values, all of which must be present. The first value, *P0*, represents the QoS queue for priority level 0. The last value, *P7*, represents the QoS queue for priority level 7. Similarly, values *P1* to *P6* represent the QoS queue for the corresponding priority level.

The switch has four QoS egress queues. Its default QoS values are 1,0,0,1,2,2,3,3, as shown in the following table.

Priority level	Queue
0	1
1	0
2	0
3	1
4	2
5	2
6	3
7	3

Packets that originate on the switch or are routed by the switch's software have been assigned a Quality of Service priority of 7. To ensure that these packets are transmitted promptly, you should not assign priority 7 to a low-numbered egress queue.

Example This example sets the mapping shown in the following table.

Priority level	Queue
0	0
1	0
2	0
3	1
4	1
5	2
6	2
7	3

To set the above mapping, use the command:

```
set swi qos=0,0,0,1,1,2,2,3
```

Related Commands [show switch qos](#)

set switch trunk

Syntax SET SWITCh TRunk=*trunk* [SElect={MACSrc|MACDest|MACBoth|IPSrc|IPDest|IPBoth}] [SPeed={10M|100M|1000M}]

where *trunk* is a character string 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

Description This command sets parameters for the specified trunk group on the switch.

The **trunk** parameter specifies the name of the trunk group. The name is not case sensitive. The name uniquely identifies the trunk group. The specified trunk group must already exist.

The **select** parameter specifies the port selection criterion for the trunk group. Each packet to be sent on the trunk group is checked by using the selection criterion, and a port in the trunk group is chosen to send the packet. If **macsrc** is specified, the source MAC address is used. If **macdest** is specified, the destination MAC address is used. If **macboth** is specified, both source and destination MAC addresses are used. If **ipsrc** is specified, the source IP address is used. If **ipdest** is specified, the destination IP address is used. If **ipboth** is specified, both the source and destination IP addresses are used. The user of the switch should choose the value of this parameter to try to spread the load as evenly as possible on the trunk group. The default for this parameter is **macboth**.

The **speed** parameter specifies the speed of the ports in the trunk group. For gigabit fibre ports, only the **1000M** value is allowed. For gigabit copper ports, **10M**, **100M**, and **1000M** values are allowed except that the uplink bays of some units are not 10/100M capable. For 10/100 switch ports, **10M** and **100M** values are allowed. The default is 100M. When a port is added to a trunk group, its current speed and duplex mode settings are ignored and the port uses the speed of the trunk group and full duplex mode. The ports that are members of the trunk group are constrained to autonegotiate to the trunk speed only.

When you add a port to a trunk group, the switch saves the port's current speed and duplex mode settings and sets the port to autonegotiate to the speed of the trunk group and full duplex mode. If the port does not support auto-negotiation, the switch sets the port to the fixed speed of the trunk group and full duplex mode.

Example To set the speed of a trunk group called Trunk1 to 100 Mbps, use the command:

```
set swi tr=trunk1 sp=100m
```

Related Commands

- [add switch trunk](#)
- [create switch trunk](#)
- [delete switch trunk](#)
- [destroy switch trunk](#)
- [show switch stp](#)

set vlan port

Syntax SET VLAN={*vlan-name*|1..4094} Port={*port-list*|ALL}
FRame={UNTAGged|TAGged}

where:

- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.
- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered switch Ethernet port, including uplink ports.

Description This command changes the status of ports in a VLAN from tagged to untagged or vice-versa.

The **vlan** parameter specifies the name of the VLAN or the numerical VLAN Identifier of the VLAN. The name is not case sensitive, although the case is preserved for display purposes. The **vlan** specified must exist.

The **port** parameter specifies the port or ports to be changed. The ports must belong to the VLAN specified. When the command succeeds on a subset of the specified ports but causes errors on the others, then the command as a whole fails and has no effect. If **all** is specified, then all ports in the VLAN change.

The **frame** parameter specifies whether packets transmitted from a port for the specified VLAN include a VLAN tag header. If **frame** is set to **untagged**, the port becomes an untagged port for the specified VLAN, and the **acceptable** switch parameter for the port is set to **all**. The user can then change the **acceptable** parameter for the port. **frame** may only be set to **untagged** when the port was previously a tagged port in the same VLAN, and is not an **untagged** port of another VLAN. If **frame** is set to **tagged**, then the port becomes a tagged port for the VLAN and the **acceptable** switch parameter for the port is set to VLAN. The user cannot change the **acceptable** parameter for the tagged port. **frame** can be set to **tagged** only when the ports were previously untagged ports in the same VLAN.

Example To change the status of port 1 of the default VLAN from untagged to tagged, use the command:

```
set vlan=default po=1 fra=tagged
```

Related Commands [add vlan port](#)
[delete vlan port](#)
[show vlan](#)

set vlan virtactive

Syntax SET VLAN={*vlan-name*|1..4094|ALL} VIRTActive={Yes|No}

where:

- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.

Description This command enables administrative (virtual) activation of VLANs. By default, VLANs are not administratively active when created. When a VLAN is activated virtually, its IP interface is active, and therefore usable, even if all its ports are physically disconnected. The IP interface associated with the virtually activated VLAN can be operated by protocols such as OSPF, BGP, and RIP. VLAN activation is useful for VLANs that are reached through L2TP tunnels instead of through switch ports.

The **vlan** parameter specifies the name of the VLAN or the numerical VLAN Identifier of the VLAN. The name is not case sensitive, although the case is preserved for display purposes. The **vlan** specified must exist.

The **virtactive** parameter specifies whether the VLAN is administratively activated. If you specify **yes**, the VLAN is administratively activated, and the IP interface associated with the VLAN will always be active even when there are no active ports in the VLAN. If you specify **no**, the VLAN is active, and the IP interface associated with the VLAN is up, only when ports are physically connected to the VLAN. The default is **no**.

Example To administratively activate VLAN "RemoteAccess", use the command:

```
set vlan=RemoteAccess virta=y
```

Related Commands

- [add vlan port](#)
- [create vlan](#)
- [delete vlan port](#)
- [show vlan](#)

show lacp

Syntax SHOW LACP

Description This command displays the state of LACP on the switch ([Figure 8-13](#), [Table 8-11](#)).

Figure 8-13: Example output from the **show lacp** command

```
LACP Information
-----
Status ..... Enabled
Actor System Priority ..... 80-00
Actor System ..... 00-3e-0a-12-00-01
LACP Ports ..... 1-3,5,7,9-12
Active ..... 1-3,5
Passive ..... 7,9-12
```

Table 8-11: Parameters in output of the **show lacp** command

Parameter	Description
Status	Whether LACP is enabled.
Priority	User-configurable priority of the system. This parameter is concatenated with the Actor System parameter to generate the Actor System ID.
Actor System	MAC address of the local system.
LACP Ports	A list of ports currently under LACP control.
Active	A list of ports currently in LACP Active mode.
Passive	A list of ports currently in LACP Passive mode.

show lacp port

Syntax SHow LACP Port [= {*port-list* | ALL}]

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of port numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command displays LACP information about a specific switch port or all of them (Figure 8-14, Table 8-12).

Figure 8-14: Example output from the **show lacp port** command

LACP Port Information	

Actor Port	1
Trunk Group	lacp1
Selected	Selected
Port Priority	8000
LACP Port Number	0001
Port Key ...	6
Admin Key	12
Mode	Active
Periodic.....	Fast
Individual	No
Synchronised	Yes
Collecting	Yes
Distributing	Yes
Defaulted	No
Expired	No
Actor Churn.....	No
Partner Churn.....	No

Partner Information	
Partner System Priority	8000
Partner System	00-3e-0a-12-00-01
Port Key	4
Port Priority	500
Port Number	0002
Mode	Active
Periodic.....	Fast
Individual	No
Synchronised	Yes
Collecting	Yes
Distributing	Yes
Defaulted	No
Expired	No

Table 8-12: Parameters in output of the **show lacp port** command

Parameter	Meaning
Port	Number of the port.
Trunk Group	Name of trunk group to which the port belongs. It is a name that LACP has automatically assigned to an aggregated link. You cannot manually create a trunk starting with the letters LACP. If LACP created, then the name has the prefix LACP followed by a numeric, such as LACP72. This number is the same as the new interface index shown by the show interface command.
Priority	User-configurable priority assigned to the port.
LACP Port Number	LACP encoded port number.
Port Key	Key that LACP has assigned to the port.
Admin Key	User-configurable key assigned to the port.
Mode	The participation mode. If active, the port sends LACPDU packets regardless of the partner port's participation. If passive, the port sends LACPDU packets after receiving one from its partner port.
Periodic	User-configurable time period between transmission of periodic LACPDU packets; one of "Fast" (1 second) or "Slow" (30 seconds).
Individual	User-configurable setting that determines whether the port is an individual. If no, the port may be aggregated; if yes, it is not aggregated.

Table 8-12: Parameters in output of the **show lacp port** command (Continued)

Parameter	Meaning
Synchronised	If yes, the port is considered to be in a synchronised state—the port has been correctly associated with an aggregator.
Collecting	Whether this port has been enabled to receive packets.
Distributing	Whether this port has been enabled to transmit packets.
Defaulted	Whether this system is using defaults for the partner information. If no, the values have been received from the partner via a LACPDU.
Expired	The port has not received a frame from its partner for 3 times the periodic time (3 or 90 seconds).
Actor Churn	Whether churning of the actor port has been detected.
Partner Churn	Whether churning of the partner port has been detected.
Partner Information	Information that has been received about the partner port. The partner port is the port on the connected device.
Partner System Priority	Partner's system priority.
Partner System	Partner's system identifier.
Port Key	Partner port's key.
Port Priority	Partner port's key priority.
Port Number	Partner port's port number.
Mode	Whether the mode is active or passive. If active, the partner port sends LACPDU packets regardless of this port's participation. If passive, the partner port sends LACPDU packets only after receiving one from this port.
Periodic	The setting of the partner port for the time period between transmission of periodic LACPDU packets; one of "Fast" (1 second) or "Slow" (30 seconds).
Individual	The setting of the partner port determining whether the port is an individual. If no, the partner port is not an individual and may be aggregated; if yes, it cannot be aggregated.
Synchronised	If yes, the partner system considers the partner port to be in a synchronised port—the port has been correctly associated with an aggregator; otherwise, no.
Collecting	Whether the partner port has been enabled for receiving packets.
Distributing	Whether the partner port has been enabled for transmitting packets.
Defaulted	Whether the partner system is using the defaults for this port's information. If no, the values have been received from this system via a LACPDU. If yes, the defaults are still in use.
Expired	When the partner port has not received a frame for 3 times the periodic time (3 or 90 seconds).

Examples To show the LACP port information for all ports, use the command:

```
sh lacp po
```

Related Commands

- [add lacp port](#)
- [delete lacp port](#)
- [set lacp port](#)
- [show lacp](#)

show lacp port counter

Syntax SHow LACP Port[={*port-list*|ALL}] COUnter

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of port numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command displays LACP counters for the specified switch ports, or all switch ports (Figure 8-15, Table 8-13).

Figure 8-15: Example output from the **show lacp port counter** command

```
LACP Port Counters
-----
Port 1
  Received:                               Transmitted
  LACP Pkts..... 0                      LACP Pkts ..... 0
  Invalid LACP Pkts..... 0
-----
```

Table 8-13: Parameters in output of the **show lacp port counter** command

Parameter	Meaning
Received	Counters for LACP frames received.
LACP Pkts	Number of valid LACPDU frames received.
Invalid LACP Pkts	Number of invalid LACP packets received. This includes those with an invalid type/length field, subtype field, actor information length field, partner information length field, collector information length field, terminator information length field, or invalid frame length.
Transmitted	Counters for LACP packet transmitted.
LACP Pkts	Number of LACPDU frames transmitted.

Examples To show the LACP port counters for all ports, use the command:

```
sh lacp po cou
```

Related Commands [reset lacp port counter](#)
[show lacp](#)
[show lacp port](#)

show lacp trunk

Syntax SHow LACP TRunk

Description This command displays the currently dynamically configured trunks for the LACP module ([Figure 8-16](#)).

Figure 8-16: Example output from the **show lacp trunk** command

```
LACP Dynamic Trunk Group Information
-----

Trunk group name ..... lacp53:
  Speed ..... 100 Mbps
  Ports in Trunk ..... 10,15
  LAG ID:
  [ (8000,00-00-cd-03-00-79,0005,00,0000) , (8000,00-00-cd-08-76-60,0002,00,0000) ]
-----
```

Related Commands [show lacp trunk](#)
[show lacp](#)

show switch

Syntax SHow SWItch

Description This command displays configuration information for the switch functions (Figure 8-17, Table 8-14).

Figure 8-17: Example output from the **show switch** command

```
Switch Configuration
-----
Switch Address ..... 00-00-cd-04-e0-75
Learning ..... ON
Ageing Timer ..... ON
Number of Fixed Ports ..... 24
Number of Uplink Ports ..... 0
Mirroring ..... DISABLED
Mirror port ..... None
Ports mirroring on Rx ..... None
Ports mirroring on Tx ..... None
Ports mirroring on Both .... None
Number of WAN Interfaces ... 0
Name of Interface(s) ..... -
Ageingtime ..... 300
L3 Ageingtime ..... 900
UpTime ..... 00:04:30
STP Forwarding ..... ENABLED
-----
```

Table 8-14: Parameters in output of the **show switch** command

Parameter	Meaning
Switch Address	MAC address of the switch from which the Bridge Identifier used in the Spanning Tree Algorithm is derived.
Learning	Whether the switch's dynamic learning and updating of the forwarding database is enabled.
Ageing Timer	Whether the ageing timer is enabled.
Number of Fixed Ports	Number of fixed Ethernet switch ports.
Number of Uplink Ports	Number of Ethernet uplink ports.
Mirroring	Whether traffic mirroring is enabled.
Mirror port	Switch port where mirror traffic is sent.
Ports mirroring on Rx	Ports that are set to send all the traffic they receive to the mirror port.
Ports mirroring on Tx	Ports that are set to send all the traffic they transmit to the mirror port.
Ports mirroring on Both	Ports that are set to send all the traffic they both receive and transmit to the mirror port.
Number of WAN Interfaces	Total number of installed WAN interfaces.
Name of Interface(s)	Name of the installed WAN interface(s).
Ageingtime	Length in seconds after which a dynamic entry is removed from the forwarding database.

Table 8-14: Parameters in output of the **show switch** command (Continued)

Parameter	Meaning
L3 Ageingtime	Length in seconds after which a dynamic entry is removed from the Layer 3 forwarding database.
Uptime	Time in hours:minutes:seconds since the switch was last powered up, rebooted, or restarted. This is the same value as the MIB object sysUpTime.
STP Forwarding	Whether STP forwarding is enabled.

Example To display the configuration of the switch module, use the command:

```
sh swi
```

Related Commands [reset switch](#)

show switch counter

Syntax SHow SWItch COUnTer

Description This command displays information about the forwarding counters associated with the switch ([Figure 8-18](#), [Table 8-15](#)).

To display reception and transmission packet counters for the switch, see the **show switch port counter** command.

Figure 8-18: Example output from the **show switch counter** command

Switch Counters			

Switch instance:	0		
Packet DMA counters:			
Receive:		Transmit:	
Packets	407	Packets	708
Discards	0	Discards	0
TooFewBuffers	0	Aborts	0
DescriptorsExhausteds	0	DescriptorAreaFilleds	0
QueueLength	0	QueueLength	0
PCI bus counters:			
ParityErrors	0	ErrorChannel	0
FatalErrors	0	ErrorResets	0
General counters:			
Resets	0		

Table 8-15: Parameters in output of the **show switch counter** command

Parameters	Meaning
Packet DMA counters	
Receive	Counters for packets received.
Packets	The number of packets received by the CPU from the switch chip.
Discards	The number of packets received from the switch chip that were discarded because either the receive queue was greater than 4096, or because the free buffers in the switch were below BufferLevel3, or because there were no data bytes in the packet.
TooFewBuffers	The number of packets received from the switch chip that were discarded because the free buffers in the switch were below BufferLevel3.
DescriptorsExhausteds	The number of times the switch chip reported that it could not transfer a packet by DMA to a switch buffer because there were no more receive buffer descriptors.
QueueLength	The number of packets received from the switch chip waiting to be processed by the CPU.
Transmit	Counters for packets transmitted.
Packets	The number of packets transferred from the CPU to the switch chip.

Table 8-15: Parameters in output of the **show switch counter** command (Continued)

Parameters	Meaning
Discards	The number of packets waiting for transmission that were discarded when the DMA process was reset due to an error.
Aborts	The number of times transmission of a packet was aborted due to it taking an excessive length of time for the transmission to complete, perhaps due to a port being in a blocked state or due to a busy PCI bus.
DescriptorAreaFilled	The number of times the transmit descriptor area filled due to a high rate of transfer of packets from the CPU to the switch chip or high PCI bus utilisation causing the DMA to proceed slowly.
QueueLength	The number of packets currently queued for transmission, or that have been transmitted and are waiting to be purged from the transmit queue.
PCI bus counters	
ParityErrors	The number of times the switch chip reported a parity error for a transaction on the PCI bus.
FatalErrors	The number of times the switch chip reported a fatal error for a transaction on the PCI bus.
ErrorChannel	The DMA channel for making the transaction for which the error occurred.
ErrorResets	Not currently supported.
General counters	
Resets	The number of times the receive and transmit DMA channels have been reset due to the occurrence of an error.

Example To display the switching counters, use the command:

```
sh swi cou
```

Related Commands

- [reset switch](#)
- [show switch](#)
- [show switch port counter](#)

show switch debug

Syntax SHow SWItch DEBug

Description This command displays debugging information for the switch ([Figure 8-19](#), [Table 8-16](#)).

Figure 8-19: Example output from the **show switch debug** command

Enabled Switch Debug Modes	Output	Timeout

ARL, DMA	16	12345

Table 8-16: Parameters in output of the **show switch debug** command

Parameter	Meaning
Enabled Switch Debug Modes	Whether the debugging option for the switch is ARL, CMIC", DMA, QOS, S5600, PHY, or None.
Output	Output device for the switch. This is shown when a debug mode is enabled.
Timeout	Time in seconds that debugging options for the switch are enabled. This is shown when a debug mode is enabled.

Example To display debugging information for the switch, use the command:

```
sh swi deb
```

Related Commands [disable switch debug](#)
[enable switch debug](#)
[disable debug active](#) in Chapter 4, Configuring and Monitoring the System
[show debug active](#) in Chapter 4, Configuring and Monitoring the System

show switch fdb

Syntax `SHoW SWitCh FDB [= {SW|HW}] [Address=macadd]
[DIScard={SOurce|DEStination}] [HIT={Yes|No}] [L3={Yes|
No}] [POrt={port-list|ALL}] [STAtus={STAtic|DYnamic}]
[VLAN={vlan-name|1..4094}]`

where:

- *macadd* is an Ethernet six-octet MAC address, expressed as six pairs of hexadecimal digits delimited by hyphens.
- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.
- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.

Description This command displays the contents of the forwarding database ([Figure 8-20 on page 8-128](#), [Table 8-17 on page 8-128](#)). It requires a user with Security Officer privilege when the switch is in security mode.

The **fdb** parameter specifies the version of the Forwarding Database that is displayed. The Forwarding Database is stored in hardware and a copy is held in software. If SW is specified, the software copy of the Forwarding Database is displayed; if HW is specified, the hardware version is displayed. Under normal circumstances, the two versions are identical. The default is SW.

The **address** parameter specifies the MAC address of the device for which the contents of the Forwarding Database are to be displayed.

The **discard** parameter specifies whether to display entries in the Forwarding Database where frames are discarded on the basis of the received frame's source or destination address.

The **hit** parameter specifies whether to display filter entries in the Forwarding Database where a frame matching the entry either was or was not received during the latest Ageing Timer period.

The **l3** parameter specifies whether to display filter entries in the Forwarding Database that were or were not created as part of a Layer 3 interface configuration.

The **port** parameter specifies that only those entries in the Forwarding Database that were learned from the specified port are to be displayed.

The **status** parameter specifies whether to display only static filter entries or only dynamically-learned filter entries.

The **vlan** parameter specifies the VLAN identifier of the VLAN for which the contents of the Forwarding Database are to be displayed.

Figure 8-20: Example output from the **show switch fdb** command

Switch Forwarding Database (software)									
VLAN	MAC Address	Port	Status	Discard	L3	Hit	QOS	QSD	
1	00-00-cd-00-45-c7	CPU	static	-	y	y	0:0	dest	
42	00-00-c0-1d-2c-f8	1	dynamic	-	n	y	0:0	dest	
42	00-00-c0-71-e0-e4	1	dynamic	-	n	y	0:0	dest	
42	00-00-cd-00-a4-d6	1	dynamic	-	n	y	0:0	dest	
42	00-00-cd-00-ab-dc	1	dynamic	-	n	y	0:0	dest	
42	00-60-b0-ac-18-51	1	dynamic	-	n	y	0:0	dest	
42	00-90-27-23-a4-e9	1	dynamic	-	n	y	0:0	dest	
42	00-90-27-32-ad-61	1	dynamic	-	n	y	0:0	dest	
42	00-90-27-76-8a-55	1	dynamic	-	n	y	0:0	dest	
42	00-90-27-76-9a-99	1	dynamic	-	n	y	0:0	dest	
42	00-90-27-87-a5-22	1	dynamic	-	n	y	0:0	dest	
42	00-90-27-bd-c8-93	1	dynamic	-	n	y	0:0	dest	
42	00-90-27-bd-c9-7f	1	dynamic	-	n	y	0:0	dest	
42	00-90-27-d0-ae-c2	1	dynamic	-	n	y	0:0	dest	
42	00-90-27-d0-c7-12	1	dynamic	-	n	y	0:0	dest	
42	08-00-09-be-06-cd	1	dynamic	-	n	y	0:0	dest	

Table 8-17: Parameters in output of the **show switch fdb** command

Parameter	Meaning
VLAN	VLAN Identifier of the VLAN.
MAC Address	MAC address as learned from the source address field of a frame, or entered as part of a static filter entry.
Port	Port from which the MAC address was learned.
Status	Whether the entry was a static filter entry or dynamically learned.
Discard	Whether to discard frames on the basis of the source address or the destination address of the received frame.
L3	Whether the entry was created as part of a Layer 3 interface configuration.
Hit	Whether a frame matching this filter entry was received during the latest Ageing Timer period. If the Ageing Timer is enabled, entries with 'n' are purged from the Forwarding Database.
QOS	Quality of Service of the frame. The first number is the QoS based on the source address. The second number is the QoS based on the destination address.
QSD	Whether the source address QoS or the destination address QoS has priority in determining the QoS of frames received that do not contain priority information.

Example To display the contents of the Forwarding Database, use the command:

```
sh swi fdb
```

Related Commands [enable switch learning](#)
[show switch](#)
[show switch filter](#)

show switch filter

Syntax `SHoW SWItch FIlTer [POrt={port-list|ALL}]`
`[ACtIon={FORward|DIScard}] [DEStAddress=macadd]`
`[ENTRy=entry-list] [VLAN={vlan-name|1..4094}]`

where:

- *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.
- *macadd* is an Ethernet six-octet MAC address, expressed as six pairs of hexadecimal digits delimited by hyphens.
- *entry-list* is an entry number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Entry numbers start at 0 and end at *m*, where *m* is the highest filter entry currently defined in the Permanent Forwarding Database. Each port has its own Permanent Forwarding Database.
- *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.

Description This command displays information about some or all of the static switch filter entries (Figure 8-21, Table 8-18 on page 8-130). The output can be limited to display only entries matching the optional parameters as described below.

The **action** parameter specifies whether frames matching the filter entry are forwarded or discarded.

The **entry** parameter must specify an existing filter entry or entries in the Permanent Forwarding Database.

The **destaddress** parameter specifies the destination MAC address in the filter entry.

The **port** parameter specifies the outbound ports over which frames matching this filter entry are discarded or forwarded.

The **vlan** parameter specifies the numerical VLAN Identifier with which the filter entry is associated.

Figure 8-21: Example output from the **show switch filter** command

Switch Filters					

VlanSecure ENABLED					
Entry	VLAN	Destination Address	Port	Action	Source

0	default (1)	aa-ab-cd-00-00-01	1	Forward	static
1	default (1)	aa-ab-cd-00-00-02	1	Forward	static
0	marketing (2)	aa-ab-cd-00-00-01	2	Discard	static
1	marketing (2)	aa-ab-cd-00-00-02	2	Discard	learn

Table 8-18: Parameters in output of the **show switch filter** command

Parameter	Meaning
VlanSecure	Whether vlansecure mode is enabled. For more information, see “Securing a Single VLAN through Switch Filters” on page 8-32.
Entry	Number identifying the filter entry.
Destination Address	Destination MAC address for the entry.
VLAN	VLAN name and identifier for the entry.
Port	The outbound port to match for the filter entry to be applied.
Action	Whether the action specified by the filter entry to forward or discard.
Source	This parameter is either “static” (indicating the filter is a static filter) or “learned” (indicating the filter is present either because it has been added with the learn parameter of the set switch port command, or has been dynamically learned during normal intrusion detection operation).

Examples To display information about the entire Permanent Forwarding Database, use the command:

```
sh swi fil po=all
```

To display information about the Permanent Forwarding Database for port 3, use the command:

```
sh swi fil po=3
```

To display information about the Permanent Forwarding Database for the *marketing* VLAN, use the command:

```
sh swi fil po=all vlan=marketing
```

To display the port to which the MAC address 00-00-00-12-34-56 belongs, use the command:

```
sh swi fil po=all dest=00-00-00-12-34-56
```

Related Commands [add switch filter](#)
[delete switch filter](#)

show switch hwfilter

Syntax SHow SWItch HWFilter [CLASSifier=*classifier-list*]

Description This command displays hardware-based filtering entries created when using the **add switch hwfilter classifier** command (Figure 8-22, Figure 8-23, Table 8-19 on page 8-132). If **classifier** is not specified, the command displays a summary of all currently-defined filters. If **classifier** is specified, the command displays the details of filters that use the specified classifier. All of the specified classifiers must exist and must already be incorporated into a filter entry. You can specify either a number from 1 to 9999, a range of numbers (specified as 1-4), or a comma-separated list of classifier numbers and/or ranges (1, 3, 4-9).

Figure 8-22: Example output from the **show switch hwfilter** command

```
Switch Hardware Filter Summary Information
-----
Number of Filters .... 12
Status ..... ENABLED
Mode ..... NPSF

Filter ..... 1
Classifier ..... 3

Filter ..... 2
Classifier ..... 100

Filter ..... 3
Classifier ..... 101
-----
```

Figure 8-23: Example output from the **show switch hwfilter classifier** command

```
-----
Filter ..... 1
Classifier ..... 3
Action ..... sp
New IP DSCP ..... -
New TOS ..... -
Port ..... -
Priority ..... 5
No Match Action ..... st, sp
No Match DSCP ..... -
No Match TOS ..... 2
No Match Port ..... -
No Match Priority .... 1
-----
```

Table 8-19: Parameters in output of the **show switch hwfilter classifier** command

Parameter	Meaning
Number of Filter	Current total of filters created with the add switch hwfilter classifier command.
Status	Whether hardware filtering on the switch is enabled.
Mode	Whether the switch expects hardware filters to be ordered with port-specific filters first ("PSF"), or non port-specific filters first ("NPSF"). This only displays for models with 48 ports (two switch instances).
Filter	Filter number.
Classifier	Number of the classifier this filter entry is based on.
Action	Action to take when a packet matches this entry; one or more of "sp" (SETPRIORITY), "sc" (FORWARD or SENDCOS), "st" (SETTOS), "dn" (DENY), "se" (SENDEPORT), "sm" (SENDMIRROR), "mpt" (MOVEPRIOTOTOS) "mtp" (MOVETOSTOPRIO), "sds" (SETIPDSCP), "sn" (SENDNONUNICASTTOPORT), "nd" (NODROP).
New IP DSCP	New IP DSCP value to assign to packets matching the entry.
New TOS	New TOS value to assign to packets matching the entry.
Port	New output port to use for packets matching the entry.
Priority	New priority value to assign to packets matching the entry.
No Match Action	Action to take when a packet matches the specified ingress/egress ports for this entry; one or more of "sp" (SETPRIORITY), "sc" (FORWARD or SENDCOS), "st" (SETTOS), "dn" (DENY), "se" (SENDEPORT), "sm" (SENDMIRROR), "mpt" (MOVEPRIOTOTOS) "mtp" (MOVETOSTOPRIO), "sds" (SETIPDSCP), "sn" (SENDNONUNICASTTOPORT).
No Match DSCP	New IP DSCP value to assign to packets on a partial match.
No Match TOS	New TOS value to assign to packets on a partial match.
No Match Port	New output port to use for packets on a partial match.
No Match Priority	New priority value to assign to packets on a partial match.

Example To display a summary of all filters, use the command:

```
sh swi hwf
```

To display details of the filter that uses classifier 1, use the command:

```
sh swi hwf class=1
```

Related Commands

- add switch hwfilter classifier**
- delete switch hwfilter classifier**
- set switch hwfilter classifier**
- set switch hwfilter mode**
- show classifier** in Chapter 21, Generic Packet Classifier

show switch l3filter

Syntax SHow SWItch L3Filter[=*filter-id* [ENTry=*entry-id*]]

where:

- *filter-id* is a decimal number in the range 1 to the number of filters defined.
- *entry-id* is a decimal number in the range 1 to the number of entries defined.

Description This command displays hardware-based Layer 3 filtering match criteria and their filter entries (Figure 8-24, Table 8-20).

Figure 8-24: Example output from the **show switch l3filter** command

Filter 1							
Matched fields tos, ttl, sipaddr, dipaddr, protocol							
Source address mask .. 255.255.255.0							
Dest. address mask ... 255.255.255.0							
Ingress port mask true							
Egress port mask true							
No match action none							
Ent.	S-Address S-Mask S-Port	D-Address D-Mask D-Port	Prot Iport Action	TTL Eport	TOS	NewTOS Port	Type Syn/Ack/Fin

1	192.168.1.0 255.255.255.0 -	192.168.2.0 255.255.255.0 -	ICMP 2 dn	30 3	2	1	0 0/0/0

2	192.168.2.0 255.255.255.0 -	192.168.1.0 255.255.255.0 -	ICMP 2 sc	30 3	2	1	0 0/0/0

Table 8-20: Parameters in output of the **show switch l3filter** command

Parameter	Meaning
Filter	Filter number.
Match fields	A list of the fields matched by this filter; one or more of "tos", "ttl", "protocol", "sipaddr", "dipaddr", "tcpport", "tcpdport", "tcpsyn", "tcpack", "tcpfin", "udpport", or "udpport".
Source address mask	Mask to apply to source IP address fields to determine a match.
Destination address mask	Mask to apply to destination IP address fields to determine a match.
Ingress port mask	Whether the filter applies to ingress ports.
Egress port mask	Whether the filter applies to egress ports.

Table 8-20: Parameters in output of the **show switch l3filter** command (Continued)

Parameter	Meaning
No Match Action	Action to take when a packet matches the specified ingress/egress ports for this entry; one or more of "sp" (SETPRIORITY), "sc" (FORWARD or SENDCOS), "st" (SETTOS), "dn" (DENY), "se" (SENDEPORT), "sm" (SENDMIRROR), "mpt" (MOVEPRIOTOTOS), "mtp" (MOVETOSTOPRIO), "sds" (SETIPDSCP), "sn" (SENDNONUNICASTTOPORT).
Ent.	Filter entry number.
S-Address, S-Mask, S-Port	Source IP address, source mask and source port to match.
D-Address, D-Mask, D-Port	Destination IP address, destination mask and destination port to match.
Prot	Protocol to match.
lport	Ingress port number to match.
Action	Action to take when a packet matches this entry; either "sp" (SETPRIORITY), "sc" (FORWARD or SENDCOS), "st" (SETTOS), "dn" (DENY), "se" (SENDEPORT), or "sm" (SENDMIRROR).
TTL	TTL value to match.
Eport	Egress port number to match.
TOS	TOS value to match.
NewTOS	New TOS value to assign to packets matching the entry.
Type	Value of the protocol-type to match. If a 5 byte hexadecimal number is shown then the packet type is SNAP, if 2 bytes are shown then the packet type is either Ethernet type II or 802.3 and (E-II) or (SNAP) is appended respectively.
Port	New output port to use for packets matching the entry.
Priority	New priority value to assign to packets matching the entry.

Example To display all filters, use the command:

```
sh swi l3f
```

To display entry 3 from filter 1, use the command:

```
sh swi l3f=1 ent=3
```

Related Commands

- [add switch l3filter match](#)
- [add switch l3filter entry](#)
- [delete switch l3filter](#)
- [delete switch l3filter entry](#)
- [disable switch l3filter](#)
- [enable switch l3filter](#)
- [set switch l3filter match](#)
- [set switch l3filter entry](#)

show switch mstp

Syntax `SHoW SWItch MSTP [INSTance=instance]`

where *instance* is 0 or 1 and specifies a switch instance (ASIC) on 48 port switches

Description This command displays information about the STP state of all ports, or ports on the specified switch ASIC, taking an active part in spanning trees (Figure 8-25, Table 8-21).

The **instance** parameter specifies the switch instance (ASIC) on switches with multiple switch ASICs—switches with 48 ports. If an instance is specified, information is displayed for ports on the specified switch instance. If an instance is not specified, information is displayed for all ports on all switch instances.

Figure 8-25: Example output from the **show switch mstp** command

```
Switch STP Port State Information at 06:23:39:
ST      Port      State
--      -
1       1         Fo
1       11        Li
1       32        Li
2       1         Fo
2       11        Li
2       32        Le
3       1         Fo
3       11        Li
3       32        Li
4       1         Fo
4       11        Li
4       32        Li
5       1         Fo
5       11        Li
5       32        Le
6       1         Fo
6       11        Li
6       32        Li
```

Table 8-21: Parameters in output of the **show switch mstp** command

Parameter	Meaning
ST	Index of the spanning tree in the switch ASIC.
Port	Switch port number.
State	Spanning tree state of the port in this STP. One of: BI—Blocking; forwarding disabled, learning disabled, BPDUs received Di—Disabled; forwarding disabled, learning disabled, BPDUs discarded Fo—Forwarding; forwarding enabled, learning enabled, BPDUs received Le—Learning; forwarding disabled, learning enabled, BPDUs received

Example To display STP state information for ports in spanning tree "Region1", use the command:

```
sh swi mstp=Region1
```

To display STP state information for ports in all spanning trees, use the command:

```
sh swi mstp=all
```

Related Commands

- [disable switch debug](#)
- [enable switch debug](#)
- [show switch debug](#)
- [show switch stp](#)

show switch port

Syntax SHow SWItch PORT[={*port-list*|All}]

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command displays general information about the specified switch ports or all switch ports (Figure 8-26, Table 8-22).

Figure 8-26: Example output from the **show switch port** command

```
Switch Port Information
-----
Port ..... 1
  Description ..... To intranet hub, port 4
  Status ..... ENABLED
  Link State ..... Up
  UpTime ..... 00:10:49
  Port Media Type ..... ETHERNET CSMACD
  Configured speed/duplex ..... Autonegotiate
  Actual speed/duplex ..... 100 Mbps, full duplex
  Configured master/slave mode .. Autonegotiate
  Actual master/slave mode ..... Master
  Acceptable Frame Types ..... Admit All Frames
  Broadcast rate limit ..... 1000fps
  Multicast rate limit ..... -
  DLF rate limit ..... -
  Ingress rate limit ..... -
  Egress rate limit ..... -
  Learn limit ..... -
  Intrusion action ..... Discard
  Current learned, lock state ... 15, not locked
  Relearn ..... OFF
  Mirroring ..... Tx, to port 22
  Is this port mirror port ..... No
  Enabled flow control(s) ..... Pause
  Send tagged pkts for VLAN(s) .. -
  Port-based VLAN ..... default (1)
  Ingress Filtering ..... OFF
  Trunk Group ..... -
  STP ..... company
  IGMP Filter ..... None
  Max-groups/Joined ..... Undefined/0
  IGMP Max-groups Action ..... Deny
  Multicast filtering mode ..... (B) Forward all unregistered groups
  DoS Attack Prevention ..... Enabled
    Defense Types Active ..... IP Options, Land, Ping Of Death,
                                Smurf, SYN Flood, Teardrop
  DoS Attack Status ..... None

PoE Information
  PoE Status ..... ENABLED
  Power Limit ..... 15,400 mW
  Power Priority ..... LOW
-----
```

Table 8-22: Parameters in output of the **show switch port** command

Parameter	Meaning
Port	Number of the switch port.
Description	Description of the port.
Status	Whether the port is enabled.
Link state	Whether the link of the port is up or down.
Uptime	Hours:minutes:seconds of the elapsed time since the port was last reset or initialised.
Port Media Type	MAC entity type as defined in the MIB object ifType.
Configured speed/duplex	Port speed and duplex mode configured for this port. Either "Autonegotiate" or a combination of a speed (one of "10 Mbps", "100 Mbps", "1000 Mbps" or "10 Gbps") and a duplex mode (one of "default", half duplex" or "full duplex") optionally followed by "(by autonegotiation)".
Actual speed/duplex	The port speed and duplex mode that this port is actually running at. A combination of a speed (one of "10 Mbps", "100 Mbps", "1000 Mbps" or "10 Gbps") and a duplex mode (either "half duplex" or "full duplex").
Configured master/slave mode	The master/slave mode configured for this port; one of "Autonegotiate", "Master", "Slave", or "Not applicable".
Actual master/slave mode	The master/slave mode this port is actually operating in; one of "-", "Master", "Slave", or "Not applicable".
Acceptable Frame Types	The frame types that this port will accept; either "Admit All Frames" or "Admit Only VLAN-tagged Frames".
Broadcast rate limit	The limit of the rate of reception of broadcast frames for this port, in frames per second.
Multicast rate limit	The limit of the rate of reception of multicast frames for this port, in frames per second.
DLF rate limit	The limit of the rate of reception of DLF (destination lookup failure) frames for this port, in frames per second.
Ingress rate limit	Maximum bandwidth to be received on of this port, or trunk group if the port is a member of a trunk group. Measured in Kb/s.
Egress rate limit	Maximum bandwidth to be transmitted out of this port, or trunk group if the port is a member of a trunk group. Measured in Kb/s.
Learn limit	The number of MAC addresses that may be learned for this port. Once the limit is reached, the port is locked against any new MAC addresses. Either "None" or a number from 1 to 256.
Intrusion action	Action taken on this port when a frame is received from an unknown MAC address when the port is locked. Either Discard, Trap, or Disable.
Current learned, lock state	The number of MAC addresses currently learned on this port and the state of locking for this port. The current learned parameter is incremented when a Learn Limit is set for the port. The lock state is either "not locked", "locked by limit", or "locked by command".
Relearn	Whether dynamic MAC address learning is used on a port with a learn limit. When off , static is used.

Table 8-22: Parameters in output of the **show switch port** command (Continued)

Parameter	Meaning
Mirroring	The traffic mirroring mode for traffic transmitted and received by this port; one of "None", "Rx" (for traffic received by this port), "Tx" (for traffic sent on this port), or "Both". If mirroring is enabled, the port where mirrored frames are sent, or "no Mirror Port set" if a mirror port has not been set, is also displayed.
Is this port mirror port	Whether this port is a mirror port; either "Yes" or "No".
Enabled flow control(s)	The flow control methods enabled for this port; one or both of "Pause" or "Jamming", or "-" if flow control is not enabled on the port.
Send tagged pkts for VLAN(s)	Name and VLAN Identifier (VID) of the tagged VLAN(s), if any, to which the port belongs.
Port-based VLAN	Name and VLAN Identifier (VID) of the port-based VLAN to which the port belongs.
Ingress Filtering	Whether ingress filtering is on.
Trunk Group	Name of trunk group to which the port belongs, if any.
STP	Name of the STP to which the port belongs.
IGMP Filter	The IGMP filter applied to the port, or "None" if an IGMP filter has not been set.
Max-groups/Joined	The maximum number of multicast groups the port can join, or "Undefined" if a limit has not been set, and the number of multicast groups that the port is currently a member of.
IGMP Max-groups Action	The action to take when the port attempts to join more multicast groups than the maximum allowed; one of "Deny" or "Replace".
Multicast filtering mode	The action to take when multicast packets are received via by port; one of "(A) forward all groups", "(B) forward all unregistered groups", or "(C) filter all unregistered groups".
DoS Attack Prevention	Whether Denial of Service (DoS) attack prevention is enabled on the port; one of "Enabled" or "Disabled".
Defense Types Active	The DoS defenses active on the port; one or more of "IP Options", "Land", "Ping of Death", "Smurf", "SYN Flood", and "Teardrop".
DoS Attack Status	Whether or not a DoS attack is in progress on the port; one of "Under Attack", "Suspected", or "None".
PoE Status	Whether PoE is enabled or disabled on the port. Default: Enabled
Power Limit	The maximum amount of power allowed by the port for the device. Default: 15,400 milliWatts (15.4 W)
Power Priority	The port priority, one of Low, High or Critical.
GBIC Information	The following GBIC fields are displayed if the port is a GBIC port and a valid GBIC is installed in the port.
GBIC vendor name	Name of the GBIC vendor.

Table 8-22: Parameters in output of the **show switch port** command (Continued)

Parameter	Meaning
GBIC part number	Vendor part number or product name.
GBIC vendor SN	Vendor serial number.
GBIC date code	Vendor manufacturing date code (two digits each for year, month, day and batch).

Example To display the configuration for switch port 1, use the command:

```
sh swi po=1
```

Related Commands [set switch port](#)

show switch port counter

Syntax SHow SWItch POrt[={*port-list*|All}] COUnTer

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command displays counters for a specific switch port or all switch ports (Figure 8-27 on page 8-141, Table 8-23 on page 8-142).

Figure 8-27: Example output from the **show switch port counter** command

```

Port 1. Fast Ethernet MAC counters:
Combined receive/transmit packets by size (octets) counters:
  64                               65 512 - 1023                0
 65 - 127                         5 1024 - MaxPktSz          0
128 - 255                         0 1519 - 1522              0
256 - 511                         0                          0

General Counters:
Receive                               Transmit
Octets                               246 Octets                4340
Pkts                                 3 Pkts                  67
FCSErrors                           0 FCSErrors              0
MulticastPkts                       0 MulticastPkts          65
BroadcastPkts                       3 BroadcastPkts          2
PauseMACCtrlFrms                   0 PauseMACCtrlFrm        0
OversizePkts                        0 OversizePkts           0
Fragments                           0 Fragments              0
Jabbers                             0 Jabbers                 0
MACControlFrms                     0
UnsupportOpcode                     0
AlignmentErrors                     0
OutOfRngeLenFld                     0
SymErDurCarrier                     0
CarrierSenseErr                     0
UndersizePkts                       0
                                     PauseCtrlFrms            0
                                     FrameWDeferrdTx          0
                                     FrmWExcesDefer           0
                                     SingleCollsnFrm         0
                                     MultCollsnFrm           0
                                     LateCollsns              0
                                     ExcessivCollsns         0
                                     CollisionFrames          0

Layer 3 Counters:
  ifInUcastPkts                     0 ifOutUcastPkts          0
  ifInDiscards                       0 ifOutErrors              0
  ipInHdrErrors                       0

Miscellaneous Counters:
  DropEvents                         0
  ifOutDiscards                       0
  taggedPktTx                         0
  totalPktTxAbort                     0

HW Multicasting Counters:
  TTL expired                         0
  Bridged Frames                      0
  Routed Frames                       0
  Receive Drops                       0
  Transmit Drops                      0

```

Table 8-23: Parameters in output from **show switch port counter** command

Parameter	Description
Ethernet MAC counters	
Combined receive/transmit packets by size (octets) counters	Number of packets in each size range received and transmitted.
64	Number of 64 octet packets received and transmitted.
65 - 127	Number of 65 - 127 octet packets received and transmitted.
128 - 255	Number of 128 - 255 octet packets received and transmitted.
256 - 511	Number of 256 - 511 octet packets received and transmitted.
512 - 1023	Number of 512 - 1023 octet packets received and transmitted.
1024 - MaxPktSz	Number of packets received and transmitted with size 1024 octets to the maximum packet length.
1519 - 1522	Number of 1519 - 1522 octet frames received and transmitted.
General Counters	
Receive	Counters for traffic received.
Octets	Number of octets.
Pkts	Number of packets.
FCSErrors	Number of frames containing a Frame Check Sequence error.
MulticastPkts	Number of multicast packets.
BroadcastPkts	Number of broadcast packets.
PauseMACCtlFrms	Number of valid PAUSE MAC Control frames.
OversizePkts	Number of oversize packets.
Fragments	Number of fragments.
Jabbers	Number of jabber frames.
MACControlFrms	Number of MAC Control frames (Pause and Unsupported).
UnsupportOpcode	Number of MAC Control frames with unsupported opcode (i.e. not Pause).
AlignmentErrors	Number of frames with alignment errors.
OutOfRngeLenFld	Number of packets with length out of range.
SymErDurCarrier	Number of frames with invalid data symbols.
CarrierSenseErr	Number of false carrier conditions between frames.
UndersizePkts	Number of undersized packets.
Transmit	Counters for traffic transmitted
Octets	Number of octets.
Pkts	Number of packets.
FCSErrors	Number of frames containing a Frame Check Sequence error.

Table 8-23: Parameters in output from **show switch port counter** command (Continued)

Parameter	Description
MulticastPkts	Number of multicast packets.
BroadcastPkts	Number of broadcast packets.
PauseMACCtlFrms	Number of valid PAUSE MAC Control frames.
OversizePkts	Number of oversize packets.
Fragments	Number of fragments.
Jabbers	Number of jabber frames.
PauseCtrlFrms	Number of Pause control frames.
FrameWDeferrdTx	Number of frames deferred once before successful transmission.
FrmWExcesDefer	Number of frame aborted after too many deferrals.
SingleCollsnFrm	Number of frames that experienced exactly one collision.
MultCollsnFrm	Number of frames that experienced 2 to 15 collisions (including late collisions).
LateCollsns	Number of frames that experienced late collisions.
ExcessivCollsns	Number of frames aborted before transmission after 16 collisions.
CollisionFrames	Total number of collisions.
Layer 3 Counters (do not include packets sent to CPU for processing)	
ifInUcastPkts	Number of L3 switched unicast packets.
ifInDiscards	Number of packets for Layer 3 interfaces that are discarded.
ipInHdrErrors	Number of packets discarded due to IP header errors.
ifOutUcastPkts	Number of L3 switched unicast packets.
ifOutErrors	Number of L3 switched packets discarded at egress due to transmission errors.
Miscellaneous Counters	
DropEvents	Number of packets discarded at ingress port.
ifOutDiscards	Number of packets for transmission discarded due to ageing.
taggedPktTx	Number of VLAN tagged packets transmitted.
totalPktTxAbort	Number of Layer 2 and 3 packets aborted during transmission.
HW Multicasting Counters	
TTL expired	Number of packets dropped by the router because their IP multicasting Time to Live (TTL) counter was too low.
Bridged Frames	Number of IP multicasting packets received on this port and bridged (L2 switched) out another port.
Routed Frames	Number of IP multicasting packets received on this port and routed (L3 switched) out another port. Note that on 48-port switches, when a packet is received on a port in one switch instance and multicast L3 switched out a port in the other switch instance, this counter is not incremented. Ports 1-24 and 49 are in switch instance 0; ports 25-48 and 50 are in instance 1.

Table 8-23: Parameters in output from **show switch port counter** command (Continued)

Parameter	Description
Receive Drops	Number of IP multicasting packets dropped by this port on ingress.
Transmit Drops	Number of IP multicasting packets dropped by this port on egress.

Example To display counters for switch port 1, use the command:

```
sh swi po=1 cou
```

Related Commands [set switch port](#)
[show switch counter](#)
[show switch port](#)

show switch port intrusion

Syntax `SHoW SWItch POrt[={port-list|ALL}] INTRusion`

where *port-list* is a port number, range (specified as *n-m*), or comma-separated list of numbers and/or ranges. Port numbers start at 1 and end at *m*, where *m* is the highest numbered Ethernet switch port, including uplink ports.

Description This command shows a list of MAC addresses for devices that are active on a port, but which are not valid devices allowed or learned for the port. The list contains entries when the **intrusionaction** parameter (**set switch port** command) is of the type TRAP ([Figure 8-28](#)).

The **port** parameter specifies the port for which to display the intrusion list. The default is **all**.

Figure 8-28: Example output from the **show switch port intrusion** command

```
Switch Port Information
-----
Port 2 -      13 intrusion(s) detected
  00-00-c0-1d-2c-f8  00-90-27-87-a5-22  00-00-cd-01-00-4a
  00-d0-b7-4d-93-c0  08-00-5a-a1-02-3f  00-d0-b7-d5-5f-a9
  00-b0-d0-20-d1-01  00-90-99-0a-00-49  00-10-83-05-72-83
  00-00-cd-00-45-9e  00-00-c0-ad-a3-d0  00-a0-24-8e-65-3c
  00-90-27-32-ad-61
-----
```

Example To display a list of MAC addresses for devices active on port 2, but which are not valid devices, use the command:

```
sh swi po=2 intr
```

Related Commands [set switch port](#)

show switch qos

Syntax SHow SWItch QOS

Description This command displays the current mapping of user priority level to QOS egress queue for the switch (Figure 8-29, Table 8-24).

Packets that originate on the switch or are routed by the switch's software have been assigned a Quality of Service priority of 7. To ensure that these packets are transmitted promptly, you should not assign priority 7 to a low-numbered egress queue.

Figure 8-29: Example output from the **show switch qos** command

Priority Level	QOS egress queue
0	1
1	0
2	0
3	1
4	2
5	2
6	3
7	3

Table 8-24: Parameters in output of the **show switch qos** command

Parameter	Meaning
Priority level	Priority level of the received frame.
QOS egress queue	Quality Of Service egress queue that frames with this priority level join.

Example To display the current configuration of the priority level to QOS egress queue mappings, use the command:

```
sh swi qos
```

Related Commands [set switch qos](#)
[set qos hwpriority](#) in Chapter 22, Quality of Service (QoS)
[show qos hwpriority](#) in Chapter 22, Quality of Service (QoS)

show switch stp

Syntax SHoW SWItch STP [INSTance=*instance*]

where *instance* is 0 or 1 and specifies a switch instance (ASIC) on 48 port switches

Description This command displays information about the STP state of all ports, or ports on the specified switch ASIC, taking an active part in spanning trees (Figure 8-30, Table 8-25).

The **instance** parameter specifies the switch instance (ASIC) on switches with multiple switch ASICs—switches with 48 ports. If an instance is specified, information is displayed for ports on the specified switch instance. If an instance is not specified, information is displayed for all ports on all switch instances.

Figure 8-30: Example output from the **show switch stp** command

```
Switch STP Port State Information at 06:23:39:
ST      Port      State
--      -
1       1          Fo
1       11         Li
1       32         Li
2       1          Fo
2       11         Li
2       32         Le
3       1          Fo
3       11         Li
3       32         Li
4       1          Fo
4       11         Li
4       32         Li
5       1          Fo
5       11         Li
5       32         Le
6       1          Fo
6       11         Li
6       32         Li
```

Table 8-25: Parameters in output of the **show switch stp** command

Parameter	Meaning
ST	Index of the spanning tree in the switch ASIC.
Port	Switch port number.
State	Spanning tree state of the port in this STP. One of: BI—Blocking; forwarding disabled, learning disabled, BPDUs received Di—Disabled; forwarding disabled, learning disabled, BPDUs discarded Fo—Forwarding; forwarding enabled, learning enabled, BPDUs received Le—Learning; forwarding disabled, learning enabled, BPDUs received

Example To display STP state information for ports in spanning tree “Region1”, use the command:

```
sh swi stp=Region1
```

To display STP state information for ports in all spanning trees, use the command:

```
sh swi stp=all
```

Related Commands

- [disable switch debug](#)
- [enable switch debug](#)
- [show switch debug](#)
- [show switch mstp](#)

show switch trunk

Syntax `SHoW SWItch TRUnk [=trunk]`

where *trunk* is a character string 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

Description This command displays information about the specified trunk group, or all trunk groups on the switch (Figure 8-30, Table 8-25).

The **trunk** parameter specifies the name of the trunk group. The name is not case sensitive. The name uniquely identifies the trunk group. The trunk group specified must already exist.

Figure 8-31: Example output from the **show switch trunk** command

```
Switch trunk groups
-----
Trunk group name ..... Uplink
Speed ..... 1000Mbps
Selection criterion ..... Destination MAC address
Ports ..... 25,26
-----
```

Table 8-26: Parameters in output of the **show switch trunk** command

Parameter	Meaning
Trunk group name	Name of the trunk group.
Speed	Configured speed of the trunk group ports, either "10Mbps", "100Mbps" or "1000Mbps", or "-" (speed has not been set yet).
Selection criterion	Selection criterion used to choose the trunk port on which a packet is to be sent.
Ports	List of the ports in the trunk group, by port number.

Example To display information about all trunk groups, use the command:

```
sh swi tr
```

To display the settings for the *Uplink* trunk group, use the command:

```
sh swi tr=uplink
```

Related Commands

- [add switch trunk](#)
- [create switch trunk](#)
- [delete switch trunk](#)
- [destroy switch trunk](#)
- [set switch trunk](#)

show vlan

Syntax `SHoW VLAN[={vlan-name|1..4094|ALL}]`

where *vlan-name* is a unique name from 1 to 32 characters. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen. The *vlan-name* cannot be a number or **all**.

Description This command displays information about the specified VLAN. If no VLAN or **all** is specified, then all VLANs are displayed ([Figure 8-32](#), [Table 8-27 on page 8-150](#)).

Figure 8-32: Example output from the **show vlan** command

```
VLAN Information
-----
Name ..... default
Identifier ..... 1
Status ..... static
Protected ..... No
Admin Active ..... No
Private ..... No
Untagged ports ..... 1,3-23
Tagged ports ..... None
Disabled Ports ..... None
Spanning Tree ..... default
Trunk ports ..... None
Mirror port ..... None
Attachments:
Module          Protocol          Format    Discrim    MAC address
-----
GARP            Spanning tree    802.2    42         -
IP              IP               Ethernet  0800       -
IP              ARP              Ethernet  0806       -
-----

Name ..... v2
Identifier ..... 2
Status ..... dynamic
Protected ..... No
Admin Active ..... No
Private ..... Yes
Untagged ports ..... 2,24
Tagged ports ..... None
Disabled Ports ..... None
Spanning Tree ..... default
Trunk ports ..... None
Mirror port ..... None
Attachments:
Module          Protocol          Format    Discrim    MAC address
-----
GARP            Spanning tree    802.2    42         -
-----

Private Uplink:
  Uplink ports ..... 21-24

Private Groups:
  Group  ports ..... 3-5
  Group  ports ..... 6-9
-----
```

Table 8-27: Parameters in output of the **show vlan** command

Parameter	Meaning
Name	Name of the VLAN.
Identifier	Numerical VLAN identifier of the VLAN.
Status	Status of the VLAN, either dynamic or static.
Protected	Whether the VLAN is a protected VLAN.
Admin Active	Whether the VLAN is administratively activated.
Private	Whether the VLAN is a private VLAN.
Untagged Ports	List of untagged ports that belong to the VLAN.
Configured	Specifies which ports are configured for the specified VLAN if the VLAN has ports that are either assigned to another VLAN, or configured for another VLAN but assigned to this VLAN by Dynamic VLAN Assignment.
Actual	Specifies which ports are actually in the specified VLAN if the VLAN has ports that are either assigned to another VLAN, or configured for another VLAN but assigned to this VLAN by Dynamic VLAN Assignment.
Tagged Ports	List of tagged ports that belong to the VLAN.
Disabled Ports	List of disabled ports that belong to the VLAN.
Spanning Tree	Name of the Spanning Tree Protocol to which the VLAN belongs.
Trunk ports	List of switch ports that belong to trunk groups. This field is displayed when a port in the VLAN also belongs to a trunk group.
Mirror port	Mirror port for the switch, or "None". Displayed for the default VLAN only.
Attachments	Information about attachments to the VLAN by other modules.
Module	Name of the software module attached to the VLAN.
Protocol	Name of the protocol, which is determined from the format and identification number.
Format	Encapsulation format specified by the module.
Discrim	Discriminator specified by the module to identify which packets of the given format should be received.
MAC Address	Media Access Control source address for which the module wants to receive packets, commonly known as the Ethernet address.
Private Uplink	Information about the uplink ports of a private VLAN. Displayed only for private VLANs.
Uplink ports	The uplink for the VLAN. This is either a single uplink port, or a number of ports trunked together.
Private Groups	Information about the groups of a private VLAN. Displayed only for private VLANs.
Group ports	A list of the ports in each group.

Examples To display information on the *marketing* VLAN, use the command:

```
sh vlan=marketing
```

Related Commands [create vlan](#)
[destroy vlan](#)

show vlan debug

Syntax SHOW VLAN DEBUg

Description This command displays debug information for all VLANs (Figure 8-33, Table 8-28).

Figure 8-33: Example output from the **show vlan debug** command

Vlan	Enabled Debug Modes	Output	Timeout
Vlan1	PKT	16	NONE
Vlan	Enabled Debug Modes	Output	Timeout
Vlan4060	None		

Table 8-28: Parameters in output of the show vlan debug command

Parameter	Meaning
VLAN	String comprising the constant "Vlan" and the VLAN Identifier of the VLAN.
Enabled Debug Modes	Whether the debugging option for the VLAN is PKT or none.
Output	Output device for the VLAN. This is shown when a debug mode is enabled.
Timeout	Seconds during which debugging options for the VLAN are enabled. This is shown when a debug mode is enabled. If a timeout value is not set, "None" is shown.

Examples To display debugging information for all VLANs, use the command:

```
sh vlan deb
```

Related Commands [disable vlan debug](#)
[enable vlan debug](#)

show vlanrelay

Syntax SHow VLANRelay[=*name*]

where *name* is a unique name for the VLAN relay entity 1 to 15 characters long. Valid characters are uppercase and lowercase letters, digits, the underscore, and hyphen.

Description This command displays information about one or all of the currently-configured VLAN relay entities (Figure 8-34, Table 8-29).

The **vlanrelay** parameter specifies the name of the VLAN relay entity for which to show information. If the name is not given, information about all VLAN relay entities is displayed.

Figure 8-34: Example output from the **show vlanrelay** command

```

VLAN relay entities
-----
Name ..... SNARelay
Enabled ..... Yes
Debugging ..... No
Protocol ..... 00
Protocol ..... 04
VLAN ..... 2 (Accounts)
VLAN ..... 5 (Admin)
VLAN ..... 16 (Sales)
Packet counters:
  VLAN 2 to VLAN 5 ..... 2345
                    VLAN 16 ..... 148
  VLAN 5 to VLAN 2 ..... 2567
                    VLAN 16 ..... 754
  VLAN 16 to VLAN 2 ..... 174
                    VLAN 5 ..... 802
-----

```

Table 8-29: Parameters in output of the **show vlanrelay** command

Parameter	Meaning
Name	Name of the VLAN relay entity.
Enabled	Whether the VLAN relay entity is enabled.
Debugging	Whether packet debugging for the VLAN relay entity is enabled.
Protocol	Protocol number of each protocol that is relayed by the VLAN relay entity.
VLAN	Numerical VLAN Identifier and name of each VLAN added to the VLAN relay entity.
Packet counters	Number of packets relayed between VLANs by this VLAN relay entity.

Example To show the configuration and counters for the VLAN relay entity SNARelay, use the command:

```
sh vlanr=snarelay
```

Related Commands

- [add vlanrelay](#)
- [create vlanrelay](#)
- [delete vlanrelay](#)
- [destroy vlanrelay](#)